REPORT

OF THE

AGRICULTURAL COMMISSIONER

MAINE 1903

Group oι University of Maine Agricultural Students who attended the State Dairy Conference.

AGRICULTURE OF MAINE.

SECOND ANNUAL REPORT

OF THE

COMMISSIONER OF AGRICULTURE

OF THE

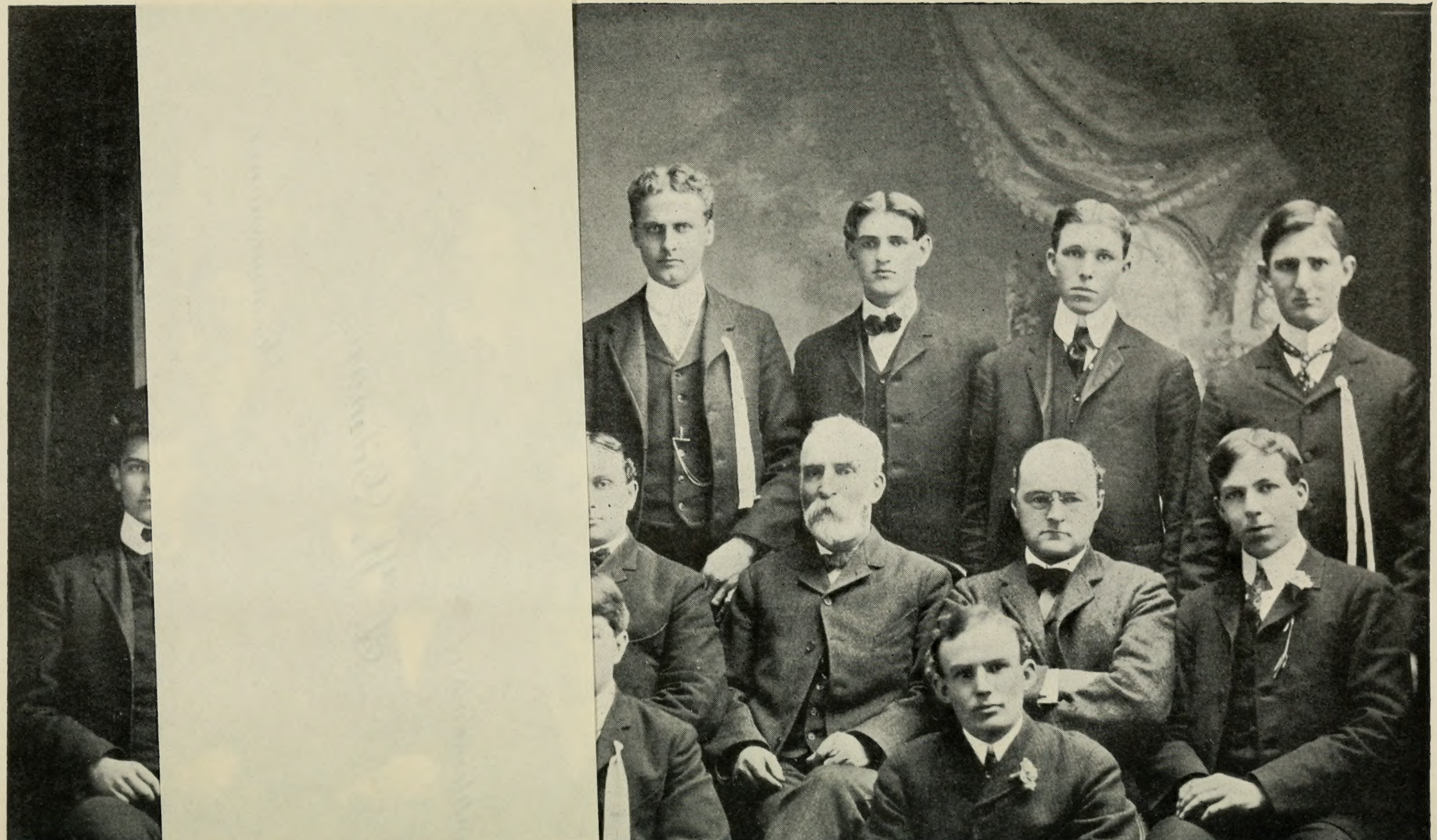
STATE OF MAINE.

Compliments of

A. W. Gilman,

Commissioner.

AUGUSTA
KENNEBEC JOURNAL PRINT
1904



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DEPARTMENT OF AGRICULTURE.

To the Honorable Governor and Executive Council of Maine:

In compliance with chapter 204 of the Public Laws of 1901, I herewith submit my second report as Commissioner of Agriculture of the State of Maine for the year 1903.

A. W. GILMAN, *Commissioner.*

AUGUSTA, January 1, 1904.

ANNUAL REPORT OF THE COMMISSIONER OF AGRICULTURE.

In presenting this report it gives me pleasure to state that the past year has been generally prosperous for the agriculture of Maine, and the outlook for agricultural advancement and prosperity in this State was never brighter than it is today. The farmers are taking new interest in their work. The crops that have been raised have brought remunerative prices and the market has been good. The acreage of tillage land is being increased and given more attention, and the farms are being made more productive. The free rural mail delivery and the farm telephone which have reached so many of the farm homes during the past year have added much to the desirability of farm life and the sociability of every community. Where all the farmers of a section have combined in establishing the telephone it has been a meagre expense, and the benefits that are derived from it, socially and financially, are beyond estimation. One of the especially attractive features of the telephone system in a farming community is the sociability that the farmers have among themselves, with practically no expense. With the daily paper left at the door and the telephone for communication with the neighborhood and the town or city, the barrier of isolation has been removed, and the rural people are being brought in close touch with the large centers.

Farmers have had serious obstacles to confront during the past season, and in some sections the effects of drought, frost and continued cold have not been overcome and the income of the farm has not equalled that of former years, but we believe that on the whole the products of the farm have not fallen below the average, and with the good prices which have been maintained the returns received have been quite satisfactory. The hay crop, which was so seriously threatened by the early drought, recovered, to an almost remarkable extent under the favorable conditions later in the season. The corn crop in many places was practically a failure, but the farmers of Maine are not discouraged. Although for the past two seasons the crop has not been a complete success, we still believe in corn culture. We cannot afford to abandon the great sweet corn industry; also, with increased dairying silos must increase, and it has been demonstrated that corn is pre-eminently the crop for the silo, that no crop can take its place for any length of time for that purpose. It is our opinion that corn in average years is a safe, profitable crop for Maine farmers to raise.

While the apple crop throughout the State hardly reached an average, the yield in many sections was much greater than in former years, and a larger income will be derived from the apple crop of 1903 than was anticipated by the most sanguine apple producers. We believe a careful estimate of the apples exported would not fall short of one million barrels. This crop has been receiving more attention than formerly. The orchard acreage has been largely increased during the past year, and fruit growers are giving their trees better care. An increased per cent of the orchards are under cultivation. The farmers have found that it is quite as profitable to fertilize and spray the orchard as any of their hoed crops. For the increased interest in apple culture great credit is due the Maine Pomological Society, which has spared no pains and used every effort to impress the fruit growers with the great financial importance of this crop. At their annual exhibition at Auburn, the fine display of fruit would have been a credit to any state in this Union. Their report is embraced in this volume, and it should be carefully read by every fruit grower in the land.

Wherever the soil is suited to this industry, and the farmer can give it his attention, it is certainly a good investment to convert these Maine hillside fields and pastures into orchards, planting the best varieties of standard winter fruit.

The potato crop of the State was the largest for years. Potatoes are bringing a good price and indications warrant us in making the assertion that the amount received by the producers this year will be far above the average. An increased interest in this crop has been noted during the past year. Not only has the crop in Aroostook county been such as to awaken new interest, but some of our practical, wide-awake farmers in the central and southern portions of the State have demonstrated that the soil in these sections, with the aid of commercial fertilizers and proper cultivation, can be made to produce potatoes equal in quantity and quality to those produced in the more favored northern section. Their success has stimulated others to an enlarged production, and the indications are that the acreage of potatoes planted in Maine in 1904 will exceed that for many years. Although profitable returns from this crop are not always assured, yet with thorough cultivation, continued well into the season, and early and frequent sprayings with Bordeaux mixture and some insecticide, the prospects will be such as in our opinion to warrant the farmers in all parts of the State in broadening out somewhat in this line.

The threatened troubles across the water indicate that the crops which are raised in this country will be in great demand, and farmers will be wise if they adopt the plan that has been so clearly and earnestly set forth by Prof. J. W. Sanborn of New Hampshire while engaged in institute work, of extensive, intensive farming. They should harness all the forces within their reach, by using capital, machinery and commercial fertilizers, to the end that their products may be increased.

The problem of securing efficient farm help is offering the farmers some difficulty, but this may be practically overcome by the use of modern machinery, labor saving devices, and economy of effort in every direction.

OUR LIVE STOCK.

We are again able to report an increase in the number and value of nearly all classes of farm stock, as ascertained by the reports of the local assessors to the State Assessors. The majority of our farmers recognize the value and importance of some kind of stock husbandry, in conserving the fertility of the farm, and a marked tendency to improve their herds by more careful breeding and selection is noted. In some sections farmers are taking much interest in the breeding of dairy stock, and have imported thoroughbred animals of the different breeds at high prices. We trust this movement will continue and will have a permanent effect upon the character of the stock of the State. A gratifying increase is shown in the number of cows, the number reported in 1903 being larger by 10,181 than that in 1902.

The poultry industry has not assumed the proportions that its importance would seem to warrant. While statistics show that during the past five years the total value of poultry and eggs produced has increased materially, the actual number of hens on the farm has decreased during that period. We believe that for the amount of capital required this industry may be made as profitable as any branch of farm work, and that many of our farmers could add materially to the income of the farm by extending their operations in this line.

OUR DAIRY INTERESTS.

We are pleased to note an advance movement along dairy lines during the past year. The Agricultural Committee of the last legislature, realizing the importance of this industry, and recognizing the desire of the Dairymen's Association and the friends of dairying that it should be fostered and protected, reported to the legislature a resolve in favor of the dairy interests of the State, providing for the appointment of a dairy expert, who should assist the creameries and farm dairies in the manufacture of a better and more uniform product, make a careful inspection of the conditions existing and methods pursued, and in every way possible further the interests of this leading agricultural industry in Maine. This resolve was passed by the legislature, and after careful investigation Mr. S. C. Thompson of Winterport, who is well versed in all lines of dairying, having had experience in the manufacture of dairy products on the farm and also as creamery manager, was chosen to fill this position. He began the work in May and continued until November, at which time he laid it down for an interval, and entered the Dairy School at Madison, Wisconsin, for a three months' course, to further perfect himself in all lines of dairy work. Upon his return he will again resume his duties as State Dairy Instructor.

We believe the work commenced by him has in it promise of much good for the dairymen of the State. An organization of the creamery men has been perfected during the past year, largely through his efforts, which is bringing about more uniform conditions and the possibility of manufacturing a better product, and his work among the private dairymen is resulting in a higher standard of production.

FARMERS' INSTITUTES.

The work of the farmers' institutes has been conducted along practically the same lines as during the previous year. Institutes have been held in every county, and in most instances the attendance has been large and a good degree of interest has been manifested. There is constantly a demand for a higher class of instructors, and we have endeavored to secure speakers who are experts in the lines which they treat. We are indebted to the University of Maine for their co-operation along this line. The members of the faculty have readily responded to all calls for assistance at our institutes when it has been practicable for them to do so. Another class of speakers that do most excellent work consists of practical farmers in our own State who have successfully solved the problems which have confronted them in their lines of farming. The agricultural editors of the State have also done much toward developing this work. The speakers from outside the State who have been employed during the past year are as follows: Prof. J. W. Sanborn, Gilmanton, N. H.; Dr. C. D. Smead, Logan, N. Y.; Prof. S. T. Maynard, Northborough, Mass.; David M. Kelsey, Durham, Conn.; Ernest Hitchcock, Pittsford, Vermont; P. M. Harwood, Boston, Mass.; Prof. C. S. Phelps, Chapinville, Conn.; John W. Clark, North Hadley, Mass.; Frank E. Emery, Chicago, Ill.

The principal topics which have been discussed are Dairying, Orcharding, Small Fruit Culture, Soil Cultivation, Forage Crops, Stock Breeding, Diseases of Domestic Animals, the Poultry Industry, Corn Culture, Potato Culture, The Enforcement of Dairy Laws, Agricultural Education, Road Construction.

The farmers' institute was organized to supplement the work of the agricultural college and experiment station in disseminating information on agricultural subjects. Its function is to take up-to-date, reliable truth relating to agriculture to these farming communities and present it in such a way as will be of practical value to every day life, and to awaken thought among the farmers and incite them to put forth more effort, to adopt new methods and to experiment for themselves. While it has not always been possible to reach the class of farmers who might be most largely benefited by these meetings, there are in most localities where they have been held a few farmers who put in practice the ideas gained, and the influence of their example and enthusiasm gradually permeates the farming community around them. It is our opinion that the results of this work, as far as apparent, are such as to justify the expenditure, and that the institute is an important factor in improving the condition of farm life and uplifting the agriculture of our State.

AGRICULTURAL SOCIETIES.

The fairs held by the various agricultural societies were generally successful. We believe the tendency toward making the educational features more prominent is increasing, and the character of the exhibits of stock and farm products exceeds that of former years.

A large and interesting meeting in the interests of the agricultural fairs of the State was held at Waterville on November 19th. Many of the speakers at this meeting were men who had had a great deal of experience in the management of fairs, and some of the papers presented, which appear in the following pages, contain suggestions which we regard of great value, and which we would commend to the careful consideration of all the fair officials of the State. Practically all the officers of the agricultural fairs of Maine were invited to be present, and many of them availed themselves of the opportunity.

The following figures show the business of these societies:

Number of horses and colts exhibited	1,606
Number of neat cattle exhibited	6,526
Number of sheep exhibited	1,252
Number of swine exhibited	760
Number of poultry (coops) exhibited	2,511
Amount of premiums and gratuities awarded	$23,252.01
Amount of trotting purses	$23,015.00
Per cent of premiums and gratuities to total awards	50
Per cent of State stipend	37.91
Number of societies receiving stipend	46

PUBLICATIONS.

The requests for the annual report for 1902 have been so large that we have been unable to supply all of them with the reduced number which are now published. We are continually having calls for back numbers of these reports, which we are now unable to furnish, as they have all been distributed.

The publication of the quarterly bulletins has been continued. Special efforts have been made to make these bulletins of great value to the farmers and gardeners of the State. Articles have been contributed for them by men who are experts in the various branches of farm work and who keep in touch with the best methods and the most up-to-date knowledge in all these lines. The spraying calendar published in our spring number is of inestimable value. The articles that have been written by the farmers of the State, giving their personal experience in the various lines of farm work, are full of useful suggestions and they are worthy of all the careful study that the farmer can bestow upon them.

Applications for these bulletins are continually being received, and our mailing list has attained large proportions.

AGRICULTURAL EDUCATION.

In our work the past year we have endeavored, whenever possible, to emphasize the value and importance of agricultural education, as we are largely of the opinion that if we improve the farmer he will improve the farm. We are glad to know that farmers are doing more reading and thinking along agricultural lines than ever before, but there is need of more agricultural teaching in the common schools of the State. We are proud of our State, of its resources, its natural attractions, its strong and intelligent men and women, but we must not forget that agriculture is one of its fundamental industries, and the decadence of agriculture will strike at the root of its greatness. Maine is fast becoming an agricultural State, and it is eminently proper that the money of the State should be used in educating her children along the line which they intend to pursue. The agricultural prosperity of our people will be in proportion to the amount of intelligence and skill which is put into their work. Many of the western states have recognized the importance of agricultural education for their husbandmen, and are giving much attention to the teaching of agriculture in the public schools. We regard the teaching of agriculture in our schools as a necessity for the best advancement of the State; but it will never be properly taught in the public schools until the teachers have fitted themselves to teach it, and this preparation should be made in the normal schools. We unhesitatingly declare that the normal schools are not doing their full duty to the State, and especially to the agricultural people of the State, until there is established, in one of them at least, a thorough course of agricultural instruction, which shall fit teachers to teach any and all branches of agriculture in our common schools. In the normal school which has recently been established, in a purely agricultural section of the State, it would seem very fitting that one of the courses should be a course in agriculture. We trust the school official of the State will give this matter his attention, and see to it that the coming legislature makes a special appropriation, if necessary, for establishing this course.

AGRICULTURAL LAWS.

The legislature of 1903 amended several of the laws relating to agriculture, and passed some new acts of importance in this line. We append the text of all these which we think are of special interest to our farmers. We have thought best to print the full text of the law relating to county and local agricultural societies, so that the readers of this report who are connected with the fairs of the State may familiarize themselves with the law and see that these fairs are conducted according to the statute.

All violations of any of the laws the enforcement of which is entrusted to this Department, which have been reported to us, have been carefully and thoroughly investigated. The amendments in the law relating to feeding stuffs appear to have been such as to have the desired effect. But very few complaints have been entered at this office since the new law went into effect.

LAWS RELATING TO AGRICULTURE.

Enacted or amended by the legislature of 1903.

AN ACT to regulate the sale and analysis of concentrated commercial feeding stuffs.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section 1. Every package of any concentrated commercial feeding stuff, as defined in section three of this act, used for feeding farm live stock, sold, offered or exposed for sale in this state, shall have affixed thereunto, in a conspicuous place on the outside thereof, a plainly printed statement clearly and truly certifying the number of net pounds in the package, the name, brand or trade mark under which the article is sold, the name and address of the manufacturer or importer, and a chemical analysis stating the percentage of crude protein, allowing one per cent of nitrogen to equal six and one-fourth per cent of protein, and of crude fat it contains, both constituents to be determined by the methods adopted at the time by the Association of Official Agricultural Chemists.

If the feeding stuff is sold in bulk or put up in packages belonging to the purchaser, the agent or dealer shall, upon request of the purchaser, furnish him with the certified statement named in this section.

Sect. 2. The term concentrated commercial feeding stuff, as here used, shall not include hays and straws, the whole seeds nor the unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn. Neither shall it include wheat, rye and buckwheat brans or middlings, not mixed with other substances, but sold separately, as distinct articles of commerce, nor wheat bran and middlings mixed together, nor pure grains ground together.

Sect. 3. The term concentrated commercial feeding stuff, as here used, shall include linseed meals, cottonseed meals, cottonseed feeds, pea meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewers' grains, dried distillers' grains, malt sprouts, hominy feeds, cerealine feeds, rice meals, oat feeds, corn and oat chops, corn and oat feeds, corn bran, ground beef or fish scraps, condimental foods, poultry foods, stock foods, patented proprietary or trade marked stock and poultry foods, mixed feeds other than those composed solely of wheat bran and middlings mixed together, or pure grains ground together, and all other materials of similar nature not included in section two of this act.

Sect. 4. There shall be annually appropriated from the state treasury the sum of one thousand dollars in favor of the treasurer of the Maine Agricultural Experiment Station, the same, or such portion thereof as is found necessary, to be expended by said experiment station in the analysis of concentrated commercial feeding stuffs.

Sect. 5. So much of the appropriation granted under this act shall be paid by the State treasurer to the treasurer of said experiment station as the director of said station may show by his bills has been expended in performing the duties required by this act, such payment to be made quarterly upon the order of the governor and council, who are hereby directed to draw the order for such purpose. The director shall annually publish a statement of the receipts and expenditures under this act.

Sect. 6. Whoever shall sell, offer or expose for sale or for distribution in this state any concentrated commercial feeding stuff as defined in section three of this act, without complying with the requirements of section one of this act, or any feeding stuff which contains substantially a smaller percentage of constituents than are certified to be contained, shall, upon conviction in a court of competent jurisdiction, be fined not more than one hundred dollars for the first offence, and not more than two hundred dollars for each subsequent offence.

Sect. 7. The director of the Maine Agricultural Experiment Station shall annually analyze, or cause to be analyzed, at least one sample of every concentrated commercial feeding stuff sold or offered for sale under the provisions of this act. Said director is hereby authorized and directed in person or by deputy to take a sample, not exceeding two pounds in weight, for said analysis, from any lot or package of concentrated commercial feeding stuff which may be in the possession of any manufacturer, importer, agent or dealer in this State; said sample should be placed in a suitable jar or bottle, tightly closed and a label placed thereon, stating the name or brand of the feeding stuff or material sampled, the name of the party from whose stock the sample was drawn and the time and place of drawing, and said label shall also be signed by the director or his deputy; provided, however, that when so requested said sample shall be taken in duplicate in the presence of the party or parties in interest or their representatives, in which case one of said duplicate samples shall be retained by the director and the other by the party whose stock was sampled. The sample or samples retained by the director shall be for comparison with the certified statement named in section one of this act. The result of the analysis of the sample or samples so procured, together with such additional information as circumstances advise, shall be published in reports or bulletins from time to time.

Sect. 8. Any person who shall adulterate any whole or ground grain with milling or manufactured offals, or with any foreign substance whatever, or any bran or middlings made from the several grains with any foreign substance whatever, for the purpose of sale, unless the true composition, mixture or adulteration thereof is plainly marked or indicated upon the packages containing the same, or in which it is offered for sale; or any person who sells or offers for sale any whole or ground grain, bran or middlings which have been so adulterated, unless the true composition, mixture or adulteration is plainly marked or indicated upon the package containing the same, or in which it is offered for sale, shall on conviction in a court of competent jurisdiction be fined not more than one hundred dollars for the first offence, and not more than two hundred dollars for each subsequent offence.

Sect. 9. Whenever the director of the Maine Agricultural Experiment Station becomes cognizant of the violation of any of the provisions of this act, he shall forthwith report such violation to the commissioner of agriculture, and said commssioner shall prosecute the party or parties thus reported. But there shall be no prosecution in relation to the quality of any concentrated commercial feeding stuff if the same shall be found in its constituent parts substantially equivalent to the certified statement named in section one of this act.

Sect. 10. Chapter three hundred thirty-four (334) of the Public Laws of one thousand eight hundred ninety-seven (1897) and all other acts and parts of acts inconsistent with this act are hereby repealed.

Sect. 11. This act shall take effect June first, one thousand nine hundred and three.

AN ACT to provide for the protection of trees and shrubs from injurious insects and disease.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section 1. All nursery stock shipped into this state from any other state, country or province shall bear on each box or package a certificate that the contents of said box or package have been inspected by a duly authorized inspecting officer, and that said contents appear to be free from all dangerous insects or diseases. In case nursery stock is brought into the state without such a certificate the consignee shall return it to the consignor at the expense of the latter; provided, however, that any box or package bearing a certificate of fumigation, which shall be an affidavit made before a justice of the peace, that all stock sold by the consignor has been fumigated in a manner approved by the state nursery inspector of the state from which said nursery stock is shipped, the same may be accepted as though bearing a proper certificate of inspection.

Sect. 2. Any transportation company that shall bring into this state any nursery stock such as trees, shrubs, vines, cuttings or buds, and any transportation company, owner or owners of nursery stock, or persons selling nursery stock as thus defined, who shall transport such stock or cause it to be transported within the state, the same not having attached to each box or package an unexpired official certificate of inspection or an affidavit of fumigation, which shall meet the requirements specified in section one of this act, shall be guilty of a misdemeanor, and on conviction thereof be subject to a fine not exceeding one hundred dollars for each offence.

Sect. 3. Should any person in the state suspect the presence of San Jose scale or other injurious insects or diseases preying upon trees, shrubs or vines in his possession or within his knowledge he shall forthwith notify the commissioner of agriculture to that effect; and it shall be the duty of said commissioner of agriculture to cause the said trees, shrubs or vines to be inspected by a competent entomologist, who shall forthwith make a report of the results of his inspection and file the same with the commissioner of agriculture at Augusta. If dangerous insects or injurious diseases are found by the entomologist the commissioner of agriculture shall publish the report of the same, and see that the best known treatment is applied to such trees, shrubs or vines for the destruction of the insects or diseases with which the same may be infested. And for the above purposes the commissioner of agriculture or his employes shall have authority to enter private or public grounds and treat any trees, shrubs or vines that may be infested with dangerous insects or injurious diseases.

Sect. 4. In case of violations of this act it shall be the duty of the commissioner of agriculture to enforce the penalties set down in section 2 of this act.

Sect. 5. This act shall take effect when approved.

RESOLVE IN FAVOR OF THE DAIRYING INTERESTS OF THE STATE OF MAINE.

Resolved, That there be, and hereby is appropriated, to be expended under the direction of the Commissioner of Agriculture, the sum of three thousand dollars for the year nineteen hundred and three, and three thousand dollars for nineteen hundred and four, for the purpose of improving and protecting the dairy interests of the State of Maine, by employing a dairy expert, and suitable assistants, and paying such expenses in connection therewith as the Commissioner may approve.

LAW RELATING TO COUNTY AND LOCAL AGRICULTURAL SOCIETIES. CHAPTER 60. R. S.

SEC. 13. County and local agricultural societies may take and hold property, real and personal, the annual income of which shall not exceed three thousand dollars, to be applied to the purposes provided in their charters; or their treasurers may receive conveyances or leases of such property, for their societies, and hold, sell, mortgage or pledge it, and shall give bonds to the trustees for the safe keeping thereof and the faithful discharge of their duties.

SEC. 14. There shall be appropriated annually from the state treasury, a sum of money not exceeding one cent and one-quarter to each inhabitant of the state, which shall be divided among the legally incorporated agricultural societies of the state not provided for by special enactment, according to the amount of premiums and gratuities actually paid in full by said societies, provided, that the stipend shall be based entirely upon the premiums and gratuities actually paid in full on exhibition stocks and products, and provided, that no society shall receive from the state a sum greater than that actually raised and paid by the society for said purposes; provided also, that each of the said societies shall cause the prohibitory liquor law to be enforced on all grounds over which they have control, and not allowing gambling in any form or games of chance on said grounds.

SEC. 15. None of such payments shall be made to any society until the treasurer thereof files with the treasurer of state a certificate on oath stating the amount raised by it and containing the specifications required in section nineteen; and also a certificate from the commissioner of agriculture that he has examined into the claim of said society; that in his opinion it has complied with the provisions of sections nineteen and twenty and with the following section; that there has been awarded and paid by said society as premiums and gratuities a sum at least equal to the amount apportioned to said society and that the provisions in regard to gambling and the sale of intoxicating liquors have been strictly complied with.

SEC. 16. No state stipend shall be paid to any agricultural society offering or paying premiums on grade males; the commissioner of agriculture may make this a part of the sworn return to be made by the proper officers of all agricultural societies; provided that evidence as to eligibility to registration be accepted as satisfactory proof of purity of blood.

SEC. 17. The payment of the state stipend to the Eastern Maine State Fair and Maine State Agricultural Society shall be conditional upon the use of the score card system in the judging of all horses, breeds of cattle, sheep and swine, and of dairy products; the cards to be used for pure bloods to be those adopted by the several breeders' associations. A copy of each score card as filled by the judge shall be delivered to the exhibitor of each individual animal judged. All county societies receiving a three hundred dollar stipend or more, shall be required to faithfully observe the same system and conditions.

SEC. 18. Every society receiving the bounty of the state, shall expend an equal amount each year in premiums and gratuities for the improvement and encouragement of agriculture, horticulture or the mechanic arts, unless the commissioner of agriculture directs for what purposes a sum not exceeding half of such bounty shall be expended; and then it shall be expended accordingly.

SEC. 19. Every society applying for the bounty of the state shall require of all competitors for premiums either on animals, crops, dairy products or improvements of soils or manures, a full and accurate statement of the process or method of rearing, managing, producing and accomplishing the same, together with its cost and value, with a view of showing the profits or benefits derived or expected therefrom; and the application for bounty shall embrace all the specifications included in the following form, to wit: "I, A. B., treasurer of the ———— society, hereby apply for bounty in aid of said society, as granted by law, and being sworn or affirmed, say that $——— has been raised and paid in good faith into the treasury of said society, and that $——— has been actually paid in full in premiums, in conformity with law."

SEC. 20. The secretaries of the several societies shall prepare an annual report, embracing a concise statement of the financial condition and doings of the society, with a synopsis of the premiums awarded, to be made by filling blanks furnished by the commissioner of agriculture. Said report shall also state the leading features of the annual exhibition, the character of the efforts of the society for the advancement of agriculture, the principal crops raised in the county or district, the success attending their culture as compared with former years, and the obstacles met with; and generally the condition, prospects and wants of agriculture; which report, with a list of the officers of the society and the post office address of each, renewed at each new election, and all statements made by successful competitors for premiums, and any reports of committees, essays, addresses or other papers presented to the society containing matters of general interest, shall be returned to the commissioner by the first Wednesday of each December. Upon receipt and after examination of said returns, if the commissioner finds them full, faithful and accurate, according to the intent hereof, he shall issue the certificate mentioned in section fifteen, and not otherwise.

SEC. 21. All incorporated agricultural societies may, by their officers, define and fix bounds of sufficient extent for the erection of their cattle pens and yards, and for convenient passage ways to and about the same, on the days of their cattle shows and exhibitions, and for their plowing matches and trial of working teams, within which no person shall enter or pass, unless in conformity with the regulations of the officers thereof; but they shall not so occupy or include the lands of any person without his consent, or obstruct the public travel of any highway.

SEC. 22. Whoever, contrary to such regulations and after notice thereof, enters or passes within the bounds so fixed, forfeits to such society not exceeding five dollars, to be recovered on complaint.

SEC. 23. The officers of any such society may appoint a sufficient number of suitable persons, to act as constables at cattle shows and exhibitions, with all the powers of constables, for the preservation of the public peace, and the enforcement of the regulations of said society, within the towns where such shows and exhibitions are held, from noon of the day preceding the commencement of the same until noon of the day succeeding the termination thereof, and no longer.

SEC. 24. Whoever sells any refreshments, or other merchandise, or exhibits any show or play within a quarter of a mile of the fair grounds of any agricultural society, during the time of any exhibition thereof, unless in his own dwelling-house, or usual and ordinary place of business or lets any land or building adjoining, or overlooking the fair grounds of such society, to spectators of any exhibition thereof, during the time of such exhibition, without the written consent of its trustees, forfeits to such society not exceeding one hundred dollars, to be recovered on complaint of two of its trustees.

INSTITUTE PAPERS.

THE DEVELOPMENT OF THE DAIRY BREEDS AND THE DAIRY TYPE.

By Prof. C. S. Phelps, Chapinville, Conn.

(Stenographic Copy.)

Practically all of the dairy breeds have sprung from the older countries, especially from England. We should give England great credit for what she has done for agriculture, in the development of our modern breeds of live stock. If we consider a moment we will see that four, at least, of our dairy breeds have their home in the British Islands, namely, the Ayrshire, the Guernsey, the Jersey and the Shorthorn breeds, and if we go into the beef breeds we must include the Devons, the Herefords, and a number of the polled breeds from the northern part of the Islands. Several of our finest breeds of horses were established in England, as well as several of the leading breeds of swine and poultry. As a new country, we naturally looked to the mother country to aid us in establishing the foundations of the best breeds of live stock, and especially of dairy stock.

In looking back over the history of dairying and of dairy breeds in our own country, we find that sixty years ago there was no fixed dairy breed or type in the cows of that time. The Jerseys were perhaps the first breed to be introduced, having any important place in the improvement of the dairy industry of this country, and the first of the Jerseys were brought to Connecticut in 1850 or '51. In 1893, the time of the Columbian Exposition, it was said that more good Jerseys traced their ancestry back to Connecticut than to any other part of this country. That remark was made by a man who was much interested in looking up Jerseys for the famous dairy breed test. The Shorthorns were introduced into this country somewhat earlier than the Jerseys, although as a dairy breed their influence came later. I speak of the Shorthorns as a dairy breed. In some respects it is truly a dairy breed, in many other respects it is a beef breed. There are two strains of Shorthorns, one of which is of the dairy type and the other decidedly of the beef type, and according to which of these strains is being developed, the dairy type or the beef type will predominate. This is not true of most of the other breeds. The Jerseys, Guernseys and Holsteins are more generally of the dairy type.

The development of the breeds has been the outgrowth of selection and environment; selection being the part played by man and environment the part played by nature. The Jersey breed and the Guernsey breed have each been selected for generation after generation for their milk and butter qualities, particularly the butter qualities. The Holstein breed, on the other hand, has been selected for a large production of milk, and the Ayrshire breed has been selected for a large milk flow.

We find, too, that the surroundings under which the animals have been placed have done much toward the development of the breeds. For example, the Jerseys and Guernseys are not naturally as rugged and hardy as the Ayrshires. This is mainly a result of differences in the climates in which those breeds originated, the isles of Jersey and Guernsey in the English Channel, between the coast of France and England, having a much milder climate than the south of Scotland where the Ayrshire breed was developed. The Ayrshire breed, without question, is one of the hardiest breeds of dairy cattle. I am not saying that the Jerseys and Guernseys are not generally hardy, but as a result of the difference in climate, the original stock of the two breeds differed in hardiness in favor of the Ayrshire and these differences are still noticeable. The Holstein breed, as a result of peculiar environment, has become a heavy milk-producing breed. The lowlands of Holland are adapted, and have been for centuries, to yielding immense quantities of rich herbage for pasturage, and this has tended to develop a large milk-producing breed.

If we want to get the very best results, it seems to me that we should follow out the plan of development that was undertaken when the breeds were first started. If we want to get the largest butter production, we ought naturally to select those breeds, which, from the foundation, have been bred for butter production. If we want to get the largest milk production, we should select those breeds which from the foundation have been bred for large milk yields. We will find, in general, that it is much easier to develop any animal along one particular line than along two or three lines. We have heard a good deal of discussion about the general purpose cow and the special purpose cow, or the general purpose horse and the special purpose horse. If we would apply the same rule to the breeding of cows that is generally applied to the breeding of horses or dogs, we ought to get similar results. We rarely try to develop a general purpose horse. Of course there are a few that might be called general purpose horses, but if we want to develop the highest degree of speed we select a breed noted for speed, while if we want to develop the highest degree of force or power, for the handling of heavy loads, we breed for that purpose alone. If we want to develop a bird dog, for the hunting of birds, we breed with that idea in view, and if we want to develop a fox hound, for the hunting of foxes, we breed with that idea in view. And yet too many of us have the idea that we can breed a cow that will be valuable for beef and at the same time be valuable for milk and butter. The highest degree of development in any animal must come along one particular line, rather than several lines, or even than two lines. So it is wise, if we desire to produce butter in large quantities, to select from those breeds which have been developed especially for butter production; while if we desire to produce milk, to select from those breeds which from the foundation have been bred for milk production.

If we study the statistics that are available with regard to the quantity and quality of the milk of the various dairy breeds, we will find that the Holsteins and the Ayrshires are noted as heavy milk producers, the milk being of moderate richness only. The Jerseys and the Guernseys are noted as moderate milk producers, as far as quantity goes, but of milk rich in butter fat, and hence their great value is for butter production. If you are producing milk for the Boston market, for example, and the standard of solids for that market is 13 per cent, and of butter fat 3 per cent, you can hardly afford to produce milk which contains 15 per cent solids and 4½ to 5 per cent fat, and sell it at the same price that the man does who produces milk containing 13 per cent solids and 3 per cent fat. You would make more money by handling that breed of stock which would give milk that just passed the standard, provided you were selling in the open market. But if you were shipping milk to some private concern, willing to pay you proportionately more for the high percentage of solids and fat contained in the Jersey and Guernsey milk, that would be a different question. In the open market, as most milk is sold, it would not pay you to keep the grade of stock that gives the smaller quantities and the higher quality.

If, on the other hand, you are producing butter and want to get the largest possible yield, it is wise for you to keep those breeds or those strains which give a large proportion of butter fat in the milk, and in this respect the Jerseys and the Guernseys are valuable perhaps above all other breeds. The New York Agricultural Experiment Station made a comparison of four of the leading breeds of dairy stock—the Jerseys, Guernseys, Holsteins and Ayrshires—and they classed the Jerseys and Guernseys as butter producing breeds from the high per cent of butter fat contained in their milk. The average percentage of solids was about 15, and in that 15 per cent of solids about 5 per cent was butter fat. The Ayrshires were a medium breed. They gave very much larger quantities of milk than the Jerseys or Guernseys, but with not nearly so large a proportion of solids and butter fat—only about 12½ to 13 per cent of total solids and about 3¾ per cent of fat. With the Holsteins the precentage of solids was even less, sometimes as low as 11½ or 12, with 3 to 3¼ per cent butter fat, but the yields of milk were much larger than for any other breed. I do not mean to say that there are no Holsteins, or Ayrshires that give richer milk than here indicated, or no Jerseys or Guernseys that give thinner or poorer milk, because there are individual variations in every breed, and sometimes those individual variations, within a breed, are very great indeed. But these figures, which I have given, represent the general average of the breeds indicated. So in selecting stock it is wise to decide first the line of work which you will pursue, and then to choose those breeds, or the grades of those breeds that will give you the greatest amount of the products for which your line of business calls.

A word might be said in regard to grade stock. By grade stock we mean stock that has a thoroughbred parent on one side and an animal of mixed blood on the other side. Generally the thoroughbred animal is represented on the side of the sire. There is no special reason why this should be so except that the male exercises a large amount of influence in the herd, while the female exercises influence only over a small number of progeny. In the grade stock we sometimes find as valuable animals, as far as milk and butter products are concerned, as we find in the best of thoroughbreds, but when we take into consideration the progeny of the animal we cannot expect as good results from grade stock as from thoroughbred. If the question of the sale of progeny is not an important one, one can oftentimes build up a herd of grade stock and get just as good results as he would get from a thoroughbred herd. It can be done very much cheaper because the breeder can secure a thoroughbred male and a number of excellent females of mixed blood at a very much smaller cost than he can secure a number of thoroughbred animals, both male and females, for foundation stock. But even if you do this it seems to me that it is always wise, if possible, to have one or two thoroughbred females of good quality to be building up from at the same time you are using the thoroughbred male in breeding grades. Then you would be making headway much more rapidly. You would be getting ahead with thoroughbreds at the same time that you were gaining ground with your grades, and after a time the thoroughbreds would increase to that extent that you could replace entirely the grade stock.

Another thing that we need to take into consideration is that, when we have selected a breed for dairy purposes, this does not end all of the thought and care that is necessary in our breeding operations. As I said a little while ago, there are wide variations in the types within a breed. A good deal of study has been given to the subject of the types of dairy cows within the last few years. It is important to know whether the type is one that will tend to result in the largest amount of dairy products, or one that would tend to lead the animal to beef production, at the expense of milk production. It has been found that a peculiar external conformation is necessary to the highest dairy development. That is, if the animal shows any marked tendency towards the development of beef qualities, this will take so much away from the development of dairy qualities. This is in accordance with the principles which I have already laid down, that you can develop animals along one particular line to a high degree, but when you try to develop them along two lines, neither of those qualities will, as a rule, become highly developed. So after we have selected a dairy breed, we may find that there are Jersey cows and Jersey cows, and there are Guernsey cows and Guernsey cows, and that they are not always on a par by any means. We find that there are a good many Jerseys with quite a good deal of the beefy tendency. They are squarely built behind and do not taper out to the front as the true dairy type should, and they do not have very large barrels. The result is that they are putting quite a good deal of their food into the production of flesh, and this you do not want if you are trying to get the highest degree of dairy development.

What you should look for in the true dairy type is an animal that shows very little tendency to beefiness, is thin in the forequarter, and has a large barrel. I mean by the barrel the middle section of the animal. If this is large and protruding, deep through from top to bottom and from side to side, then you have, as the Scotchman expresses it, "an animal with a big gristmill," an animal that is capable of taking a large amount of food and converting it into milk. An animal with small abdominal capacity will not use a large amount of food for milk production. If the animal shows any tendency to beefiness the result will usually be that she produces a large amount of milk for two or three months after calving, then she begins to drop off rapidly, and will want to go dry for three or four months of the year, thus giving very little profit for about half of the year. The true dairy type will be a persistent milker, giving not necessarily a very large flow at the start but quite an even flow throughout a large part of the lactation period. The nervous temperament of the animal is another quality that should be looked for in the true dairy animal. You will find that the animal of a beefy tendency has a quiet, sleepy, easy disposition, a very quiet eye, showing no tendency to nervousness.

Briefly outlined, the true dairy type of cow has a sprightly eye; not necessarily a wild eye, but a bright, clear eye, and a slender head with no tendency to beefiness in the cheeks or under the chin. She has a long, slender neck, very light fore quarters, the middle section broadening out as you go back onto the body of the animal with wide, full rear quarters. What does this mean?

It means that the animal has been developed along those points where the greatest amount of strain comes upon her in milk production. The rear quarters are necessarily heavier, fuller and broader than the forequarters in order that she may be able to produce her offspring freely, and in order to allow for the development of the udder. If the rear quarters are narrowed down so that the rear legs come close together, you cannot get a large, full udder development. The fore quarter should be slender, so that as you look at the animal from the rear you get a tapering condition, broad behind and tapering somewhat towards a point at the front. This is a result of the special development of the milking qualities. The cow turns her food in the direction of the greatest amount of strain upon the system, which in the true dairy type is in milk production. You will thus see that after you have chosen the breed that you may want for dairy purposes, it is wise for you to study the type within the breed, and to select and use the type that will yield the largest amount of profit for a given amount of food, so as to keep the expense of production within the limits of profit.

QUES. Is one safe in breeding from grades if he wishes to improve his herd?

ANS. He is not always sure of getting something better than he started with, but the superior degree of excellence of the male will increase the safety of the operation. If the male is far superior in his good qualities to the native or the grade females, you are likely to be reasonably safe, but it frequently happens that the native and grade females have a good deal of prepotency, and unless the male is an especially excellent one there is danger that the qualities of the female will predominate in the offspring. A great many people get the idea that in the breeding of grades any thoroughbred male will do. We frequently find that grade females are pretty powerful in the transmission of their own qualities, and a male should be used that is powerful enough to impress his qualities over those of the grades. In breeding grade stock the breeder should be as careful in the selection of his thoroughbred male as in breeding thoroughbreds.

QUES. If you had a herd of grade Holsteins of the dairy type, would it be advisable to use upon them a pure bred sire of the Jersey or the Guernsey breed?

ANS. I do not think so. I do not believe in crossing breeds. The general rule in breeding seems to be that divergency leads to further divergency.

MR. HITCHCOCK: I would like to give an illustration. A friend of mine went down to the New England fair at Worcester to judge the dairy cattle. He tells me that he saw there in the class of grades as fine, if not the finest, type of a dairy cow that he ever saw, and that cow was bred from a pure bred Holstein dam and a pure bred Jersey sire. But that cow had an own sister that was absolutely worthless. I do not consider it safe to cross the breeds.

QUES. Is there any more danger of getting poor offspring from a grade cow, provided she is a good type, than from a thoroughbred?

ANS. I think there is, because the grade cow has not the fixedness of type that the thoroughbred has. The thoroughbred has been bred along a certain line for many generations, and has her qualities pretty well fixed. The grade has been bred in a mixed way and her qualities are not so firmly fixed, and you are more likely to get variations.

QUES. If I am choosing a male of the Jersey breed, how am I am to be quite sure that it is of the dairy strain?

ANS. I think you can apply the same general rules that you would apply to the female. You have to take into account somewhat the masculinity, which will give us some variation in the coarseness of the type, but the same general rules should hold. He should be somewhat wedge shaped, with not so large a development of the barrel but still a considerable amount, and a good width between the legs behind, which would show that the animal came from a progenitor that had a large development of the rear quarters and of the udder. You would look for the same general outlines in the male as in the female, with the exception, of course, of the peculiar organs possessed by each, but above all study his dam and her records of production.

QUES. How far do you think the score card can be used in the selection of dairy animals?

ANS. The score card may be valuable in a general way, but if you attempt to follow it strictly I do not regard it as of much value. The score cards of a great many of the breeders' associations place comparatively little importance on a large development of the barrel, and I consider that one of the most important points in the judging of a dairy cow. A large barrel development, a large udder development, with its corelations of teats and milk veins, and a highly developed nervous organism are the three important points that I should look for in the dairy cow. A nervous temperament does not necessarily mean a wild, excitable animal. It may be a quiet nervous development, which is shown by the open condition of the backbone. If you can drop the edge of your hand between the vertebræ of the backbone, this shows a large development of the spinal column, which is essential to high dairy qualities.

I want to say incidentally that I am not speaking entirely from a scientific or theoretic standpoint. While I have had class room work for fourteen years, yet during those years I have studied dairy cows, and at the present time I am managing a farm of 500 or 600 acres with 50 head of cows, 30 thoroughbreds and 20 grades that will, I hope, be replaced by thoroughbreds in time. I have endeavored during all of my teaching and scientific work to combine the practical with the scientific, and I think this is what we must do if we are successful.

Ques. I would like to inquire in regard to the Devon breed?

Ans. There are very few Devons in our State at the present time. Fifty years ago the raising of Devon oxen was quite an industry, but now there are but few. These are kept mainly for the same purpose, the raising of working cattle. There is scarcely a herd of Devons that would be classed as a dairy herd in the State. I am inclined to class the Devons as a beef breed rather than a dairy breed. Certain strains of the Devons may be developed, as is the case with the Shorthorns, that will have a decided dairy tendency, but the general tendency is toward beef production.

Ques. Is there any certain way that we may know the difference between the two strains of Shorthorns? Is there so great a difference as between the Shorthorn and the Jersey animal?

Ans. There certainly would not be that wide variation between the two strains of the Shorthorn as between the Shorthorn and the Jersey or the Shorthorn and the Guernsey, but still you see the same general variation. Some of the Shorthorns have a decided dairy tendency, but the general tendency of the breed as a whole is towards beef production. Some of the

Shorthorn strains have been bred for a long time in the dairy line. About 1845 the two different strains were well established in the herds of Booth and Bates in England. Booth bred for beef and Bates for the dairy and these two distinct strains have come down to us, but there are probably more beef Shorthorns than dairy Shorthorns today. In the dairy Shorthorn you would have something of the wedge shape with broad rear quarters, allowing for a full udder development, and a large barrel tapering to the front, light forequarters and a slender neck and head. In the beef type you would have a square built animal, the forequarters nearly as broad as the rear quarters. The typical beef animal has what is called the rectangular figure.

DISEASES OF DOMESTIC ANIMALS.

By Dr. C. D. SMEAD, Logan, N. Y.

(Stenographic Copy.)

The subject assigned to me tonight is sometimes a very easy subject to talk upon, at other times a very hard subject. Disease is something that we do not like to think about. Disease and death are things which we dread. But when we are ailing, then we are ready to talk of these things. We are ready to ask advice of the doctor, and we find people ready to ask any elderly lady in the community, ready to follow any advice. All of humanity come the nearest to one level when they are ailing of any time in their lives. If you who are here tonight had a diseased animal, a horse or a cow, then you would be anxious to ask me if I could tell you of something that would cure him. Farmers are continually seeking for prescriptions. They are asking me daily for remedies for this, that and the other ailment; but how little interest do they seem to have, all over New York and I believe in Maine, as to what caused that disease! We can see from a moment's consideration that it should not be for the farmer to ask for remedies, to try to get hold of some prescription, as much as it should be for him to study the cause of the disease. Let us consider it a moment. If you had a sick animal, I could talk to you about that special ailment, but as you haven't anything of

Dr. C. D. Smead, Logan, N. Y., among his pets.

that kind I will talk to you upon some of the causes of disease, and try to throw out a few hints that may prevent you from having disease among your flocks and your herds.

We shall have to take up a little bit of the veterinarian's life, and you will pardon me if I take up a little of my own experience. I have been a practicing veterinarian for something over thirty years. When anyone asks me today if I am practicing I answer, yes and no. Through the press and by correspondence advice is being given all over the country, from Maine to Texas and from Oregon to Florida. It is really a line of practice. I have a large amount of correspondence with men who are seeking advice for the treatment of their animals. As I look back upon it I find just this condition: sixty per cent of all the diseases upon the farms of the United States occur simply because the owner of that animal did not understand the proper manner of feeding him, did not study what was the proper food for the animal. That seems like a large statement, but if there is a physician in this audience I think he will almost bear me out in saying that sixty per cent of the diseases with which he has to contend today occur because the person was not properly fed. I want to say just a word on that. Do you know how we are looked upon today by people on the other side of the Atlantic ocean? When the great World Congress was held in Paris, some of our physicians reported that people over there would say to them, "You are nothing but a race of dyspeptics." There is a great deal of truth in that. The fact is that in this God-blessed land, this United States of America, we have so many of God's blessings that we are eating ourselves to death; so much to eat that we abuse the privilege. Go down to your drug store and ask the druggist what he sells the most of. He will answer, dyspeptic tablets or other medicines for dyspepsia.

In regard to the animals, as I have said, sixty per cent of the diseases upon which we are called to give advice arise from the fact that the animal was not properly fed from infancy up to maturity. It has grown up a dyspeptic in many instances, or it has grown up with a weakened vitality that makes it subject to disease. When we find a horse that is peculiarly subject to colic, and about every time a little change of food is made, or there is a change of atmosphere he has an attack, it has been my experience to find that his destiny was fixed during the first winter of his life, because he was not properly nourished. We find, again, that fifteen per cent of the diseases that exist among horses and cattle occur practically because the breeders do not understand as much about the animal conformation as they should. They are breeding promiscuously, and have reared animals that are so constituted that they are compelled to have diseases. The larger per cent of the ring bones, spavins and heaves among horses are simply because they were bred that way, and yet the owners are seeking the veterinary profession and asking, What is the remedy? What can I do for the heaves? What can I do to cure a spavin? What can I do to cure a ring bone? If a ring bone came purely from accident, then there would be some show for the horse. Hence it is only when we are called upon in the early stages, and personally see the animal and know the conformation, that we can know whether there is a reasonable prospect for a cure.

Let us consider the subject of food for the animal. All food nutrients might be said to have started from milk. If it had not been for a little milk, at some period in your existence or mine, we would not have been here. Milk was what we were started on life's journey with, and a little later on what we had was something that approximated milk. The little child, the little pig, the little calf, or the little lamb, had to have milk the first day of its life. If it had not had milk, or something which approximated milk, it would have perished. When that boy before me was little he had milk, and when he got a little older he wanted bread and milk. If he has a healthy, normal digestion he will eat bread and milk and craves it, but if his digestion has been ruined in some way, he will not crave it. When we get as old as Mr. Gilman and myself, we want a little Johnny-cake thrown in, and then we have a balanced ration. Milk has a nutritive ratio of one to four, the flour or bread of one to eight. When we get a little older and need something more to keep us warm, we add a little Johnny-cake, and we have a balanced ration for man. How is it with the animal? When the little colt or calf or lamb has grown a little older and begins to exercise, it needs then not the bread, but the same elements. It needs a balanced ration all the time. Let us be a little more specific. All over the land farmers, as a rule, if they know nothing about protein, carbohydrates or anything of that character, have learned by experience that certain foods which they grow upon their farms will cause the cow to give milk, and the pig to grow; and they are willing to feed the cow upon that class of food just as long as they can see the stream of milk coming down into the pail. They are willing to feed the horse upon a class of food that will enable him to work, give him muscular vigor and strength, which is on the same line only a little wider ration, one which has a little more of what we call carbonaceous food. When the time comes that they see no milk coming down into the pail, or we will say while drying off the cow, when she goes dry either by nature or by forcing her, what will they feed? Anything that they happen to have the most of and cannot sell. If they happen to have an abundance of timothy hay, perhaps they will feed that. When I speak of timothy hay I mean pure timothy when it is worth about five dollars a ton. The farmer will say, timothy hay is good enough food for any cow. He does not stop to consider whether it is a balanced ration. The animal in order to get enough of the muscle-making food to keep up its nervous vigor must eat about two and one-half times as much of another element as it needs. You may not believe it, but it is true, nevertheless, that timothy hay can be fed to a horse until he starves to death. Corn can be fed to a pig until he gets so fat that there is no blood in him and he starves to death. And a pig can be fed on the finest bread that any lady can make and he will die inside of forty days. It does not contain the elements necessary to sustain all parts of the body. The important point I wish to impress upon your minds tonight is this, that the dry cow, and the idle horse need just as good a variety and as good a quality of food when not working as when at work. If every man understood that, and would simply reduce the amount of food, or perhaps vary it a little bit, making it a little more carbonaceous, he would save trouble later on. What do we mean by that? A little later on the cow becomes fresh. Behold, there is retention of the placenta! That is a disease which is caused by unbalancing the system during the latter stages of her pregnant condition. Nature did not design any such thing. It is because nature's laws were violated in the feeding of that animal during the time that she was not giving milk. Had she been properly fed during that time, rare indeed would be the case in which this would have happened. Perhaps the cow has a caked udder; not a drop of milk will come. We look for that when she is fed upon straw or timothy hay, non-milk-producing rations. If that dry cow had been fed during that time only about half as much of the same class of food that would produce milk, the trouble would have been avoided. The horse that is having a working ration, say oats and bran and mixed hay, needs the same class of food when he is not at work, but he does not need as much of it. Let us bring it down to a practical illustration. I am going to give away some of the secrets of the trade in veterinary science. When I am out in institute work I get home occasionally, perhaps once a month, and I usually find a number of calls waiting for me. Here are men whom you would not call bad caretakers of their animals, and until about the first of December the animals are all right. Then they will all be in winter quarters and the man will say to himself, I am through with my fall work, through with my team, and I have an abundance of straw, I will give the horses some straw and I will give them some corn. He will feed along that line, and at last what happens? The man notices that something is going wrong and he comes to my door and says, "Doctor, I am glad you are at home. My horses are not doing first-class. Their hair looks bad, they act a little off, do not seem to have much life." Sometimes the man thinks their teeth need attention, or he thinks they have internal parasites. I am not here to say that animals do not have worms. I am not here to say that occasionally a horse's teeth do not need attention. Even a little colt's teeth need attention. But I want to tell you that a horse's teeth that are all right the first of December do not get bad before the middle of January. Five times out of six I will ask this question, "What are you doing?" "Well, I am not doing much of anything with my team; I am feeding a little timothy hay, and so forth, and they are looking bad." We will examine the horses, and occasionally the teeth need filing. I want to tell you that every doctor in this land does not depend upon his medicine altogether. He has to know his man, and we have to know our men. If we know that a man is very set and has got it into his head that the animal must have his teeth filed, we will file them anyway. We have to do a great many things in this world that are not necessary, to keep the other fellow right. Another thing,—the whole American people are wonderfully struck on medicine, so to speak. They want medicine and you cannot get along without giving them medicine, whether they need it or not. It is something that must be given them at any rate. When that man has told me what he is feeding I know why the hair looks rough. The hair of the animal should be the farmer's thermometer. The horse is not getting enough food in the system to make the hair grow and look well. The muscles are going, the blood is going, the nervous system is all going, right on the same line. I might say to that man, "John, you have got to change your food, your animal is actually starving; while it is getting an abundance to eat it is not being fed, it is filled but not fed." Sometimes I will say to him, "Have you got any wheat bran? I am going to put you up some medicine and it will be bitter and I want you to mix that up with some wheat bran so the horse will eat it." I insist upon it and he gets the bran, and the medicine is put into the bran, four or six quarts, as the case may be. A month later he will say, "Doctor, I never saw anything work better than that medicine." The wheat bran balanced the horse's ration. The little medicine was simply to tone up the weakened digestion so that it might assimilate the food. When the hair got plenty of food it was nourished and began to look sleek. The nerve was nourished, the blood was supplied. Here is where the condimental food men benefit. The basis of their foods, if they are of good quality, is something that is rich in protein, another name for blood making, nerve making, hair making material. When they can induce a man to buy linseed oil meal at from twelve to twenty dollars per hundred, with a little salt, a little gentian, and a little of some other elements put into it, just what the animals would seek out in the pasture, with a little charcoal added, it is largely to their advantage. The man would have had no need of condiments if he had simply balanced the ration. The farmers should study on these lines. The experiment stations are sending out bulletins, and some of the farmers are reading them and putting the knowledge obtained into practice. That man was a wise man who came seeking advice in the beginning. All are not as wise as that. They will say, my horse looks a little rough, but I will feed him better after a while. It usually runs along until about March, when the snow begins to go off, and then he thinks he had better begin to feed up his team a little, and sometimes he does it with a vengeance. The digestion has been weakened all winter in trying to get nutrition out of innutrition, and then he begins to feed good feeds and to work the horse, with his muscles untrained, his vitality not what it should be, and very soon there comes a knock at my door, and the man says, "My horse is tearing the barn down. I wish you would come down there." It is simply because the horse's digestion had become debilitated. The cow, with her stronger digestion, not infrequently will go through that critical period of giving birth to her calf, and then trouble will begin. She does not seem to have any life. Perhaps she has escaped the other conditions that we spoke of, but she hasn't any life. In my boyhood days this used to be called hollow horn. I do not know whether it is so called now in Maine or not but it is pretty well rooted out in New York. Then there was another disease called the wolf in the tail. And I remember that an old gentleman in my vicinity, in my youth, used to go about the country looking for cases where the hide had grown fast to the back bone, and usually for a drink of new York cider he would loosen up the hide. All those symptoms, you understand, were simply brought about from nervous, muscular and blood starvation. Of course you should go to work and build up the system, using the condition powders and using perhaps a little nux vomica to tone up the appetite.

Let us follow the life of the little colt for a while. It makes my heart sad sometimes, when I see the conditions under which he is raised. Look at that little colt when he is getting his milk diet, with a little grass or a few oats to furnish the bread. When he is weaned he looks like a little horse, he has the body of a horse, the conformation of a horse. Wean him as many a man weans him and carry him through the first winter of his life, and he will look but little like a horse. My mind goes back to my boyhood days when I was given a colt. My father told me to feed him but a very few oats, that he needed a lot of bulky food, something to distend his stomach so as to make him wonderfully strong. That was the common belief in those days, and it is not altogether rooted out from the country yet. I did not always obey my father. The colt had more oats than he told me to give him, and the result was that colt was not just like some of the others. Now how does this little colt, as he has been in years gone by, look the next spring? Has he the body of a horse? No, he has a body shaped more like a sunfish. He looks as though he had swallowed a feather bed with a straw tick thrown in. Is his hair smooth and sleek? No, it sticks out all ways. Does he have a good bright countenance? No; he has a neck a good deal like a crooked elbow. He did not look that way when he was a colt. It was because he was not fed upon a milk-producing food. After he was old enough to digest and make milk for himself, the food for the colt should have been upon the same line, a milk-producing food. His digestion was overtaxed, was weakened, and in five cases out of six he grew up a dyspeptic. When he got to be a horse he had a weakened digestion, so that when he was overfed a little, or his food was a little warmer or a little colder than usual, what was given created pains in the digestive organs. He had cramps, or what we call the colic.

Again, take a little calf. Do they always look just right? I do not always see them looking that way where they eat whey, down in New York. Sometimes a farmer will come to me and tell me that his cows are giving stringy milk. That indicates a gargety condition. A weak digestion means trouble with the udder. It is not the whole cause of garget, but a large per cent of it. The cow with a weak digestion is a dyspeptic and she is not a good dairy cow. The all important point in the raising of animals is to raise them strong, and then they will not have much trouble from disease; they will be better able to withstand the germs of contagious diseases. A man with a strong digestion can stand microbes. The doctor does not protect himself by drugs. He studies on the line of clothing himself, feeding himself, and surrounding his home with good sanitary conditions. He raises the curtains in his home and lets God's sunlight in, the best germicide in the world.

I want to speak of just one more disease,—a disease of good feeding. It will be strange indeed if there is not some one within the hearing of my voice who, between now and the first of next May, will be caught in just the condition that I am about to describe. It comes on in this way. When the farmer has commenced his spring's work, perhaps after he has plowed a few days, there comes a little period of rainy weather, it may be only two or three days. The horses are in good condition, have been well fed. The man starts off and thinks he will drive to town.

The horse goes all right for half a mile or a mile, seems to feel first rate. But all at once he begins to stumble and go a little stiff legged. Soon he breaks out into a sweat, and the man realizes that he has a sick horse, that there is trouble. It is not necessary to name the disease, it is a feeding disease. Now it is a very important thing for the farmer to study what to do in case of an emergency. When men do not know what to do, as a rule they will do some things that are very irrational. They are just as liable to do the wrong thing as the right thing. What was the trouble? The animal at work, as a rule, is well fed. When he was working every day, what was taking place? The food was being digested, assimilated, and carried into the blood, for all food has to be carried into the blood in order to nourish the parts of the body. The animal was eating and the food was supplying the energy necessary to perform the work and all was going well. There came an idle day, or two or three days. The food was digested, it was carried into the blood, but there was no breaking down of tissue to any extent. When the animal was taking that exercise all was going well, but when he stopped work and there was no breaking down of tissue, the blood became overcharged with unappropriated food nutrients until it was almost in a semi-coagulated condition. The horse felt well and the man thought he was well. But when he started and the exercise commenced, the increased action of the heart could not pump the coagulated blood through the smaller blood vessels of his system. He stumbled because he hadn't free use of his muscles, because they were becoming cramped from improper circulation. Why did he sweat? This was nature's effort to relieve a cramping muscle. Just remember this,—no physician in the world ever cured disease except as he aided nature, except as he tried to find out what nature was endeavoring to do and then lent the aid that was necessary. That being true, if nature was trying to sweat the horse, and if exercise was bringing on the cramping, what would commonsense say that the man should do? Oftentimes the man will think that he must hurry home and hurry to get the doctor, and so he strikes the horse with a whip and the poor horse goes a little ways further and then falls, sometimes to his death. At other times the cramping is extended to the spinal cord and when he is down he cannot get up again. How could all that have been avoided? Commonsense would have said, if nature is trying to sweat the horse, let us help her, and the man would have got right out and put on a blanket. Then he would let the horse stand right still. Usually in from five to ten minutes he will take a long breath and then you can let him walk a short distance. If you are far from home, do not try to get home. Do not try to hurry and get medicine; you do not need any great amount of medicine. Go to the nearest farm house and get some hot water and if possible a piece of old rag carpet. It is the ideal thing because it is always a yard wide and a piece of it is usually long enough to run the whole length of the animal's spine, and there is where the congestion would be, if any. Wring that out of hot water and lay it along the spine and put on a dry blanket, over it. And do not give the horse anything to eat. Here is where a mistake is often made. About the time he begins to feel all right he wants to eat, and the man will wonder if the horse will eat, and nine times out of ten will go and throw him a mess of feed. People think if a horse can eat he is all right. I have seen the housewife, and the sons and daughters feed him. He does not need a bit of feed for the next twelve hours, at any rate, and then a little light bran mash. I know there are men who would have said that horse had congestion of the kidneys. Not one time in fifty have I ever found any disease of the kidneys whatever. They would think so from the high colored discharges. The office work of the kidneys is to carry off the waste material, and they were doing their very best. I have seen horses killed by giving them drugs for their kidneys. The man will send to the drug store and get that wonderful remedy, spirits of nitre. What is that? It is a diuretic, or a kidney irritator. If the kidneys were irritated and you gave nitre it would be like trying to put your fire out with kerosene oil. If the horse needed any medicine it would be a mild physic, three-fourths of an ounce of barbadoes or lucrative aloes.

How could this trouble have all been prevented? When an idle day comes, cut your ration right in two. Then the trouble need not occur. If it does occur, follow the line of treatment I have given you and you will save a valuable animal.

FEEDING DAIRY COWS.

By Ernest Hitchcock, Pittsford, Vt.

(Stenographic Copy.)

The question of feeding is a very important one. Dr. Smead has explained most clearly, and none too emphatically, the importance of feeding as a matter of health. I shall have to take a little lower ground than that, perhaps. I want to emphasize the importance of feeding simply with reference to its more or less immediate relation to the pocketbook. We heard this afternoon a very interesting talk on the matter of the development of the dairy cow, or the dairy type. I would not for one moment minimize the importance of every farmer's building up and maintaining a herd of cows of the proper type and of the highest possible capacity. But I do believe—I know—that throughout our own state the matter of feeding has been given too little attention, relatively.

I want to illustrate, in a very homely way, what feed will do, and I will use an illustration that probably every man and woman within the hearing of my voice has seen over and over again. You have seen a cow on dry feed through the months of March and April and the first of May, fed more or less liberally, and then you have seen that cow go out upon the green, fresh pasture grasses and, as soon as they came to be at their best, that same cow, with simply that change in the feed, increased her production enormously. You have seen the same thing take place in the fall. You have seen the cow go through the hot, dry summer months, rambling over our barren pastures, getting about a ration of maintenance, and then you have seen that cow in the fall go into the aftermath, the fall feed as we term it, and, if your experience has been that of a good many, you have seen her double her production of milk within a very few days. That is simply the result of feeding. In the one case the cow was not getting enough feed. Then she came into conditions where her wants were supplied, and almost immediately came the response to that supply.

Take another illustration. A few years ago the experiment station of Michigan wanted to test this matter of the effect of feed and care upon the dairy cow. In order to do this they turned aside from all highly bred, highly developed dairy animals and went out amongst the farmers of the state and bought a herd of about twenty cows, without attempting to select the cows of the highest dairy type. These cows were mostly grade Shorthorns. They put them into the barn at the station, cared for them properly and fed them properly, and the first year of that treatment those cows averaged over 300 pounds of butter per cow. It was not breed, they were not dairy cows; it was simply feed and care. Now if there is this difference, and there most certainly is, is it not worth the while of every farmer engaged in dairying, I care not whether he has two cows or one hundred, to consider whether he cannot with satisfaction and profit produce approximately these ideal conditions all through the year, so that the cow may be kept up to her highest performance for nine, ten or eleven months of the year, instead of falling down, as she is frequently allowed to do, to an amount of performance away below the range of profit?

This question of feeding is important, as I have said, and further than that, it is difficult. You have all observed, I think, how a child in school, and the teacher too for that matter, will move along very easily through the simple matters of addition, subtraction, multiplication and division, but by and by they get over into the subjects of ratio and proportion and in almost every case the child goes to pieces and quite often the teacher too. Why is this? Because they have a different sort of a problem, a problem of relationship. We have a problem of the same character in this matter of feeding. It would be a comparatively easy thing for the experiment station to give any intelligent farmer a ration on which he could feed his dairy cows which would enable those cows to produce satisfactory amounts of milk and butter, but that is not all. That milk and butter must be produced not only in satisfactory quantities but at a profit. That brings in another element of the problem, it brings in the farm. We have now to deal with the relationship between the farm and the herd. The cows must not only produce in satisfactory quantities, but the farm also must produce in such a way that when the product is fed to those cows, supplemented it may be more or less from the market, but still depending first of all upon the farm, the resultant product shall be made at a profit. Did it ever occur to you that after all that is said about a herd of cows, that herd has still a minor position in our business of farming? Did it ever occur to you that all in the world that your herd of cows does for you is simply to constitute the vehicle for taking the products of your farm to market? The cow simply takes the rough, coarse products of your farm, difficult of transportation, not finding a ready market, and transposes that product into another product more easily transported, finding an easier and better market, and so bringing the results home to your pocket-book in a quicker and more satisfactory manner than could be done in any other way. That is all the herd of cows is to you. Then is it not of importance to have your farm in a productive condition as well as the herd?

I will ask you to follow the line of Dr. Smead's thought. He said, you will remember, that you could feed your animals a starvation ration, and thereby ruin their constitutions and bring on future trouble; or you could accomplish the same result by overfeeding. I want to say that the same causes will produce trouble from an economical standpoint, just as they do from a standpoint of health. You can feed your cows away below the point of profit, and it is also possible, though not so common, to feed them above the point of profit. Every cow must have, to begin with, a ration sufficient for her maintenance. Before she puts milk into the pail she must have a sufficient amount of food to support life and maintain her body. Of course I know, as you all do, that when fresh a cow will, for a time, take from her own body, her own flesh, to make milk, but that is only a temporary, and, if long continued, a very expensive thing for the farmer. Your profit must come out of the surplus that you feed to the cow over and above what she needs to maintain herself, and unless you do feed above that point, the result is simply a loss of what she has consumed. Take the little colt that the doctor spoke of, that went into the barn in the fall a horse, ears erect, eyes bright, a proper conformation, and came out in the spring as he so accurately described him,—a sun-fish. Assume for a moment that that course of treatment had no permanent effect on the health of the colt, would it still follow that that had been a profitable and wise method of procedure? Don't you see that the colt in the spring was not so far along towards being a horse as he was in the fall? What does that mean? Simply that every pound of hay and every pound of oats that had been given him had been absolutely wasted,—lost. The farmer had nothing whatever to show for the feed which he had given to the colt. The same thing is true of the cow. You must feed her above the point of maintenance before you can expect any profit for yourself.

Keep this in mind, it is the fundamental rule for the dairy stock feeder as well as the feeder of any other animal. What we are seeking for is not necessarily the highest amount, the largest production, but the point of the highest net profit. It does not make any difference how much we take to market unless we can keep some of those returns in our own pocketbook. Perhaps there is no need of this caution, but I will say to you just this,—that it is entirely possible to feed a cow above the point of highest profit. You start in with a reasonable ration, a ration made up, for illustration, of ensilage and clover hay as the roughage, and three or four pounds of a proper grain mixture,—a fair ration. Add a pound to that grain mixture and you will get a little more in the milk pail; add another pound and you will get still a little more. And you may keep on adding to your feed until you get up to perhaps twenty pounds, depending on the digestive capacity of the cow, and all the time the cow will increase her production. You will find, however, that the first pound of additional feed gives you a certain return in the milk pail. The next pound gives you a little less additional return, and so on, until finally somewhere in the series you will pass the point of highest net profit. Where that point is I cannot tell you, I do not think I would tell you if I could. It is a problem you must solve for yourselves in your own herd. But possibly we can get a little help in the matter. Experiment stations have been testing that point. They have been experimenting for years to find out so far as they could, in a general way, where the point of highest net profit came, and they have determined it in their own herds. The Pennsylvania Station quite a number of years ago made some experiments in that line. Our Vermont Station at Burlington tried it, and has repeated the experiments for several years. This was about the result at which they arrived. They found that as they increased the ration from four pounds up to about eight pounds they got a higher net profit, if they considered the value of the increased amount of skim-milk and the increased value of the fertilizer resulting from the extra grain. Considered from the standpoint of butter alone, there was a larger profit at four pounds than at eight. They found that as they increased the ration to 12 pounds the profit of the extra feed practically disappeared, the net profit was less than it was at four pounds. That does not constitute a rule for you, it is simply a hint, giving you some idea of the limits within which you can work.

I suppose you would naturally expect me to say on this subject a few words about the balanced ration. What is it? Our cattle foods are made up of carbohydrates, protein and fat, as well as certain other things which we ordinarily ignore because whatever the feed of the cow she gets enough of these other elements. The primary function of protein is to make the lean meat, cartilage, etc., and the casein or the cheesy matter of the milk. The carbohydrates constitute the heat and energy producing element; and the fat in the food is reckoned as a part of the carbohydrates, though it is reckoned at a little over twice its value. Of course this is a very brief and incomplete statement of the functions of the different food elements, but it will serve the present purpose. Now the balance of a ration is simply the proportion between these elements. If it is said that a ration is balanced 1 to 5 it simply means that it contains one part of protein to five parts of carbohydrates and fat, the fat of the ration having been multiplied by two and a fraction (2¼ to 2½) because of its inferior value before being added to the carbohydrates. All of our common foods have been repeatedly analyzed and the results published in many bulletins and periodicals. Any farmer of average intelligence can figure his own rations if he pleases. The protein is the difficult element to raise, the expensive one to buy.

When it is said that a cow must have a balanced ration it simply means, as far as I am able to see, that she must have a sufficiency of each one of these elements, and if she does not get a sufficiency of these different elements she may starve to death just as surely as if you did not give her any feed whatsoever, although to some extent the cow may substitute one food element for another. This involves waste, however.

No experiment station can lay down a rule as to what is a balanced ration for you or for me. What would be a balanced ration for one cow, under one set of conditions, would not be a balanced ration for another cow, under different conditions. Climate, stage of lactation, different things vary the ration. Down South they can feed more protein and get along with less of the carbohydrates, although I am inclined to think they are carrying that to an extreme. I presume that down there enough cottonseed meal and hulls have been fed to kill a cow up here. Up in this cold climate the animal requires more of the heat giving food, the carbohydrates, than in the southern states. So I say you cannot lay down any absolute rule as to what is a balanced ration for you to feed. But in regard to the quantity of the grain ration, the experience of those who have worked upon this problem serves to narrow the field of the farmer's experiments, of his own inquiry. Every farmer should conduct on his own farm a little experiment station of his own; but after the work which has been done there is no occasion for the farmer to extend his trials in this matter of a proper ration over such a wide territory as he otherwise would. As the result of these experiments it seems to me perfectly plain that here in Maine it is a waste of energy, of money and of time, for a farmer to experiment with rations away out to 1 to 8 or 9 or 10. The use of that sort of a ration has been demonstrated to be unwise. And for the same reason it is no use to experiment with a ration 1 to 3 or 4. It is too expensive and not adapted to our climate. So, by the work of the experiment stations the field of investigation has been brought down to comparatively narrow limits, but the necessity for a farmer to study his own cows and his own herd has not been and never will be done away with.

It is fair to assume, then, that the cow must have a sufficient amount of these different elements, protein and carbohydrates. The question comes, how is the farmer to get those substances? Is he to raise them on his own farm entirely, or is he to go into the market and buy a part of them? I am aware, of course, that it is a common thing with many speakers to say that the farmer should produce upon his own farm everything which he possibly can produce, and go into the market and buy just as little as it is possible for him to buy. I believe that to be illogical advice. It is not the principle followed by any successful manufacturer. I should change that and say let the farmer produce upon his farm whatever he can produce most profitably, and then go into the market and buy whatever it is necessary for him to have in order to give his cows a complete, sufficient ration. We must have these two elements, protein and carbohydrates, and, whatever may be in store for us in the future, today, here and now, our farms are far better adapted to the production of the carbonaceous foods than they are to the production of protein foods. So when a man attempts to produce upon his farm a sufficiency of protein for his herd, he is attempting to produce something which that farm is not so well adapted to produce. The future may change that. We may sometime be able to produce alfalfa here in Maine. We may have the soy bean or the cow pea, or some other crop come to the point of development where we can produce it profitably, but today those crops are not so well adapted to our soil and conditions; though doubtless it may be wise for the farmer to try some of them in an experimental way, especially alfalfa. What are the crops that are adapted to our soil and conditions? Obviously, as it seems to me, first and foremost is the great crop of corn. That I believe to be the corner stone of successful dairying in New England. So strongly do I believe this, that if I were compelled to give up the production of corn on my farm, and the handling of the corn crop through the silo, I should cease to make dairying my principal business. I do not believe I could make a dollar out of it without the corn crop and the silo. I believe in the importance of the corn crop for two reasons: First, it gives you a quantity of fodder which nothing else will rival. I have seen, right up there in the shadow of the Green Mountains where I live, 25 tons of good, wholesome feed for the cow growing on a single acre. Further than that, it gives you a certain quality of feed that you cannot get in any other way. Do not misunderstand me. I am not referring now to its chemical make-up, but to a different sort of quality. What is the best feed for your cow? There would not be the slightest difference of opinion on this point. The best feed the cow ever gets is the green, succulent pasture grasses at their best. Why are they the best feed? Is it because they are well balanced? Go to your Experiment Station and Prof. Woods would make up for you a ration of oat straw and cottonseed meal which would contain just as good a chemical formula as your pasture grasses, but could you fool the old cow with that ration? O no! The one ration has the qualities of succulence, of palatability, of digestibility, and the other lacks them, and those elements are just as important, I would almost say more important, than the chemical constituents. You want something in the winter time that will come as near as possible to supplying that lack, and there are two ways in which you can get it approximately, one through the silo and the other through the root cellar. Roots are all right; I have nothing to say against them. They are a healthful, wholesome food, but the only trouble is that we Yankees do not take to the raising of them. A Scotch friend tells me it is because we do not know enough. However that may be, the fact is that we do not like to raise them. It is too much labor and comes pretty near to being drudgery. But we can raise the corn and put it into the silo and get that green, succulent, easily digested food for the cow by that means, and we can get more of it in quantity than in any other way.

The second crop I would mention for production on the farm is the clover crop. In the first place, it gives you a good quantity of feed. You can raise four or five tons to the acre per year, if you handle it properly. In the second place, it gives you a food strong in protein; not strong enough to balance up the corn and give you a complete ration from ensilage and clover alone, however. Further than that these two would make too bulky a ration, but it gives you, probably, of all the crops which our climate and soil will produce equally well, the one strongest in protein. It does the most to save your pocketbook. More than this, whenever you take a crop of clover off from your field, instead of detracting from the fertility of that field you have added to it, because of the power which the clover plant has of taking its nitrogen out of the air, storing it up in the roots and stems and putting it where other plants can use it. In addition to this the clover roots penetrate deeply into the soil and bring up plant food from a depth which most grasses never reach. When you take off a crop of clover you have left the land richer, for these reasons. But when you take off a crop of timothy you have left it poorer.

I put the two crops of corn and clover ahead, for the quantity and quality and because they are adapted to our soil and climate, but, as I have hinted, these two alone will not make a complete, satisfactory feed for the cow. You must have more protein, and you must have a feed which will reduce the bulk of the ration to a point where the cow can consume it in sufficient quantities, and to do that you must have something in the way of grain. And it is economy for the dairy farmer to devote his farm chiefly to the production of these two crops and go into the market and buy his concentrated feeds. Some one will say, "There is Jones who is doing just as you say, going into the market and buying grain all the time, and the result is that when he gets his creamery check at the end of the month all he has to do is to endorse it over to the grain dealer. The grain dealer gets it all." I haven't the slightest doubt but there are just such cases. I do not stand here to advocate the reckless, indiscriminate purchase of grains to be fed to cows that will not pay for them. But while there are such instances, I will undertake to say that if you will show me the dairy farmer in Maine or Vermont who is making the largest net profit from his cows, I will show you a man who is spending a considerable amount for the purchase of grain feeds. A few years ago a cow census was taken in a certain town in New York, one of the best dairy towns in the world. As the result of that census it was found that the dairyman in that town who was making the largest net profit from his herd was the man who was purchasing the largest amount of mill feed per head for his cows. It simply means that this man was buying on a business basis, he knew what he was doing when he paid out his dollars for this feed, he knew what his cows would return him for it, while the other man was buying because he had heard somebody say it was the proper thing to do. One man knew his business, the other did not.

Now, what kinds of feed shall we buy? Shall we buy corn? I like to talk about the corn plant. I like to urge upon the farmers of New England the raising of that corn plant. I like to point out to them that they are perfectly able today to compete with the farmers of the West in the production of corn. I wish I had taken the time before I came down here to look up the statistics a little. I would not be surprised if the State of Maine today is producing more corn per acre than the state of Illinois, or Kansas, or any other state of the West. I would say, do not buy corn, first, because you can raise it, and second, because it is not what you need to make your ration complete. When a man goes into the market to buy, he does not buy something with which his pockets are filled, he buys something which he lacks. We lack the protein element of our feeds; we have enough of the carbohydrates. That is simply sunshine. You get enough here in Maine. You can just as well use your sunshine as the Kansas man's sunshine. Buy what you lack, and that is foods strong in protein. What are some of them? Cottonseed meal, gluten meal, linseed meal, distillers' grains, bran, middlings, etc. Which one you should buy depends upon the market in your vicinity. Buy the one out of which you can get the most for a dollar. Ordinarily speaking a man can probably get more protein for a dollar out of cottonseed meal than anything else, but it is a food that should be handled very cautiously. You should be very careful that you do not overfeed, and I never, under any conditions, feed it alone. It is the most highly nitrogenous feed of anything we have, but if care is not taken in feeding it, it is liable to produce trouble. The same thing applies in a somewhat less degree to the glutens and distillers' grains. Ordinarily bran is what you need to make the ration safe and give it proper bulk, and it is in itself a most excellent ration. Cottonseed meal tends to make butter hard, while gluten and linseed tend to make it soft; so if you are making butter you want to see to it that you so combine your feeds that the result will not be injurious to the product.

One other point, you should consider what costs you most in fertilizing your soil. When you buy chemical manures in the spring, for what do you pay the most? The nitrogen, is it not? I am no chemist, but practically speaking the nitrogen in the fertilizer corresponds very closely with the protein in the food, so that when you are buying protein for your cow with that very same dollar you are buying nitrogen for the soil. The time has been when the cheapest form in which, in some sections, one could buy nitrogen for the soil, without any reference to feeding, was in cottonseed meal, and this may be true in some parts of the country today. Thousands of tons of it have been spread on the soil simply for a fertilizer. Now when cottonseed meal is fed to the cow, she takes out but a small proportion of the fertilizing value. If proper care is taken of the manure, you can put back upon your soil $16 to $18 worth of fertilizer for every ton of cottonseed meal fed to the herd, and what is true of cottonseed meal is true proportionately of the other feeds named. The fertilizing value of feed is substantially determined by its percentage of protein.

So this problem presents itself to us from two sides. We go back to the relationship between the farm and the herd. Following this system which I have indicated, all the time you are improving the productive capacity of your herd you are improving the productive capacity of your farm. The two things work together in this way, each aiding the other, and the result is more profit for the farmer, and, what is even better, by making it a matter of study and thought it becomes a work in which he can take satisfaction; the doing of these things becomes not mere drudgery to be endured, but life to be enjoyed.

SOIL AND TILLAGE.

By David M. Kelsey, Durham, Ct.

Experience meetings are usually more valuable for agriculturists than mere instruction, but as Commissioner Gilman, in his introductory remarks, made use of the word "education," I shall, like a good soldier, obey orders, and attempt to instruct you. Now, the instruction usually offered to farmers through addresses at meetings, the press, and other printed matter is of three kinds. First and narrowest, specific and special directions for doing some one thing in a certain way. This is always dangerous and often injurious, because conditions constantly differ and relations vary with each year, each location, and each kind of crop.

The second form of instruction, and a much safer one, is the relation of the *experiences* of some practical farmer. This does *not* give specific directions or advice, but simply the detailed facts, leaving the listener to draw his own conclusions and make his own plans. As experiences, this is highly valuable. The intelligent person can always make use of it somewhere, sometime.

But the third and highest form of instruction I shall also make use of today. It is by a statement of broad principles and underlying truths which are fundamental to any success. This may but discourage you at the first, but these statements will bear the closest investigation. If I can but get you into a questioning spirit which will bear fruit in original investigation, research, thought, and study, I shall have accomplished my purpose and have succeeded. At the same time I promise you I shall not assert any facts, principles, or truths incapable of demonstration in your own daily work nor that I have not, myself, proven upon my own land.

First, then, what is soil? Is it simply pulverized stone? Granite, quartz, hornblend and gneiss grind into sand. Others finer, produce loam, and the very finest, clay; but these are not soil. Mix your sand and loam and clay and you still have only dirt. Just as the word "atmosphere" comprises not only air, but the moisture, dust, pollen, smoke and other vapors which float therein, so the word "soil" means dirt plus bacteria, decaying roots and plants, and decomposed organic matter called humus, in as great a variety as it does decomposed rock,—the peaty matter which decayed vegetation of all kinds leaves, exposed to warmth, moisture, and air so that the chemical processes, which begin the very day the first tap root of a seed enters it, can at once begin to act.

Thus we have the four foundations of soil—dirt, humus, moisture and nitrification, and are ready to till the soil. But here economy steps in with a bit of advice. Never attempt to raise a crop until you have your land properly prepared; not merely broken into clods and dressed with coarse manure, but as you would wish it for a garden. This means that there are three points yet to be considered before you can plant it to a crop, economically. First, you must rid it of all obstructions,—fast stones, loose stones, stumps and rubbish. Second, you must *drain* the land. Some thirty to forty inches of rain falls on the surface every year. We want every drop to go into and down *through* the soil. If it stays on the top more than a few hours or if it pushes off instead of going through it, we cannot have proper results. Neither can we, though we have succeeded in getting all the water to soak in (instead of flowing away or standing on the ground) *unless* the water that goes down *continues* to go down several feet. As we must not have standing water on the surface, we also must avoid having standing water *under* the surface for the first four or five feet down. It is impossible to get certain results by any system of agriculture on lands where the "water table," that is, the standing water which feeds our wells and springs, is nearer the surface than this. Most plants have drinking roots that go down from three to six feet. If the water table is within two or three feet of the surface these roots cannot properly develop, then comes a drouth that lowers the water table, and the plants suffer.

Second, the nitrification spoken of a moment ago cannot go on successfully in land chilled and kept soggy by lack of under drainage. Precious weeks are lost in spring, waiting for such land to dry out by the action of the air, before plant-growth, tillage and nitrification can begin. Then hot, dry weather comes too soon. Thus we have both conditions wrong. In dry weather this land suffers first from drouth, in wet weather it is equally discouraging.

I said there were three conditions to be met before we could till. The first, clearing of all obstructions; the second, draining, and now comes the third. We must have humus. The best garden soil may become so exhausted of humus that it cannot be made to produce a good crop of anything, even grass. The land is naturally fertile, free from obstructions, well drained and in good tilth but the decayed organic matter or muck has been taken out by a system of clean tillage so that it is no longer "soil" but mere dirt, such as one will find in a cellar. It will puddle or run together solid upon the slightest provocation. It will bake and lump and the old farmer says "it must have a rest," so he sows on clover, etc., and finally the soil gets full of decayed roots and plant-stalks again.

Take notice! Upon that little black film of humus which should separate one grain or particle of dirt from another, plants depend for their processes of growth. There is where the bacterial action which nitrifies the soil takes place. There is where the moisture, which capillary action brings up from below, is held ready for the plant. There is where the nitrogen, phosphoric acid and potash are handed over, ready-made, to the million mouths of each tiny feeding root.

Now, we have our obstructions removed, our moisture regulated by drainage, (either surface or under drainage) and our humus abundant. Let us proceed. We now have soil, *fertile* soil, but let us inquire a little more closely into the meaning of the word "fertility." The chemist tells us that growing plants take up nitrogen, potash, phosphoric acid, calcium, hydrogen, carbon, oxygen and many other things, but the agricultural chemist has instructed you that the first three are the only ones the plants find it difficult to obtain in abundance. He tells you that usually the soil lacks some one or all of these, and you dress the land with manure or buy fertilizers to supply them. Now, let us see if they are really lacking.

The results of 49 analyses of soils in some ten states for a period of years as gathered and averaged by Professor Roberts, late Director of Cornell University Agricultural Experiment Station, give the following as the amount of these elements known to be in the first eight inches of surface dirt in an acre of land. Nitrogen, in round figures, 3,000 pounds; phosphoric acid, 4,200 pounds; potash, 16,000 pounds. This does not take into account what may be locked up in the coarse sand and gravel, perhaps 40% more. (The soil was sifted with a fifty-mesh-to-the-inch-sieve.) Neither does it take into account that which was contained in the lower soil and subsoil, perhaps half as much more. But we are sure that there is at least as much of these materials in the first eight inches of average soil as would be placed there by the application of 75 tons of average commercial fertilizer.

Take another set of figures: The average wheat crop for this country is around 14 bushels per acre. Now, 14 bushels of wheat require about as follows: nitrogen, 30 pounds; phosphoric acid, 10 pounds; potash, 14 pounds. Hence, the amount of actual *chemical* fertility which these analytic tests discovered to be in the first eight inches of soil provide enough nitrogen for one hundred years, enough phosphoric acid for 400 years and enough potash for 1,000 years for the growing of wheat annually at 14 bushels per acre. So much for theory. As a matter of fact, we know that in actual practice we cannot go at it in any such way as this, yet these figures should certainly make us pause and inquire further into this mystery. Evidently the chemical elements found are not "available," are not ready for plant food. How then, can we unlock this store-house of wealth? At present we are like Robinson Cruso sitting upon his bags of gold "Pieces of Eight," utterly unable to get any comfort or nourishment or profit out of it.

What does the plant require of the soil besides these elements of fertility in abundance, plus moisture and humus? It requires comfort. If you give your cow water in the shape of ice blocks, hay in the form of powder, and corn on the cob roasted hot, these would not be comfortable to her. Besides the elements of fertility, humus and moisture, the plant demands good texture (that is, physical condition) a regulated moisture supply, warmth, aeration and nitrification. These demands are primal and must be met *before* its demands for food. Texture I shall discuss under tillage, also moisture, merely stopping here to say that plants much oftener suffer for lack of a plentiful supply of moisture than they do for lack of food. The plant requires from three hundred to seven hundred pounds of water to produce *one* pound of dry product (as of wheat, potato starch, etc.).

Keep these thoughts in mind and we will now proceed to speak of soil, temperature and aeration as they are intimately associated. Next to the conservation of moisture, the first aim of the farmer in spring should be to get his soil warm. Air and light rain-fall do this. If his soil is solid or too moist, this process is very slow. Under-draining will take care of the chilly surplus moisture and wise tilling will do the rest. All these points under the head of "comfort" are so closely related to that of tillage that we can take them up together.

First, the plow. Rid yourself of the old idea that turning the soil up-side-down is a necessary beginning. It is often the worst possible procedure. In the case of grass or grain where the upper three or four inches of soil have been almost exhausted by the previous crop, inversion will bring up more fertility from lower in the soil, but in the case of inter-tilled crops like corn and potatoes, the surface soil is the richer and by plowing it under you have reduced your immediate fertility because their roots have fed deeply. But do not understand me to advocate that even sward ground should be inverted as it is usually done. The first business of the plow is pulverization; to stir and mix as a cook does. If you merely turn over an unbroken block of turf the end has not been gained. It was a clod before and it still remains a clod. The best process in plowing sod land is to begin with some sharp instrument, that will cut the turf into small pieces before it is plowed. I believe that a cutaway harrow used a few hours on sward before plowing is equal to three times that amount of tilling after plowing. I will tell you why a little later.

Plow shallow in the spring. By deep plowing you bring up land that is wetter and colder than that on the surface. In summer and fall plow deep, if you know why you are doing so. As to whether you should till, cultivate or harrow deeply, that is a constant and recurring question. After rolling, deep harrowing before a crop and shallow tillage *with* a crop are the best. Right here a word about lumps and clods. Any system of tillage that produces them (as in the case of plowing or harrowing when too wet) is fatal and any system of tillage which allows them will be unsuccessful. Crush, cut, grind, and turn "if it takes all summer" as General Grant said.

But what does this tilling do besides improving the soil mechanically? It is of great assistance in the conservation of moisture and in promoting nitrification. First, as to moisture. The rainfall in some of the interior states is less than 26 inches per year and quite often it does not thoroughly rain for three or four months at a time, yet they produce wonderful crops of corn. How is this? They conserve the moisture. I make the statement without reserve that a good system of tillage will plant a field of corn, grow it to maturity and harvest it successfully without one drop of rain during that time! Mind I do not say that this would be as *profitably* done; but it *can* be done without a doubt. In California trees stand loaded with fruit and green leaves with no irrigation, where rain seldom falls from May to October. The procedure there (and in New England the same) is something like this: the land would be plowed in the spring as early as it could be handled and at once rolled and harrowed. It would be reharrowed or cultivated, always shallow, every ten days from that time until the crop was ripe.

But how does this accomplish the result? We know that the rain of winter passed through the soil down to the water table. We know that the capillary action by which oil goes up the wick of our lamps draws this water back to the surface as fast as it is dried out there by the wind or taken up by the plants. The process of drying out on the surface often takes out as much water in one day as a growing crop would in five or even ten. This waste, nature prevents by covering the soil with a mulch of decaying leaves and grass. We must mulch the surface in the same way but not with the same material. We must use dust. By tilling two inches deep every week we can make the upper soil so loose that the moisture cannot rise through it. At the same time this dust is almost air-tight and keeps the air from reaching and licking up the moisture. If you let a crust form (as from rolling or rain or from this dust gradually settling down) then this waste from air-drying goes on. In the apple orchards of New York state this system is carried to perfection. They don't wait until the soil is dried out before plowing in the spring and then leave the land on edge. To begin, they plow *early* (and they do this, too, for any crop) and immediately roll and harrow. Land thus treated will remain in condition for planting through a spring drouth of sixty days, such as we had this year, in the pink of condition. These orchardists harrow under their trees after every shower to break up the crust, and if there is no rain, every ten days. The result is that they conserve the moisture, which rises sometimes from thirty feet below, and the tree is abundantly supplied regardless of the season's rain-fall.

I have seen trees only two or three years planted, make astonishing growth in light sandy land under this system when the drouth of June and July had burned every thing brown within sight of the field. A side push of the foot removed the dust and uncovered a soil so moist that a handful of it would stay moulded, under even light pressure. This tillage must be frequent and thorough, but very shallow. Personally, I have found the Acme harrows best for the purpose.

Right here a word of warning lest some person should over-do this. By this system of orchard cultivation the trees grow vigorously and continuously from the abundant moisture and nitrification which the tillage induces. If this is continued too late in the season (and it *can* be continued and the tree forced to grow until October) you will kill the tree by kindness. All tillage must stop by the middle of July and some cover-crop at once be sown. This will take the moisture from the soil, also the nitrogen; and the trees will at once form the tip buds for winter and have three months for the wood to harden. If this is *not* done the sappy wood produced will be injured by winter freezing. Trees standing in gardens or where potatoes are dug or pigs allowed to "plow" the orchard in the fall are often injured and sometimes killed in this way.

Now, just a word as to nitrifying, a comparatively new term. Nitrogen, you are acquainted with as the most expensive form of plant food you have to buy. In my mind you should seldom buy it at all, except for strawberries, garden vegetables, and potatoes. Phosphoric acid will not evaporate nor leach if top dressed on the land, more than two or three inches deep in the hardest rain. Potash will probably not go down under similar washings more than eight inches before the natural filtering power of the soil will arrest it. But a hard rain will entirely wash all free nitrogen from the soil, as it locks hands with water almost as readily as it does with air. To be sure capillary action will bring some of it back within two days after even a hard rain, and earth worms deposit rich nitrogenous humus on the surface every night, brought from the subsoil below. But you can manufacture your nitrogen in the soil by a superior method of tilling. Numerous forms of bacteria which are present in fertile soil when warm and moist, produce or set it free from day to day just fast enough for plant uses. To stimulate these little fellows you must till every few days and aerate the land. They cannot work over-time without this encouragement. Just as the pig goes into the pile of rank green manure and by turning and returning it oxygenates it by exposure to the air and causes it to turn black—just as your silver turns black, so does your soil and humus when propertly aerated. In doing this the oxygen which unites with the humus surrenders the nitrogen which was locked up with it in the air.

One word more and I am done. Look out that your land is "sweet." It often happens that land which you little suspect carries an acid reaction, and these lands are, by the way, very hard ones in which to maintain nitrogen. If, for instance, clover or other nitrifying plants, especially other legumes do not grow, your land is probably sour and should be treated with a dust of "biting" lime. Fifty bushels per acre will sometimes reclaim land so sour that it previously would not even sod over. Use the best lime, and slack it by covering for a few days with several inches of moist soil. It will come out a dry powder, as fine as flour. You can spread it with a shovel, soil and all, and by harrowing thoroughly, sow at once with oats or grass, with no danger of the seed being killed. Sometimes green manure will sour land and it is safer to sow a green crop with a few bushels of lime, ashes or gypsum just before turning it under.

Another word of warning just here. Do not plow under green stuff so late that there is not sufficient heat left in the soil to decompose it, otherwise you may make a silo of your land and the material remains "pickled" there for years. There is another danger also, as there is in plowing under any turf—that you break the subsoil connection so that the capillary water cannot rise into the soil at all, or at least not freely. This is why I always advise using the cutaway harrow on turf before plowing. It is probably the most frequent and damaging error the plowing farmer perpetrates upon his long-suffering land.

A liberal supply of hard wood ashes, carrying with it, as it does, thirty or forty per cent of wood lime, will sweeten land. It is safe to say that often two-thirds of the benefits, which farmers ascribe to the potash the ashes contain, should be credited to the lime.

Now, to recapitulate, choose any kind of land, first clear it of obstructions, second, see that your drainage is all right, third see that it contains sufficient humus, fourth, attend to the comfort of the plant, which includes all the details of pulverization, aeration, sweetening, conservation of moisture, warmth and nitrification; and finally, *till*. Clark says, land should be stirred from twenty to forty times before any crop is attempted. If you will accept these suggestions in the light in which they are intended, as merely to stir you up to reflect and experiment for yourself, I feel certain that some of you will in the course of a few years change your entire system of cropping and tillage to the great benefit of your soil, and to your personal profit and joy.

FRUITS IN FRANKLIN COUNTY.

By D. H. Knowlton, Secretary Maine State Pomological Society.

The culture of the apple in Franklin County began soon after the first settlers came. One of these settlers with whose life I am familiar, tramped through the forests all the way from Bristol. After he had made his first clearing and erected a log-cabin, he returned to Bristol, from whence he sailed in a schooner to Boston in the fall of 1795. On the streets the boys were selling pears, and of these he bought several, from which he saved the seeds, and on his return these seeds were planted, and some of them grew into large trees that for many years bore pears in abundance. The last of these trees were only recently cut down by the present proprietor of the farm. Very soon after this he yoked up his oxen and hitched them to the hayrack, and by a spotted line drove through the forests to Winthrop, where he loaded up with apple-trees, and then drove home by the same way. On his return the trees were planted on his newly cleared land, and thus this early settler had an orchard under way. The trees grew and for years this orchard was famous far and wide for its fine fruit. In Winthrop he met Dr. Vaughan, a man who did so much to make that town famous for its fine fruits in later years. From Dr. Vaughan he obtained trees or scions, I do not know which, of the Winthrop Greening. At any rate, there were two or three trees of this variety in that old orchard. The owner, either because the variety at that time had no name of its own, or because he chose to make some recognition of Dr. Vaughan's courtesy to him, named it "Vaughan" apple, a name that clings to it still.

This was the beginning in one locality in the county, but it is typical of that which was made by others in other localities. These original orchards were mainly seedlings grown by the early settlers. Some of the trees, shorn of their beauty and utility, are still standing—memorials of the industry and foresight of those who planted them, and at the same time testimonials of the shiftlessness and neglect of those who permit an unprofitable, insect-bearing tree to still live on. This suggests a practical point, which is that old fruit trees that have outlived their usefulness and all other trees that are breeding-places of injurious insects and fungi should be cut down and destroyed.

The beginnings taught these early settlers that conditions were favorable for growing apples, and there followed the introduction of better varieties and a more general growing of fruit for home use, for no one then thought of marketing fruit. Mr. Sears, an enthusiastic fruit grower of Winthrop, some years later came into the county and grafted many trees to the best varieties available. The fruit growers of the county owe him a debt of gratitude for the impulse his labors gave to fruit growing.

From these beginnings the growing of fruit has developed into a leading agricultural industry. In Franklin county, 1901 was the banner year for its fruit growers, for in that year they received more than $200,000 for their apples and apple products. This year, 1903, there are not so many apples in the county, and yet many growers are blessed with abundant crops. While the prices are much less the quality was never better, and what we may lose in the receipts we shall gain later on in the fame our apples are gaining in the markets of the world. This fame, by the way, deserves a few words, for it is a reward well earned, and if we wish to keep it, we must remember to be honest in packing our fruit for market. Some, I know, seem to think if they can only get a dollar from their apples it is all they care for. They see only the present. Next year the man who bought the apples will shun these growers and these orchards because the sellers were so selfish as to sell all the grades together. Sometimes such fruit is sent to the commission men and when the checks come back the selfish grower gets his medicine. It tastes bitter and he does not like it. He blames the commission man and next year he sends his fruit somewhere else. I saw an illustration of this some days since in Boston. One of the commission men told me a certain grower sent him a lot of apples to ship across the water. As it happened, they were taken to the wharf before they were examined. A barrel or two were opened there, and instead of being placed on the steamer the whole lot was taken to the commission house and sold for a nominal price. The commission man said, "If I had sent those apples to Liverpool, the grower would have been in debt to me," and I think he told the truth.

Last year, as you very well remember, much of Maine fruit, on account of the immense crop in other parts of the country sold at a low price or was fed to stock, or rotted in the cellars. Mr. John W. Clark of Massachusetts, a skilful grower and a skilful handler of fruit, had 3.000 barrels of apples. 1,000 of these he sent to a cold storage house in Boston, and 2,000 were stored by himself. As I have already said, fruit was selling low, but Mr. Clark so handled his fruit that the entire 3,000 barrels averaged him somewhere around $3.00 per barrel.

Last spring we sent to New York for a bushel box of Oregon apples. We didn't care what variety they were, but we did want a box of the fancy apples we read about. The box met us over to Cornish where we exhibited it to the fruit growers to show the style the Oregon fruit growers put on when they send their fruit across the continent to compete with the eastern fruit that is loafing around a glutted market. Stamped on one side of the box in large letters were these words, "Oregon Apples." On one end was stenciled the name of the grower, his residence, etc. On removing the cover the first thing to meet the eye was a sheet of heavy blue paper, covering the fruit which was carefully wrapped in white paper, the apples lying on the side in rows; between the layers was another sheet of blue paper and another at the bottom. These apples at the time were selling for $4.00 a box and that was what we paid for this box. The variety was Spitzenberg and larger apples of the same variety were selling for $6.00 and $7.00 for the bushel box. The apples were not so good as specimens we had on the exhibition tables at Cornish. Every apple was perfect; the size was uniform; the color was good, and the packing as nearly perfect as those Pacific fruit growers could make it. It was the *style* of packing and *quality* of fruit that commanded the price.

A large part of the fruit grown in this part of the State is for export. In conversation with the agent here I was much gratified to learn that he told people how to put up their apples and that beyond this, his company made every man responsible for the packing of his fruit. Good, bad, or indifferent as it might appear when it reached the market, the fruit sold on its merits. I am all out of sorts with these buyers who go about the country buying our excellent fruit and then dumping it all together and selling it all for "Fancy Maine apples." Maine apple growers if they care for the future fame of their fruit, should insist upon its being honestly packed and honestly marked. Our fruit never stood better in foreign markets, and I am sure that with honest and skilful handling it will hold its place. This is all the more important at the present time, as our Canadian neighbors, under their "Fruit Marks Act," are required, under heavy penalties, to pack honestly and correctly label their fruit. Maine fruit is all right in competition with any grown, but we must guard its fame and not allow it to suffer at the hands of the speculator who buys and sells for what he can make.

In these illustrations there are two things that stand out conspicuously—quality of fruit and care (style, if you prefer) in packing. Since the selling of the fruit has now become of so much importance, there comes home to us the fact that the local markets are worth looking after. For years in our frenzy to send our apples to foreign markets we have forgotten that the home market is often the best market for fruit. If I could have my way about it I would somehow place our best fruits in the home markets. I would have No. 1 Nodheads, Kings, McIntosh and others, just as they matured, placed on every fruit stand by the side of the oranges and bananas. Some of the Italian fruit dealers in the cities have learned this trick and are doing much for Maine fruit growers. First, then, make the quality No. 1 always; second, pack them just as neatly as you know how in neat, clean packages. For local markets I prefer a small package—a box or a basket, I don't know which, but something the hustling, busy man can grab in his hand as he rushes for the cars that will bear him to his home. If the fruit is just fine his wife tells him to bring another package when these are gone, and so it goes. This is the way to compete with the tropical fruits, and the market will be open for us long before we get there.

No doubt a million barrels of apples were grown in Maine in 1903, and a very large part of these apples are seeking a foreign market. In a period of two weeks 226,000 barrels were laid down in European ports and more than 3,000,000 barrels of American apples will be marketed there before the season is gone. At times the markets are more than full, but the Europeans seem to like American apples, and are paying more than many expected to receive. A large part of the fruit consists of late keeping varieties, and thousands of barrels of these are dumped on the docks that are hard and immature, and will not be edible for several months after they arrive. Storage abroad is expensive or impossible and much of the fruit is slaughtered simply because it is immature. In other words fruit that goes to market should be about ready for the consumer. A good system of storage at home can be made inexpensive, so that the fruit may be held until it is just right for shipping. This policy would add many dollars to the net receipts for Maine fruit. A city consumer does not know what to do with a barrel of green apples. The commission men say it doesn't matter, the fruit better go forward, but you will notice that the varieties that are mature are quite likely to bear the highest price if only they reach the market in good condition.

Mr. Geo. T. Powell recently wrote the Rural New-Yorker as follows: "While spending two weeks at the Willard Hotel in Washington some time since, and finding no baked sweet apples on the bill of fare, I asked the head waiter if he would not have them provided. At the next meal baked sweet apples and cream were on the bill of fare. I was given a seat at a private table with a man, his wife and his children. The lady, observing my ordering, ordered baked apples and cream. She found them so delicious she told her husband to try them; then the children had them, and for two weeks these were ordered by the entire family, besides myself, twice a day. With such an increase in the use of apples as this in hotels alone, hundreds of thousands of barrels of apples more would be consumed than at the present time." Mr. Powell taught those people what a good baked apple tastes like.

Now, Maine has thousands of summer boarders every year. They come here to get away from crowded cities, to enjoy our invigorating air, to drink pure water from our hillside springs, to bask in our glorious sunshine, and last but by no means least to enjoy the delicacies produced on our farms. Many a farmer's wife has sold her cheese to the visitors because they found nothing like it in the city. From city homes many orders come back to the farms for butter, for fresh eggs and other good things. Now, suppose every one who has a visitor should serve apples baked, stewed, jellied, in any way to make them luscious to their guests. You have all the means for doing this on the farm. The more delicious you make these fruits the more your guests will want to eat Maine apples when they return to their city homes. I am sure there would be many more orders for Maine fruit and its products.

GOOD ROADS.

By L. O. STRAW, Newfield, Me.

Good roads are a public necessity. They are indicators of life, thrift and prosperity. They are economical, and when properly taken care of they are a source of satisfaction. But they are expensive, from whatever standpoint they are viewed. The law, though erroneous I believe, regulates the time to labor on our roads, and specifies the amount of money to be expended. We violate the law and impose upon the people an unwelcome roadway. We raise annually large amounts of money to be laid out in repairing and improving the highways, with but little thought, and in too many instances, but little care, of the practical results of the expenditure; and thus it will be so long as the same methods are practiced that are in vogue today. As time will not permit of a detailed description of road building, I will simply point to a few of the advantages and disadvantages of good roads. You may ask, What constitutes a good road? The question is very proper, and with the Department of Road Inquiry at Washington continually sending out printed matter which treats the subject both practically and scientifically, and the press in general as well, every thoughtful voter ought to be able to answer it.

John L. Macadam, the inventor of the Macadam road, so-called, says a good road is "an artificial floor forming a strong, smooth, solid surface, capable of carrying great loads and over which carriages may pass without impediment." We should adopt that as our ideal and work towards it.

The Telford and Macadam roads are unquestionably the best known roads. I wish we could afford them in every town and hamlet in the State but this would be too expensive, costing at least one thousand dollars per mile. We cannot afford it, except for a main thoroughfare, when, under certain conditions, I think we can.

Macadam roads are being constructed in nearly every state of the Union, indicators of the progress of the community in which they are made. Vermont, Massachusetts, and many of the states in fact, are building expensive Macadam roads even in rural sections, and the more these roads come into use the more the people ask for continued appropriations for permanent road building.

In New Jersey more than 1500 miles of Macadam road have already been built, and the people are pleased with it. To be sure their conditions are somewhat different from ours. Their farming is principally market gardening, and the farmers cart their produce to the city every morning. Such roads are feasible for cities and suburbs, and should be for a main thoroughfare, but not for country roads. To the latter I should say emphatically no, but I would urge for the welfare of our rural towns that we give more thought to the construction of better roads, and if possible appropriate money enough to build up the oft travelled roads throughout our State.

Next to the Macadam road is the gravel road so common in the State, and while it seems impossible to avail ourselves of the former, a more through study of the latter should be encouraged. The old adage "What is worth doing at all is worth doing well," should not be lost sight of. Because of the meagre appropriations for road purposes, a careful survey of highways should be made, and such places as need repair should first be made good. Low, wet places should be drained, a good stone bottom placed and well covered with fine rock and gravel.

The road machine is a valuable acquisition in building long stretches of road, and if properly managed builds the best gravel road possible, with a little help from the hoe and shovel to smooth up. Usually too long a stretch is undertaken, which for lack of money and time we are obliged to narrow until it becomes dangerous because of its oval condition and deep gutters. A road should be of sufficient width to allow teams to meet and pass without interference. All stones and missiles should be carted off and not thrown into the gutter and onto the road bank to tumble again into the way and become an obstruction worse than before. Bushes should be cut from wall to wall, and the practice of cutting should be followed every year until they are entirely eradicated.

I am aware that there is great opposition among the tax payers to the raising of money by direct taxation to build permanent roads, but they say not a word when taxed the interest on a quarter of the valuation of the town to be laid out annually to keep mud roads in repair, an annual expenditure with no hope of getting any return either in satisfactory transportation or otherwise. I would not have it understood that I would have such a tax levied upon our property as would cripple financially every town in the State for the sake of first class Macadam roads, but I do think with better men at the helm, making a more thorough study of the science of road building we can, even with the money raised, do better and more satisfactory work in this line.

We may hold aloof from the building of better roads, but progression is the watchword, and along with the progress of other things will come the demand for improved highways. Think of it! With forty or fifty thousand dollars we can build a permanent road across the county of York from Northwest to Southeast, which in my opinion would develop the agricultural interests of the county to a greater degree than would the investment of the same amount of money in any other enterprise. Farmers living in the rural districts would not have that dire dread of mud and dust that now confronts them, and lowery weather, with loads and teams well protected from the storm, would be chosen to market the products of the farm. It would offer a better opportunity for those living away from the seashore market to compete with others living nearby, and a way thus opened would encourage the raising of small fruits, poultry and eggs, where the industry is not thought of today.

We have improved our buildings, we have improved our cattle and our horses, everything with which we have to do in our civilization has been rapidly changed and greatly improved, but we have the same old roads, muddy after every shower and dusty after the sunshine.

The roads of North Carolina, Tennessee and Georgia have been for decades the solace and comfort of the people. They are built almost entirely by convicts whose duty it is to liquidate in some way the injury done the people through the perpetration of their wicked acts. The prisoner who has injured a community by the commission of some crime and whose capture, conviction and punishment have added to the burden, should, if possible, in connection with his punishment, do something to benefit the community which he has injured. And this principle is widely accepted in the Southern States where the belief prevails that perhaps the best way in which a criminal can benefit the community which he has injured is in helping to improve the highways. In doing this work without compensation, at a cost actually less in many cases than that of his keep in the county jail, thus benefitting his community without imposing on it an additional tax burden, he becomes a beneficiary, and like the sign of the tramp placed along the highway it will serve as an indicator warning him and others against the commission of crime, in the states where such is practiced. The better would it be for the county and the convicts if such were the law and practice in our own State.

A discussion of road improvement began in real earnest some fifteen years ago, and within this time every legislature in New England has been wrangling over the question. But few of them have much to show for the time and labor spent in the discussion of so important a question, barring Massachusetts, for she has appropriated and expended several million dollars in building Telford and Macadam roads.

The subject has been, and is being, extensively discussed and the consensus of opinion is that we should build scientific roads. For many years my own town appropriated annually fifteen hundred dollars for the purpose of road repair in summer, a sum large enough to pay the interest on a bonded debt of fifty thousand dollars floated at three per cent. And this same fifty thousand dollars would macadamize every public thoroughfare in the town and give good and substantial roads forever, with but little annual repairing. In place of this, fifteen hundred dollars is expended in plowing and scraping into the center of the road all the dirt possible, to be converted into mud in wet weather and into dust in dry, as a recompense for money raised for road repairs. And yet, for the sake of macadamized roads we would not recommend so rash an act in many of the towns of our State. We must possibly forego the pleasure of such roads and content ourselves with the old mud and dust roads, with an improved system of road construction. The cities and large villages with machinery for building and means to pay for them may boast of their scientifically constructed roads and, pointing to them with pride, say to the rural districts in this silent way, this is one of the drawing cards which populate the cities at the expense of the rural towns. Young men and young women are unresistingly enamored with the beautiful, and there is nothing so enchanting to the young or old as a good ride over a well constructed piece of road. Is it not so that the people who experience the beauties and comforts of good roads in the old countries are telling us truthfully that we maintain the poorest system of road building of any civilized nation? History is replete with such evidence, and is it not high time that we awake from our sleep and kindle the latent spark to the end that we shall adopt some means to stir up the people in what would be to their lasting welfare? Good roads call to our midst city people who would never come without the attraction. They encourage the boys and girls to stay on the farm; they enhance business, and draw from the cities as permanent residents more than enough to compensate for those who under similar circumstances have been drawn from the country. They increase the value of our farms and aid materially in the marketing of our crops. It is the custom in France to do the marketing in wet weather, for the loads well protected with rubber covering will stand a drive of forty or fifty miles with no fear of injury from the storm, and the roads are always firm and smooth, and if the market in one place does not please, the farmer readily moves on to another.

To move stone from the mountains hundreds of miles away, as is done in Pennsylvania and New Jersey, for the building of Macadam roads is of but little consequence compared with the luxury of a good road; and farmers and others along the way are ready to be taxed that they may have the comfort and benefit of them. Let us adopt the southern plan, if need be, and if a convict is wicked enough to commit a crime worthy of jail sentence enlist him in the road gang and make him pay the penalty, if only in part, by helping to do what will improve the way not only over which he travels but over which others travel; at the same time allaying the discontent of the people and making them better satisfied with the town and State in which we live.

I have studied the question of road building somewhat, and am satisfied, with others, that our system is wrong; in fact, we have no system. Every road commissioner has his notion of road construction, and whether he be worthy or unworthy, one season is enough for him, and a new man must be elected for the next year; a continuous A, B, C knowledge of road building, and as often a complete failure in road construction. Why not seek the best possible man for road commissioner, and when such a one is found and he is successful, let him serve in that capacity as long as he is faithful and builds good roads. If he is not aware of the fact, let some one say to him (and this is no criticism) that the time to build mud roads is as early in the spring as possible. The land is then in the best condition to work, and we are entering the best season for compacting and solidifying the road bed. Say to him that water is the greatest hindrance to good roads, hence the road must be relieved of all surplus water, being left high and dry. Short, muddy places must be bedded with rock as an underdrain, and instead of hitching six or eight horses to a road machine, with men enough to man it, and plowing from center to circumference and tearing up the only decent road bed in the stretch, leave the foundation already there and draw from the sides enough to round and smooth. Build what can be well built with the money at command, and leave the rest until the people see by his works that he is the road commissioner needed, and are ready to add a larger appropriation for a continuance of the work so well done.

Let him call to his aid competent assistants, locating them in such parts of the town as require the closest attention to the destruction of the roads by showers and heavy rains, require them to attend carefully to their respective sections and pay them well for their labor. With a good road commissioner, well assisted, making repairs as soon as needed, better roads and a more economical outlay of the public funds will be experienced.

SPECIAL DAIRY MEETING AT PRESQUE ISLE, OCTOBER 22 AND 23, 1903.

At the request of the State Dairymen's Association a two-days' meeting devoted to the subject of dairying was held at Presque Isle on October 22 and 23, for the benefit of the people in this section of the State. While this is not a special dairy section, we were much pleased at the interest manifested, and the large display of butter and cheese that was made. The judges from Vermont and Massachusetts, who scored the dairy products, were surprised at the high standard of excellency found. A few of the addresses delivered at this meeting are presented in the following pages. The remainder we are unable to print, for lack of space, but they will be found in the annual report of the Maine Dairymen's Association for 1903.

HANDLING THE DAIRY FOR PROFIT.

By S. C. Thompson, Winterport.

I am well aware that you farmers of Aroostook county are making a great success at raising potatoes, that this year is perhaps the greatest success of all, surely so far as yield is concerned, that your land is fertile and valuable and that you are prospering financially. You are raising large quantities of clover, and it is a crop on which you can rely from year to year, and is one of the best feeds for the dairy cow, carrying a large percentage of protein which is so necessary in the production of milk; and you are selling large quantities of timothy at from eight to ten dollars per ton, with the average, I am told, at the lower figure. We find by experiments that if we go into the market to replace the fertilizer sold in one ton of hay it will cost us more than seven dollars. For every ton of hay sold for eight dollars we are selling seven dollars worth of fertilizer. We are getting but one dollar a ton for our labor of harvesting, pressing and marketing. In contrast I want to call your attention to work done by a young man in our town with a herd of 13 cows, none of which are thoroughbreds, and merely an ordinary herd. This herd averaged him $59.60 per cow, gross, and the cost of grain was $17 per cow, leaving a balance of $42.60 for hay, pasturing and care. The work was done with the aid of one hired man, which would have been necessary to carry on the farm of 150 acres. The milking is done at five o'clock in the morning and 5 o'clock in the evening, making a day of twelve hours, with an hour for noon.

Allowing each cow to have consumed two tons of hay at $8.00, or a total of $16.00 for two tons, we have $26.60 remaining, in addition to the $14 worth of fertilizer saved from the hay, also quite a portion of the $17.00 paid for grain, which will offset the pasturing; so we can safely reckon a profit of $40 a cow or a total of $520 for the herd of 13.

My point is this: We can raise our potatoes and in connection with it conduct a dairy, work no harder than at present, market the hay on our farms, thereby saving rather than buying fertilizer and saving the cost of pressing and marketing the hay, and come out with more money at the end of the year. It is necessary in order to do anything at a profit to reduce the cost of production to the lowest possible figure, and in order to do that we must do the most work with the least labor. And here comes in the question of machinery.

I am willing to admit that you are doing successful farming without dairying, but I do maintain that you can do successful dairying in connection with your present work. I shall try to show how dairying can be done at a profit. It is, of course, necessary that careful selection should be made of the cows kept. I am certain that successful work may be done with any of the recognized dairy breeds, but I believe that a careful selection must be made of the individual animals of whatever breed, and that because a cow is a thoroughbred is not sufficient evidence that she has the qualities which we need for successful dairy work.

I do not wish to be understood as being opposed to the breeding of full-bloods, for that is a step in the right direction, and must be followed; but when the animal has developed and we can judge of her qualities, then we should keep or discard her as the results will warrant. And we must bear in mind that careful breeding is one of the secrets of success, for if we are able to improve our herd from year to year we are constantly growing richer without any extra expense.

We must have cows that have capacity for the work intended for them, and the whole structure must tend in the one direction. We cannot hope to get large quantities of milk from a cow with a small udder, neither can she produce the milk to fill the udder if she has not the capacity for taking and assimilating enough food to do the required work. She must have lung capacity to correspond with her frame, or we have a weak spot. Nor will the lungs be of any use unless the opening of the nostrils is large enough to fill the lungs at every breath. Her disposition must be of the same capacity as the organs we have mentioned. In short, a dairy cow, to be kept for profit, must be so constituted and constructed that she will return the largest amount of milk and butter for a corresponding consumption of feed, and the more feed she will consume at a profit, the more valuable is the cow for the dairy. When we have a cow with enough capacity we are ready to do a business that even the potato farmers of Aroostook county will be glad to pursue.

After such a cow is selected it is necessary to give special attention to her surroundings and feed. She must have clean surroundings, plenty of pure air and sunlight, and be made as comfortable as possible. She must have plenty of pure water, and be fed such rations as can be used to the best possible advantage. There are certain rules for feeding which have been found by experiment to produce the best result, and tables of feeds have been published by our experiment stations which are of great value to the dairymen. The essentials of the ration are protein, carbohydrates and fat, and it has been found by experiment that certain quantities of each are necessary, and that the ratio is very nearly the same for all cows. Rations made up to correspond with this ratio are called balanced rations and if we feed more of any ingredient than is necessary, we get no benefit, and consequently it is wasted, with the result that our ration is too expensive, and if we are dairying for profit, we must give especial care that we are not wasting feed, which is money.

Protein is the expensive ingredient, and the one most difficult to get in sufficient quantities to balance our ration. Most dairymen are raising their carbohydrates and fat, with what protein they are able, and are buying the remainder in the concentrated feeds on the market, such as cottonseed meal, gluten meal, and lately the Fourex, which recently came into use. As these feeds cost but little, if any, more than corn meal and carry from 30 to 45 per cent. of digestible protein, it seems to be an economical plan and one intended to get the greatest profit. So then, with our clover hay and peas and oats, which can be grown in great abundance here, the remainder, which will be very small in connection with those feeds just mentioned, can be best procured in the concentrated feeds.

After having selected the cow which will yield us the most profit, and the feed which costs us the least and contains the necessary ingredients, with surroundings such as will keep her comfortable and contented, we come to the milking and caring for and marketing the product. I am aware that the matter of getting help is a serious problem, especially help to carry on the dairy, for many men object to milking and will not work for the man who has many cows. It is also difficult to get good milkers. I am sure milking is not any harder than a majority of farm work. Why, then, does this condition exist? One reason is that most farmers who are not making a specialty of dairying do not make their chores a part of their day's work, but expect their men to get up an hour earlier than would be necessary, to do the milking and other work of caring for the cows, then do a day's work on the farm and spend another hour in the evening at chores. Is it any wonder that men object to that way of doing, for they get no more wages than the man who works where no cows are kept.

Now, friends, a man who has a disposition to give value received will accomplish as much in 12 hours as he will in 15 on a farm, and if he makes the chores a part of a day's work, we shall get as much other work done, and our hired men will feel better natured, be more willing to do what is asked and will not object to milking. I have seen the result in actual practice, and have heard the men express their opinions. Another reason for doing this is that we shall get the best results by milking regularly and making periods between of like duration. Some men are naturally good milkers, while others are poor, but all may be improved if they have an interest in the work they are doing.

The requisites of a good milker are cleanliness, speed and thoroughness. They must also treat the cow as a friend rather than as an animal, and pet rather than abuse her. Then we shall get the profits, when the reverse would mean a loss. The care of the milk will be discussed later by a man who has had much experience in that direction. That is one of the necessary qualities of profitable dairying, for so long as we can make a better product than our competitor we are sure of a better market and better prices, which always means more profit.

We come next to the separation of the cream from the milk and it does not matter how it is done as long as it is thorough, but we cannot afford to allow any amount of fat to remain in the skim-milk, and I know no way in which the work can be so thoroughly done as with the separator, of which there are several on exhibition today. They do the work quickly and thoroughly, leaving the skim-milk warm as it came from the cow, minus the fat, and it can be fed to the pig or calf in its best possible condition, an important factor in the profit to be derived. I am surprised and pleased to find so many separators in your county, and am convinced that all that is necessary is for you to show that you can get profit out of the work, when you will make Aroostook county not only the garden of Maine, but the dairy as well.

The marketing of the product is one of the most important questions connected with dairying. Though we have every other condition right, if we have no market, or not a profitable one, our efforts will fail, and as I said before if we will take the care of our product, which will make it the best, we shall find a ready market in whatever form we choose to sell it.

The creameries afford a ready market for all the product we care to supply, and place no restrictions on the quantity, but take whatever increase we may have from time to time at prices that compare with the markets of any other state. Vermont is the one New England state which we look to as the dairy state. Its farmers are making dairying their specialty, and are very prosperous, and the stories of their prosperity sound very much like those of your own county. But the prices of their products are not as high as those in our own State, and I am sure they can raise no better nor sweeter feed, nor have purer water than in the beautiful county of Aroostook. Why, then, cannot we increase our production and be doubly prosperous? But you say: "We do not have the creameries, nor the markets for our butter, such as they have in Vermont, or other dairy states." I say to you that when you become interested in that branch of agriculture, the creamery will surely come, which is made evident by the attempt to establish creameries in this county. Already there are three or four of them manufacturing butter, and you have one in this town preparing sweet cream for the Boston market. The demand for that product is constantly increasing, and the more work you do in this direction the greater will be the market for your products.

Another point not to be forgotten in connection with the creamery, is the fact that whatever of your product is shipped away leaves a better market at home for those who prefer to sell the finished product, and it is safe to say today that every part of Aroostook county and the whole state have a profitable market for their entire product, either in cream or butter as long as care is taken in the selection of the cow, her feed, her surroundings, the handling of her product, and the marketing. The demand is constantly increasing, and I truly believe that you farmers of Aroostook county, if you will use the same care, thought and study with the dairy that you are using in the raising of potatoes, can make it a source of revenue in connection with your present work, and that you will be able to double your present profits.

DAIRYING IN AROOSTOOK COUNTY.

By Hon. R. Alden, Winthrop, President Maine Dairymen's Association.

While visiting your beautiful county last spring I was very forcibly impressed with the great natural advantages you possess for dairying.

Your rich, nutritious grasses, pure water, cool climate and intelligent farmers, all conspire to make this the leading dairy section of New England, and when we saw it demonstrated just over the line that they were producing butter second only to one country in the world, I felt that the commissioner of agriculture and our association ought to hold a special dairy meeting here, hoping and believing that such a meeting might result in awakening your people to a realizing sense of the great advantages you possess for this business.

For many years I have thought about the possibilities which might result from dairying in Aroostook county, if it were once undertaken with the same enthusiasm which has characterized your methods of raising potatoes, and I believe results would follow which would surprise the whole county.

I am so thoroughly interested in dairying myself that what I say to you may sound visionary, but I am a firm believer in dairying in your county and shall continue to be until I am convinced that I am mistaken, which I hope will never happen.

The fine quality of butter and cheese they are producing in New Brunswick, whose soil and climate are identical with yours, goes to prove that I am correct in my assertion. Our dairy instructor is here, ready and willing to aid, assist and instruct you in any possible way.

I believe we shall see the wisdom of our last Legislature in appropriating money for this purpose, as I think Maine is soon to become one of the leading dairy states of this country.

You have 14,484 cows, which is more than any other county has in this state and yet you do not claim to be a dairy county. You could easily double this number of cows, and by making a choice article of butter that would command the highest market price you would find a handsome profit in the business.

The time will come when the farmers of Aroostook county will learn as they have in older sections of our state that the raising of potatoes for a long period on the same ground will exhaust the soil. I hope you will try to avoid the mistake made in other sections of the state when they had their virgin soil. Would it not be better for you to take advantage of dairying to increase the fertility of your soil before it is exhausted, and in this way save thousands of dollars every year that go out of our state to purchase fertilizer? Then you would have more than one source to draw from, so if one crop fails you will have something else to help you out. I could not pay my bills if it were not for my milk and cream checks coming every month.

If I were a young man it would be the height of my ambition to come to your beautiful county and put up a barn two hundred feet long and have in it one hundred good cows. I know from my own experience for a term of years that I could make them pay me $70 per cow per annum, and at the same time double and treble the hay crop in a few years.

We have a great many men whose dairies are paying them better than mine, for the cows in some dairies are averaging $100 per cow each year.

I am aware that the potato crop is putting thousands of dollars each year into your pockets at the present time, but I well remember that a few years ago the potato crop for some cause proved a failure here, and almost bankrupted some of the farmers.

You must not forget we are all Yankees, and some of the farmers in the older sections of the state, including our commissioner of agriculture, have been watching you and have learned some of your scientific ways of raising the tubers, and have put these ideas into practice and surprised us with what they have demonstrated. One of my Yankee friends, Hon. Geo. R. Smith, has raised the past season, from twenty acres or less, about 4,000 bushels of potatoes.

You will remember that the freight on our potatoes to market is very much less than it is on potatoes from here. The freight on four hundred pounds of butter from here to Boston probably would not be any more than the freight on seven bushels of potatoes, and the butter ought to bring you $100, and the potatoes would sell for about $3.85. It seems to me it would be better for you to send the products of your soil to market in a condensed form.

While I am not here to instruct you, I feel that if I could in any way encourage or aid you to increase the fertility of your farms and to develop Aroostook county which Maine is so proud of, it would be a great satisfaction to me.

THE MISSING LINK IN OUR STOCK HUSBANDRY.

By W. W. HUBBARD, Agricultural Agent, Canadian Pacific Railway.

Allow me a word of explanation of my position in connection with a railway corporation. You will naturally inquire why the Canadian Pacific Railway should have an agricultural agent. Well, the first reason is that we want more business for the eastern end of our road. As Mr. Gilman has very well said, our governments, both provincial and federal, in the Dominion of Canada, have been doing a good deal to help agriculture. It may be that our people are rather slow, I am sorry to say that many of them are, and they need more encouragement, more spurring on, than the people on this side of the line. At any rate, it has been deemed advisable by the government to do all it can to promote agriculture. Since 1890 we have been doing our best, through our provincial government, to stimulate dairying, in some parts with very great success. In the southern part of the country the returns are very satisfactory and dairymen there are doing very well. Along the valley of the St. John river, of which you might be said to be a part, the people have not taken so kindly to dairying, although they have far better facilities for raising all kinds of fodder crops, they have better pasturage, and are much better situated for dairying than the men who are making the best success of it, in the hilly and poorer parts of the province. Dairy stock has been talked persistently to these people, but whereas fifteen or twenty years ago they were keeping, perhaps, a class of stock that was better adapted for making flesh than they are today, they were keeping far more of it, and we now have hundreds of farms along the banks of the St. John that are carrying practically no cattle at all.

Our corporation came to the conclusion that the trouble was that a great many of these farmers were not naturally adapted to dairy work, and if we could induce them to take up stock husbandry in general, pursuing not less dairying but raising more horses and more cattle, we should be doing something to stimulate business along our line.

Here in this part of the State of Maine you are making a great success of potato growing. You are making money out of it, and it would be presumption on my part to come over here and give you any advice on the matter because I do not know of any section in the whole country where the people are doing better than you are. so far as potato growing is concerned. If you could go on illimitably in that direction no doubt you would make lots of money, but a disquieting element fortunately has come in. Experts say that in the light of history your land will surely run out as it has in other places under such special work. From shipping off the raw products of the farm and not feeding enough of them, the fertility of your land, the supply of vegetable matter in the soil, will be gradually exhausted. What are you going to do about it? This is a dairy convention. You are urged to go into dairying as a specialty, and quite rightly. I believe there is more money to be made per acre, if your land is adapted to it, from the dairy cow as a specialty than in any other way. But I am inclined to the opinion that here, as across the line, we are up against a condition of affairs where we need—the missing link—in this business. The great majority of our men over there who are selling hay and grain in large quantities are not men who will immediately take kindly to the proposition of milking cows, and keeping dairy cows for all their stock. I am not here to argue that the special dairy cow is not the best money maker, but I want to say she is not likely to be used with success unless the man who uses her gives her special dairy food and treatment. Our observation is that this man, the dairy specialist, the man who loves cows, understands their needs and the conditions of success is the missing link in our stock husbandry. Our people are not sprung from a stock raising ancestry, they do not inherit the love for and delight in good cattle and other stock that characterizes some peoples, for instance, those of the British Isles and Denmark, where from the highest families in the land to the lowliest, there is an inborn affection for domestic animals and a pride in the highest development of their excellencies. To find this missing link by stimulating a love for domestic live stock should be one of our efforts. Having this view of the case we are working to coöperate with our provincial government by encouraging these men who are not specialists to keep a class of cows that will make milk, and make it more profitably in some cases than the cow of special dairy breeding, and at the same time will drop a calf which will sell for a good price for veal, or to raise for a beef animal.

I am not here as an exponent of the dual purpose animal, and yet I believe the keeping of these cows, to some extent, may work out better for the country than to place special cows among men who are not specialists. The farmers will gradually come around to the dairy end of it, I think quicker in this way than if an attempt is made to have them keep nothing but special dairy stock. In the St. John valley years ago we had largely Shorthorn grades. We were keeping on many farms forty or fifty head of cattle where today only three or four cows are kept. Those men were not and are not today special dairymen, but they were willing to feed cattle. Another point was that they had rough fodder and rough pasturage, which cannot be profitably utilized in forcing the dairy cow to her highest production, but it will grow young stock. We can turn off cattle in two or three years which have cost us practically nothing so far as the concentrated foods are concerned, and after they have utilized the coarse foods and the rough pastures we can top them off with a small amount of grain and sell them at a good profit. When we can find men situated as those men are, who are not prepared to milk 30 or 40 cows but who will milk from six to twelve and keep a number of dry cattle, I think we can intersperse stock raising with dairying to the advantage of the farmer, the country and the dairy industry.

Right here I may be pardoned for dropping a suggestion in relation to keeping up the fertility of the land. By growing potatoes year after year I do not think we are getting the best results. I think you should adopt a short rotation. After the potato crop is lifted cultivate the land that fall and the next spring sow a crop of grain, seeding to clover. What will you do with the crop of grain? Some of you may sell it to the lumber camps or dispose of it in other ways. Our people are largely selling it off the farm, feeding a little to the horses. If you have any manure about the place put it on the young clover during the fall or winter, and the next season you will cut a good crop of hay, and if the season is favorable you will have a good crop of aftermath, which you can turn under for the potato crop the following year. Then you have a large amount of vegetable matter in the soil, which is just what you need. I believe this soil is very fertile, containing potash and phosphoric acid in great quantities if we cultivate it to make those elements available, but we are slowly but surely taking out the vegetable matter, the humus. This humus can be replaced by the clover plant, from the roots and the stalks and the leaves, and the clover has another valuable quality in that it is able to get nitrogen from the air. Your bill for commercial fertilizers can be cut in two, and cut in two again, by that process.

Now, how will you feed that clover and grain? To special dairy cows, or to cows and dry stock? The proposition in regard to the special dairy cow looks to me something like this: You can keep, say, 36 head profitably on your farm, to eat up the grain and hay and the other rough fodder that you may have. If you are keeping dairy cows, you will keep 30 of them in milk, the others being young stock coming up to replace the cows that you may sell. If those are well selected cows and you are forcing them, you will get a return of $80 every year from each cow. It takes a pretty good cow to do this, but it is a fair return. That means $2,400 from your herd. But it also means forcing those cows twelve months in the year, milking them twice a day. It means labor, it means skilled labor. It takes a man who likes to do that kind of work in order to make a thorough success of it. You cannot run those cows over a rough pasture; you cannot feed them a great deal of your coarse feeds without adding concentrated feeds; you cannot feed them heavily on roots, especially on turnips. But you are getting $2,400 dollars a year in clean cash, not a bad income to supplement your potato crop, and at the same time help in keeping up the fertility of the land.

On the other hand, suppose you are keeping grade Shorthorns, using a Shorthorn male and getting large, strong cows, with good constitutions. These cows properly handled, perhaps not forced as high as the others, will turn you in $48 or $50 per year each for their products. I can point to two Shorthorn cows, one with a record of 12,000 and the other 9,000 pounds of milk in a year, but I will admit that those are exceptions. But you can quite easily get $48 or $50 from them. You have twelve head of yearlings and twelve head of two-year-olds. If you are wise you will turn those off before they are three. You can make them worth from $50 to $55 a head for beef. That, along with the dairy products from your cows would mean about $100 per cow, $1,200 against $2,400. But you can care for those twelve cows with a great deal less labor and get rid of a great deal of coarser feed.

I just hold this out as an aid to the dairy business. I believe that under certain conditions you can do business in this way and do it more profitably, especially if you have not the special dairy man. I am free to confess that our people do not like to take care of stock. They do not like to spend all winter in the barn. They want to be out, some of them in the woods cutting spruce logs, some of them trucking on the road, anything rather than staying in the barn and trying to make a profit out of stock. How we are going to turn them around, I do not know. Some of them are seeing that the fertility of their land is being reduced by this constant drain of selling grain and hay; and I think you will find that, although the selling of potatoes is far better and far easier than the selling of hay and grain, unless you keep stock your crops will be reduced, as is the case in the Middle States, and the quality also will be reduced, so that there will not be as much profit in the business.

I grant that from a special dairy standpoint, I am preaching a doctrine that is heterodox to a certain extent, but we must be guided somewhat by the conditions that exist. You may say, why don't you advocate a special dairy herd and a special beef herd, because there is certainly more money to be made out of an animal so constructed that it will make beef and put it in just the right place? A man may be able to make pretty good money, under special conditions, from a beef herd, taking no account of the dairy, but when you can get cows that will give from six to eight thousand pounds of milk in a season and at the same time raise a good calf that will make a beef animal worth $50 or $60 at two years old, I believe, in this country where we have comparatively small farms, that is the solution of the raising of home grown beef.

But I do not believe that we should confine our attention entirely to cattle in stock husbandry in this country. There is a great demand at the present time, as you know, for horses. We need horses to work on our farms, and I believe we can economize very much by using larger and stronger teams. I took a little trip up through our Canadian Northwest, and if there was one thing that impressed me more than another it was the amount of work that one man would do, with modern implements and plenty of team power. One man with a six-horse team would plow two furrows at a time in prairie sod; he could plow two furrows with three horses on old land. Then they were using wide cultivators for stirring the land, wheel cultivators, putting plenty of team power in front of them and one man doing the work of two or three with small two horse teams. I believe that on our farms which are of any extent we can greatly economize in the amount of human labor that we put onto the soil by increasing our team power, raising heavier horses and using them in our farm work, and always having a good team to sell for the city truck teams or to go into the woods. You know it is almost impossible now to get horses to supply the demand.

I will not stop to refer to sheep and swine. I believe swine should go hand in hand with the dairy because I do not think there is any way in which we can utilize the by-products of the dairy so well as by feeding them to swine. The bacon pig is quite a distinct animal from the pig raised in the corn belt. The bacon pig will bring fourteen or fifteen cents a pound in the English market, and you can make him cheaply on summer pasurage with the by-products of the dairy.

Another thing that struck me in connection with this dairy business was the suggestion dropped by Prof. Hills last night when he spoke of the supply of cows needed for the milk centres near the large cities. I believe with him that you would find it a profitable business to raise cows for the market; and I know of no cow that will suit that market better than the cow from which the dairyman can get a good supply of milk for six or eight months and then have her ready for the butcher. He will get much more money though he may get less milk. That is the kind of cow that is netting the best return to the dairymen around Toronto.

Perhaps, however, you will answer the arguments advanced at this convention by saying, "Well, our business is all right now and we need not worry about the future." This may be a satisfactory argument, but it is a short-sighted one. We must realize the responsibility that rests upon us towards the boys and girls who will be the men and women after us. Are we going to run this country down so that the boys and girls will have to move away and leave these snug farms and homes? Is that a pleasant picture? Is that fair and just to the country? If there is no other ground upon which to appeal to a man to keep up the fertility of the soil, there is a patriotic one. If he has faith in the future of his country, if he wants to see it develop and become one of the best countries to live in under the sun, he must pay some attention to this matter of keeping up its resources, so that the constantly increasing population may find not only a living but wealth. I think this is a common duty, for both the people of the Union and the Dominion of Canada. We are young countries, and we both have great opportunities, morally, financially and socially. I hope to see both countries working together hand in hand in friendly intercourse for the development of this great American continent.

ADDRESSES DELIVERED

AT A

Meeting in the Interest of the Agricultural Fairs of the State

HELD AT

Waterville, November 19, 1903.

WHAT AGRICULTURAL PRODUCTS SHOULD BE EXHIBITED AND HOW THEY SHOULD BE SHOWN.

By Wm. D. Hurd, Professor of Agriculture at University of Maine.

I have been told by the person who had charge of the dealing out of these subjects, that I might digress if I chose from the one given me, and talk on some things which seem to me to be vital considerations when a Fair Association is to be organized. The financial side of the question is always, of course, of primary importance.

I am speaking from more than theoretical knowledge on this subject, it having been my privilege to spend six or eight weeks out of each of six or seven years in attendance as an exhibitor, at several of the best fairs of the Middle West. I have tried to look into the workings of the different associations with which I am familiar, from both the practical and ethical standpoint and it is such observation that leads me to make the following remarks.

I suppose the fairs in this country were a direct outcome of those of our mother nation across the sea, which in the beginning were nothing more than market days, at which time people from the surrounding country brought their produce, exhibited it for comparison, and finally sold it in a competitive way. Such a gathering gave a stimulus to those present which said to them "Grow better products or your goods will not sell on these days." From such crude beginnings as this, the fairs of this and other countries have sprung.

About twenty or twenty-five years ago, the popularity of fairs reached its greatest height. Nearly every county of the states of the Middle West, has boasted of its county fair association. Several counties banded together founded District Associations, and every state supports a State Fair of more or less wide renown. Since the time of which I speak, many fairs have been on a gradual decline, and in many instances we find societies which were formerly in a flourishing condition, bankrupt and not even operating their gates for public exhibition. Their once attractive grounds are growing up to weeds and brush.

In many cases we find so called "Street Fairs," in place of those formerly held. In these towns some street is given up to this purpose, and booths and stalls are erected along its sides which serve as a place where the produce of the country and the wares of the village merchant may be exhibited side by side, to the prospective purchaser.

There are many reasons why fairs have fallen into this condition but there is one main cause which I believe has been responsible for most of this failure and that is, the management have drifted away from the original foundation idea. That idea I believe to be this,—that a fair if it is a true fair, must depend for its permanent existence on agriculture and that agriculture and its products must be the one center about which all other branches should gather. The fundamental idea and purpose of a fair should be to educate the people, and by educate in this sense I mean that such an exhibition should be held as will send the man who breeds a good Jersey or Shorthorn cow, or a draft or speedy horse, home, with a firm determination to improve that breed and come out the next year with some article in friendly competition with his neighbor. He should carry back with him as a result of that day's visit some new idea that will aid him in bringing his farm up to a better state of productiveness, or a better method of performing the farm operations.

I think if you will look over the record of the different fairs of this State, you will find that those in the most prosperous condition are the ones which have kept close to the people. To permanently interest the community, get as many life members as possible. Let the public get the idea that this is their fair, not the managers', and that they have a personal interest and, in a way, are running things, and I do not believe you will have much trouble in making the association a permanent factor in the community.

I have made the statement that the fair must have for its foundation agriculture. Agriculture and the show of farm products and animals are things everyone is interested in.

You may criticise the statement I am about to make if you will, but it is my best judgment that the day is past when horse racing alone will make a fair. Horse racing in itself has been one of the best sports of modern times, but it has been abused by the introduction of gambling to such an extent that the mass of the people are ready to pass it by. It has gone by the stage when it furnishes amusement. So bicycle racing and other events have had their day.

The fair of to-day in many cases is largely what is so extensively advertised "The Great Midway." Not a reproduction of that far-famed place, but a place harboring exhibitions of the most questionable character whose performances are witnessed not alone by the lowest dregs of humanity—but by the sons and daughters of the best families in the surrounding country. They must be brought in contact with it for it occupies the most prominent and conspicuous place on the grounds. There is a desire on the part of every boy to see all there is to see and he usually finds sufficient material to set his mind at work on subjects which may mean much harm to him in the years to come. It is the first taste of this sort of thing. It is the first chance, and perhaps a winning one, which he takes on some wheel of fortune or other gambling device, which sends him downward on a gambler's career. We will grant that this is education, but is it of the kind you wish your sons to obtain? There are scores of amusements high in character which when participated in, give a sense of gratification and satisfaction. It is not those other things which leave a satisfactory and pleasant taste in one's memory. You will find, too, that the fair associations in the best condition are those that recognize the principles I have mentioned. No fair will be successful whose backbone is the sporting element. There must be a different idea than this alone. I know of one specific instance, that of the Hillsdale (Mich.) County Fair, which numbers its daily attendance by the thousands, often reaching as high as 20,000 to 25,000, and it is not because of any favored location or fancy buildings. The management of this fair have never allowed a game of questionable character, or an exhibition or show of any but the highest type. They have all the amusements they can crowd into their grounds. It pays such to be present, and the success of this fair lies in the fact that people for miles around, city and country, are sure that what they are to see will be worth their while, pure, wholesome, enlightening and satisfying.

The Danbury, Connecticut, fair is probably as notable an example here in the East as could be found. This fair draws hundreds out from New York City every year. and the amusements, and the industrial and agricultural exhibits are in a well balanced proportion to each other.

No doubt I have said more than is necessary, or perhaps called for on such points as these, but there should never be a time or an occasion in this free country, where it is improper to discuss problems relating to the welfare of coming generations, and so as one deeply interested in the educational advantages, as well as other things, offered by fairs, I have taken the opportunity to speak as I have.

In taking the stand that agricultural products must occupy such a prominent place the question of buildings must needs be one of the first considerations. In the first place the general aspect of the whole grounds should be pleasing to the eye. People are bent on gaiety and pleasure at such a time as this. The buildings in which the different exhibits are shown should be roomy, light, substantial and dry. The most ideal form of those which have been brought to my notice is the form of a hollow square. This allows the crowd to pass in through the exhibits, viewing them to good advantage, and the space in the center can be devoted to many other purposes. On account of the uncertainty of weather conditions the buildings, both halls and stables, must be substantial enough so that valuable articles will not be ruined, or animals unduly exposed.

We often hear it said that there is not much value in showing grains and other like products. The trouble is that too little attention is given to the displaying of such things. A sack of grain is left here, there and everywhere. Each variety should be put into a bucket or attractive measure and placed on tables or benches whose sides slope upward toward the rear so that every sample can be readily seen.

In the showing of fruit I know of no better method than plates, as used at the present time. Besides this there should be samples of all the newer and more approved styles of packing boxes and baskets, and these should be filled with the produce ready for shipment.

In the matter of vegetables, too much stress has been laid on the showing of especially large and abnormal specimens of pumpkins, squashes, etc. What we most want is quality rather than quantity, and those which approach the true type rather than monstrosities.

To show live stock ample provision should be made for stabling so that the stock can be kept during the entire fair instead of being sent home as soon as it has been scored. A parade every day of the best stock on exhibition, adds much to the enjoyment and gives a larger idea of the show as many are seen together.

In other departments some of the most interesting displays I ever witnessed were those where goods were being manufactured on the grounds. Ample shelter and ample power ought to be furnished so that the makers of agricultural implements and other machinery could show their goods in full operation.

The matter of judging the various exhibits should be carefully attended to. A dissatisfied exhibitor, like a dissatisfied customer in a store, is not likely to come again. The one way to have general good feeling on all sides is to have a person of recognized standing and reputation judge each particular class of exhibits. It is not possible nor ought it be asked of any one man that he judge the whole show. Use some recognized standard for judging individuals in every herd of cattle, every horse, and every dairy or farm product. Stick to this standard, and you will take a step toward a much needed reform in judging at our fairs. A high class of awards and the fact that such are placed according to true merit, and stand for what they mean, insures the bringing of exhibits of the highest character and this is necessary to success.

At the present time there is a mighty awakening in agricultural circles everywhere. The man in the city, be he capitalist or on a salary, is taking a deeper interest than ever before in these things. Our young people are not so anxious to leave the farm and go to the city as formerly. We want better grains. The markets are demanding more and finer vegetables, better milk, butter, poultry and eggs. They want more and better fruit. They want this fruit sent to them in better packages. There is no better place where the mass of the people can have all these things called to their attention—in short, be educated to furnish the things most wanted, and in the way they are wanted, than through this agency, a good, clean, enjoyable, well-managed fair.

THE RELATIONS OF THE GRANGE TO AN AGRICULTURAL FAIR.

By Hon. J. A. Roberts, Norway.

(Stenographic Copy.)

I think it is well, in an enterprise of this character, that the Grange of the State be recognized. An agricultural fair is educational; the Grange, too, is educational in its character. Going back many years we might come to that time when two neighbors brought together their oxen to compare them. By that comparison each man learned something. Later on other neighbors were brought in and the instruction received was broadened and given to more people. Still later, another step was made,—that yoke of oxen was compared with an ideal yoke of oxen, that cow which was brought into the show ring was compared with an ideal cow which was supposed to be perfect, and the people of the community were brought together that they might receive instruction and gain information. There is no way in which we can learn more quickly and more surely than through object lessons, and the instructions we receive at an agricultural fair are of that character. Later on our State stepped in and helped to sustain these fairs financially, for two reasons. The first reason was that these institutions are instructive in their purpose, and the second reason was that the State believed that by encouraging an exhibition of the best products of the State her industries would be promoted. It is upon these two grounds, and these two grounds alone, that the State of Maine stands willing to assist these agricultural fairs financially.

The original purpose of agricultural fairs was for the development of the products of our soil. Social intercourse and amusements are mere incidents and while valuable in themselves, if the amusement is clean and wholesome, they are not the main purpose. In the management of the fairs of our State, it has always seemed to me that we have not laid sufficient stress upon the exhibition of the products of our soil. Go with me into the halls of some of these fairs, and what do you see there? Go with me into the halls of the State Fairs, the large fairs that represent the entire State. My friends, do you realize that the dairy products of this State bring into it millions and millions of dollars every year, that go into the pockets of thousands of people and add wealth to our State? And yet, when you go into the exhibition halls at our State Fairs do you find a display that represents this large industry of ours, or do you find there a display that in itself, in its size, belittles that industry? Ought not the managers of the fairs to offer premiums of sufficient size and number that they may draw to the exhibition halls a display of dairy products that will advertise our business to the people in our own cities and villages and to the people who come to these fairs from outside of the State?

The potato industry of this State brings within our borders millions upon millions of dollars every year, and those dollars, too, are distributed among our people all over the State, they are adding wealth to the State constantly, and yet if you go to one of these fairs do you see there an exhibit of potatoes that in any way represents this industry? If you were to judge the industry from the exhibit that you find at the fairs, you would say that the raising of potatoes in this State was of little consequence, it was a minor matter; and I submit to the fair managers of Maine whether it would not be well to offer premiums in size and in numbers that will draw a display of potatoes which will attract the attention of the people in our cities and villages and of those outside our borders who come in here, and show to them what the potato raisers of this State are doing and what a great industry it is becoming.

Again, the Baldwin apple has brought into this State millions of dollars, and that money has gone into the pockets of thousands of the people. It has increased the business and added to the wealth, not only of the men on the farms but of the men in the villages and cities; and yet, if you go to the State fairs you will find on exhibition there just a few plates. A few dollars, a very few dollars, are offered in premiums by our fair managers for the Baldwin apples, an industry of tremendous importance in the State, and if this industry were to be judged by the exhibit at our fairs it would be deemed of no consequence. If an outsider were to visit our State fairs and examine the exhibit of Baldwin apples and judge the industry by that exhibit, he would say, "Maine is not a place where Baldwin apples can be bought." Now I submit, as a fair proposition, whether a sufficient amount of money should not be placed upon the Baldwin apple to bring out an exhibit that will show to the people of our cities and villages, as well as the people outside of the borders of the State, many of whom will come here, what we are doing, and what we have to sell. When I speak of the Baldwn apple I do not mean that we should confine our efforts to that one variety, but there is one thing I do wish to say: I do not believe it is right, or business, to pay out just as much money in premiums for an apple that is comparatively worthless as for an apple like the Baldwin, that has stood the test for years.

Now, what has the Grange to do with all this? The Grange, my friends, is an educational institution, the same as the fair. The Grange stands for the advancement of education, of every educational agency in the State, I do not care what it is. The Grange is interested in a better press, in better common schools, in better high schools and academies, in better colleges; it is interested in a broad and progressive educational system; it is interested in having better farmers' institutes; it is interested in everything that is liberal and just and wise, in everything that tends towards the advancement of our people and towards the development of our industries. The Grange today, in the State, has become a powerful organization. Its numbers do not constitute its greatest strength. Its greatest strength comes from the fact that it has educated its members up to a higher standing, to a greater appreciation of the opportunities that lie before us. Our old geographies used to say that the soil of Maine was sterile and the soil of the West was fertile. I read an article a few days ago from my friend who is to speak to you this afternoon, in which he took the ground that the soil of Maine has as great capacity for production as the soil of any state in our country, and I believe it. I believe that right here in the State of Maine we can produce products superior in quality and equal in quantity to those of any state in this Union. I believe that these fields of ours, under intelligent and skillful management, will produce the best products in the world; products that will equal in quantity those of any state or country. Bring out these products to the fairs! Let the fair managers offer premiums sufficient to bring them out! Let the people of the cities and villages see what we on the farm are doing and what we can do, and then we will tell them that we can do better and are going to do better in the future. I am glad the time has come when we are appreciating ourselves a little better than we did formerly. Not very many years back we were sending our men and our money out into the other states. The money was lost, much of it; a few of the men made for themselves success, but many did not succeed in a large measure. We are realizing in these later days that there are just as good opportunities open for us in this State as in any other, and I think that under the teaching of the Grange our farmers are beginning to believe that there are just as good opportunities upon the farms of this State as upon the farms in any other state. And as these agricultural fairs stand true to their original purpose and aid the farmers of this State in the development of its resources, then they will repay their managers and accomplish a worthy work.

SHOULD THE EDUCATIONAL FEATURES OF FAIRS BE MADE MORE PROMINENT?

By Prof. C. S. Phelps, Chapinville, Conn.

Ever since the first agricultural fair was held in Massachusetts, in 1817, fairs have been thought to be of advantage to the farmer, —of pecuniary advantage by encouraging him to raise crops and products that would win the coveted premiums, and of educational advantage by stimulating a desire to know the reason, in case of failure to win. The raising of better stock and better products has thus been encouraged, at least among those who were in the habit of exhibiting. As long as the fair received no State aid, and thus did not come under State control, the managers were fully entitled to conduct it on such lines as they saw fit, as long as they introduced no morally objectionable features.

Realizing the educational advantages to be derived from fairs, the state has been induced to come in to help the farmer. By comparing the good and the poor qualities of the various exhibits it was thought that all in attendance would receive some benefit, that the standard of quality, or of excellence, throughout the state would thus be raised. This was a broad view of the situation and the only one upon which state aid could justly be sought. State aid to agriculture should always be sought on the basis of benefit to the state as a whole. When a fair association offers premiums on stock or products which are raised by the few and perhaps are not adapted to the local conditions of markets or to the special industry supposed to be encouraged, the fair association is using state funds unjustly. A case in mind is the paying of premiums on such a breed as the Hereford in the dairy class of stock, a breed no better adapted for dairy purposes than the Percheron is as a trotter.

The fair, rightly managed, offers one of the best means of education open to farmers. The eye and the ear are the two organs for conveying impressions to the mind, and the eye is by far the quicker organ to receive and convey impressions. This is why the teacher or the institute speaker tries to illustrate his lectures or talks with charts or models, or better, with the specimens of the products under consideration. What the farmer needs is a keener eye to see what there is at the fair that might be of benefit to him. But like the boy who has always lived amid the beauties of Maine scenery, as found in lake and valley and mountain, his eyes have not been opened to the advantages that lie closest at hand. One of the most interesting lectures on nature study to which I ever listened was summed up in the few words, *Open Your Eyes.* Right here it seems to me is where the state aid to fairs can be made of highest value. It should be used to call attention to and impress the educational features of the fair. If the fairs would employ disinterested experts to judge their various products and then assign to them the duty of explaining why the premium product was better than that which failed, all who would might see what constituted excellence. Not only would the man who felt hurt because he failed to get a premium be let to see where he might do better next time, but every one who wanted to raise a higher grade of market products would also be benefitted. I believe, too, that in case of a limited number of entries of a single product the judge should be allowed his discretion as to whether any exhibit was worthy of a prize.

Premiums based on the work of a full year or a season would encourage improvement in our crops and herds. If the best peck of corn is worthy of a prize, is not the best acre of corn, with a detailed record of the cost of production, accompanied by samples of the product, far more worthy and of far greater general interest and value? The best herd of not less than six thoroughbred or of an equal number of grade dairy cows, based on the points of merit as seen by an examination of individuals, is a matter of considerable interest, but would it not be of far greater value if the premium was given on the basis of production for a full year? I believe this could be made practicable by requiring the presentation of daily milk records or daily milk and monthly butter fat tests, the latter to be made under the supervision of a fair official.

The fairs should encourage the children and stimulate their interest in nature and in farm life, by offering prizes on the best collection of wild flowers, of injurious insects or weeds, or on the best stock or product raised by them. Only as we begin early in the child's life to interest him or her in farm life, and to point out the pleasures and educational advantages there to be found, can we hope to stem the exodus from hill and vale to the cities and towns.

These thoughts as to how the educational features of fairs may be strengthened may seem to you not to be practical, when considered in detail. But be that as it may, the detail of operations is not what I would wish to impress, but rather that education is the true function of the fair and that whenever state aid is received this is the only true basis upon which it can be sought and used.

The encouragement of tests of speed or of circus-like performances at fairs, while all right when these occupy but a subordinate place, is all wrong when they constitute the chief feature of the fair, and the use of state money to encourage such performances should receive the disapproval of every loyal citizen.

AGRICULTURAL FAIRS AND THEIR BENEFITS TO A NEW ENGLAND COMMUNITY.

By Prof. J. W. Sanborn, Gilmanton, N. H.

I picked up a Boston paper this morning and noticed in it an editorial which stated that the Middlesex Fair was closing its accounts and was about to sell its lands. This has been, I am sorry to say, somewhat the drift of events in the history of fairs in New England during the last few years, and something like the old question in a new form has been asked over again. A while ago we were discussing whether life was worth living, and next whether marriage was a failure, and for the last few years the papers have been discussing the appropriateness of the agricultural fairs. The editor brushes the whole question aside and says this marks the passing off from the stage of action of the fair as one of the features in the organized rural life of New England. I am inclined to dissent from this view.

If venerable years and universality of place in which they have been held is evidence of popularity and utility, fairs grow out of an enduring public demand, and they are likely, under some form, to remain a permanent part of the educational, commercial and social forces of organized society. Under various guises their existence parallels organized industrial society. Indeed their very name is of Latin origin, signifyng a holiday or day of rest.

In earlier days they were centers of barter, and of social, religious, and political festivities, or again they took the form of harvest homes. At some of them the annual gathering numbered as high as two hundred thousand people, and they were often attended during the evenings with great social hilarity. Modern development has changed somewhat their character, those known to us today being scarcely a century in age.

The great Royal Agricultural Society of England, though projected in the century previous, was not actually organized until 1839. In 1784 one was organized in South Carolina and one in Philadelphia. In 1791 one was organized in New York and another in 1792 in Massachusetts. No doubt a restless and changing industrial life will, in the future, be reflected in a change in the coming type of fairs.

The social feature of fairs, though varying in method of expression, will remain a permanent one. The gregarious, sport loving and social traits are deeply bedded and constitutional characteristics of man. They will abide with him, and in the future as in the past, there will be a strong tendency to introduce features of fairs that minister to these desires. I perceive no valid reason why the unbroken historic tendency of fairs in this direction should not continue to be recognized. Man is something more than a mere working machine, however splendidly effective that machine may become. After the long strain of seed time and harvest, muscular and mental relaxation and social good cheer are natural demands which, when properly responded to, may add to rather than detract from the value of fairs. These festive features, however, must be kept carefully in hand. The tendency of many of our fairs to increase gate receipts by pandering to the lower instincts of man cannot for a moment be tolerated. Nothing should be permitted that would wound the sensibilities of virtuous, high minded men and women with high Christian sensibilities. Many of our fairs, held in the name of public good, violate not only civil, but moral laws, by admitting gambling devices under many guises, and midways of distinctly low moral tone. What avails it if we increase the powers of man as a working machine, and degrade him as a man? A stable social fabric rests upon morality, and any sacrifice in this direction cannot be counterbalanced by any increased producing power that may be gained by fairs. Society itself is to blame whenever it supports a fair in which occur features that appeal to the baser instincts of its children. Any fair manager, capable of an attack upon the morals of the community through these cursed features of fairs, is capable, when released from the restraints of society, of indulging in the vices that he licenses, and is not a man to be trusted.

As industrial exhibits, fairs are to rural education what museums and laboratories are to schools. Object teaching or eye education, wherever it is possible to give it, is becoming the general and most effective method of imparting instruction. Statements in the abstract, and descriptions of things and qualities appeal, if at all, but imperfectly and slowly to the mind, especially so to these youths. In a moment of time there can be learned of things more by their exhibit and scrutiny than can be learned in many moments by statements touching them. Hence it is at school botany is taught by the plants themselves whenever the laws that govern the evolution of plant life in its varieties, species, etc., are being presented. In mineralogy, specimens of minerals replace verbal descriptions of them. In short, the natural sciences are taught by specimens and laboratory work. Fairs, as museums and laboratories, appeal to the eye of multitudes that could not be reached by books, newspapers and public speakers. The objects on display represent genius as applied to agriculture in its highest form, and inspire to emulation.

Robert Bakewell, the father of the modern art of breeding, who transformed the type of Shorthorns, becoming the parent of similar movements for all the other breeds, is one of the world's great benefactors. He impressed his art and its successes at once on the public mind by placing on exhibit in England from town to town a splendid specimen (in the white ox that travelled) of his high attainments in breeding.

No individual, viewing noble types of animals, can remain unimpressed with what he has seen. Some, it may merely hold from a tendency downward in their farming, while others will move in their methods toward a higher ideal than that which had previously determined their course. Nor are such lessons confined to animal life. Farm plants themselves are the product of the breeder's art, and have their superior types. Mere grossness is not the measure of success in plant growth. It is not a question of size, but of symmetry and quality.

Fairs, then, fill a unique field in the educational system of a people, and in their dual purpose as object lessons and of harvest homes, they render a high service to the public. If our reasoning is correct, fairs are a legitimate object of state support, as are schools of agriculture, state boards of agriculture, horticultural societies, or other methods of teaching the science and art of farming at public expense. State aid to either is rational and defensible. Such aid is not, as supposed, in the interest of farmers as a class, but in the interest of the entire state. Socrates, one of the world's deepest thinkers, spoke of agriculture as the mother and nurse of all the industries. And Gibbon placed this industry first, since the products of nature are the materials of

Sheep belonging to the estate of I. C. Libby, Fairfield.

art. As the primary industry, the character of agriculture not only determines the price of the food of every citizen, but is the measure of all human progress. If by improving the processes of the farmer, production is cheapened, the purchaser or consumer, by the great law of supply and demand, obtains his food cheaper, and is thus as highly benefitted as the farmer. Indeed, the improved processes release the numbers engaged in agriculture, and afford an increased ratio of the population that may be engaged in the arts that minister to our comfort and our pleasure. Hence I hold that there should be in every state one central state fair under state auspices, and possibly a limited number of subordinate and local fairs.

Among the advantages of state support to these schools will be the purification of the morals of fairs. They will not be dependent entirely upon gate receipts to meet the expenses, and will not be under the necessity of pandering to vice. A permanent home means a much stronger fair than a peripatetic one that has no resting place. The stable fair means a complete equipment of buildings, museums, and settled permanent features in their conduct that cannot exist with a moving fair. Such fairs can be made more educational through their accumulation of objects, charts, processes and lands for illustrative trials that are inconsistent with a homeless fair.

FUNCTIONS OF FAIRS.

Primarily fairs are for the exhibit of things. Under this heading I would suggest some desirable changes in them.

Machinery has become the right arm of modern civilization. It multiplies greatly the power of man and substitutes natural and animal forces for human muscle. It will be as impossible in the future to conduct successfully agriculture without a complete equipment in machinery as it would be for a mob armed with bows and arrows to meet an organized army with gatling gun and repeating rifles. Where muscle is pitted against machinery in farming it must be conducted at a fearful loss in the products of the soil and in the mentality of man, for overwrought muscles mean weary minds. A merely muscular industry must occupy a low and mean place in the industries of the people and in the social status of those pursuing it. It were better that New England agriculture be wiped out than to be machineless.

Yet, meaning more to our future than any other single factor, machine exhibits of New England fairs have been less in variety and amount than is owned by the best class of our farmers. In the West, where genius applied to farm machinery is doing its best, not only are all classes of machinery on exhibit, but on exhibit in action. The steam gang plow tracing its swift and parallel furrows is seen, the power ditcher is doing its drainage work, the cotton gin at real business, and all classes of machines are seen in action, and no man visits a fair but catches the spirit of modern mechanism in its relation to cheapened production. Let us make the machinery department, instead of the weakest, the strongest feature of New England fairs. When we do so there will be the inspiration of a new agriculture for this section.

Stock has been the central feature of New England fairs and the study of fair managers, yet there is a relation of this feature to the public that admits of improvement. An early maturity class for steers will teach our youths the supreme importance of producing so-called baby beef. The West has far outstripped us in the art of breeding steers, and I recently noted carloads of baby beef coming into Chicago from the hands of a few experts, that weighed 1,200 pounds each for year-old steers. Such a steer against a four-year-old—the age for equal weight here—involves the saving of maintenance ration for the difference of time required to mature them. Maintenance ration for a 1,000 pound steer is from 16 to 18 pounds. The Fat Stock Shows of the United States and England have shown that the growth runs down from two pounds per day for year-olds, yearly with advancing age to one pound per day for four-year-olds, while the cost per pound of growth increases with size and age. The same is true of swine and sheep. Beef is impossible in New England until the lesson of early maturity is taught, and our fairs will be the quickest way of impressing the lesson upon New England feeders.

The lesson that should be taught by the decision of the judges is lost upon the public. If, upon a platform, the animal under view could be scored for premiums and reason for decision given, the importance of each feature in the modern animal could be clearly brought out, and the lesson impressed upon the onlookers. Judging would then become a school of education to the public. The same may be said of fruits and vegetables.

Things are measured in these departments by grossness or mere size. The overgrown is not the best in quality, and even the exhibit is not representative of its class. It may be the exhibitor's ideal rather than the representative of the class or variety to which it belongs. Everything shown at the fair should be absolutely typical of its variety and for quality and symmetry the best. When this becomes the standard, then fruit exhibits will teach the onlooker rather than mislead him.

PROCESSES.

But I hold that fairs should now become something more than a mere exhibit of things. They should be teachers of processes. I have not the time to elaborate this phase of the subject, but incidentally remark that state fairs should include museums where not only should be permanently placed many things that it is difficult to annually collect in the way of tools, grasses, foliage plants of the several sorts, charts, statistics, analyses, and other things relating to agriculture and having value to its students. It may be possible to illustrate the best way of mixing Bordeaux and other spraying compounds with which many find trouble in securing freedom from clogging. Permanent plots may be laid out illustrative of the methods of testing soils through the growing plants, each receiving the three essential elements of plant food, alone and in their several combinations. Dairy tests and other things that will suggest themselves to the mind may well find illustration at the fairs.

I am inclined to think that a lecture course of two or three days' duration, of a semi-scientific or educational character could be conducted for the several broader departments, the live stock, vegetable, and fruit departments. Time will not admit of the elaboration of this suggestion.

I agree with the Boston editor's remark regarding the demise of the Middlesex fair in so far as to say that fairs should pass away in their old forms, but only to appear again in a distinctly more educational character, and purged of some of the censurable social features.

I think the time will not pass away when man will cease to love nature, whether he be city or country born, nor will pass away the historic tendency to meet in groves or the open air. Open air exhibits and social diversions will abide.

We found museums and art galleries for the exhibit of man's masterpieces in sculpture and painting, yet the inimitable blending of nature's rich colors in fruits and vegetables and the blended and harmonious outlines of domestic animals, touched and idealized by the breeder's art, will so far rise above the best product of the painter's brush or the sculptor's chisel that the exhibits of our fairs will always remain far more inviting than all that wealth and culture can do for museums and art galleries. If we find museums and art galleries essential to pleasure and culture, how much more do we need exhibits of those objects that art at its best but poorly imitates.

IN WHAT WAY SHOULD AN AGRICULTURAL FAIR ENCOURAGE THE BREEDER OF HORSES?

By Dr. C. D. Smead, Logan, N. Y.

(Stenographic Copy.)

We have a few excellent fairs in the state of New York, and it has been my fortune to be connected with a good fair, in an official capacity, as an exhibitor and as a judge; so I have had the opportunity of studying some along the line of fair management and seeing, as it were, both sides of the proposition; and with all that, I know but little yet in regard to this subject. An allusion has been made to the article which I wrote when I came into Maine, in which I compared Maine with New York. When I came into the State I saw that Maine had resources and advantages which I did not see right in my own native state of New York. I saw pastures here, even on what you call your poorer land, your grass land, of which the better parts of New York would feel proud, if they could have the same condition. It has been my fortune, along the line of the study of horse breeding, to visit the country where horses are raised to a greater extent than they have ever been raised in New York or Maine, or any of the eastern states, and I may say to you truthfully this afternoon that I never have seen in that great western country soil so well adapted to the rearing of horses in a state of perfection as I have seen in the past two weeks in the State of Maine. And yet, what do I hear in relation to horse breeding in Maine? As I came to the hotel here in Waterville I saw an advertisement of horses that were raised in that very country of which we were speaking, in the West, advertised to be sold at large figures to the farmer. As I have seen upon the streets of the various villages in which I have been some very good looking horses, I have inquired of the farmer if he bred that team. His reply would be, "Oh, no! Those are western horses." The question comes to my mind, why, with all this advantage of pastures and grasses, do you pay your hard earned dollars to others for what you might have raised yourself? You will have to answer that question yourself; I cannot say why it is being done.

I understand that you have organized a fair here today. I will speak to you a few moments from the side of the little fair knowledge which I have. The agricultural fair, as has already been said, should be educational, along lines of usefulness. It should be of such a character as will enable the farmer to receive educational benefit, practical benefit. It is the duty of the management of the agricultural fair to be broad minded and comprehensive enough to take in the whole situation. I will say to you who are members of this organization that you should see for yourselves what these farms are capable of producing, then come in touch as near as you can with the farmers upon those farms, and make them understand that you are their friends; that you are not a sort of a travelling institution, or an institution to get up an entertainment for them. Go to see them and give them to understand that they must, in unison with you, make the fair a success. For there are two sides to this question. The management cannot make the fair without the aid of the farmer. A fair must represent all of the agricultural products, everything which is raised upon the farm. Make your premium list so extensive that there will be a place for a man to come and exhibit at your fair anything that can be raised on your soils, whether it be potatoes, beans, horses, cattle, sheep, fruits of any kind, or any other product. Then take pains to get in touch with the farmer, and send him that premium list. In my experience in fair management how many times I have tried to induce a farmer to come forward with some of his products and he has said that he hasn't anything to take to the fair. A farmer in Maine or New York, or anywhere else, who makes that assertion is not the man that he ought to be. He is producing something that he desires to put upon the market. What would you think of the manufacturer of a carriage or a machine who would say that he hadn't anything which he dared to show there. You would not buy his goods. The fair is an advertising medium. The farmer who brings his fruit or potatoes to the fair brings them there for those who live in the town, that are not producing them, to see.

The horse part of the fair is the very hardest part, I have found, for the fair management to conduct properly. So it is of importance, as you are organizing your fair, that you have a premium list that is full. Make it not alone for one class. Offer not your premiums alone for speed. That is a mistake that has been made by many an association. They say it is the trot that will bring the people. There is no doubt about that, but it is not the thing that is beneficial. I am not saying a word against speed. There should be premiums for the standard bred horse, which means the trotting horse; arrange a place for him but do not give him all of it. There is something besides the trotting horse to be considered, something besides the standard bred horse. Give him what belongs to him but do not give him the whole. The horse is a beast that is used not alone for speed. It is not of such vast mportance how fast a horse can draw a pneumatic tired sulky around a ring. There are other purposes for which a horse is used. Encourage the man who is engaged in the breeding of the standard bred, offer a prize, if you will, for those that are bred within your Central Maine or your State of Maine; give that man a chance to compare his horse with those of other men, for it is by the comparison of one man's product with another's that information is gained. But we need more than this. Here is the carriage horse, and the hackney horse which is a specialty of the carriage horse. Make a class for the carriage or the hackney horse. Make a class for the coach horse of a pure breed. That takes in the French coach horse and the German coach horse. Even if there is but one German coach horse in the State of Maine, make a class for him and induce the owner to come with that horse. Then the people who come to the fair can see what a German coach horse is. Then, again, there is the draft horse. We have different breeds of draft horses; we have the Percheron and we have the Norman, but these are so nearly alike that it is not necessary to make two classifications. Then we have the Clyde and the Shire, between those it is not necessary to make a distinction unless there is a large number. For the present make a classification for the Shire and the Clyde, and for the Percheron and the Norman. Then if there is a Belgian horse that comes nto the country, offer a special prize for him. Make a class for the farmer's horse, and offer a good premium for the farmer that will produce the best farm team, or the best single carriage horse. Offer a premium for coach horses that are purely bred and for a coach team independent of the breeding. Make your premium list large enough. The most successful fairs that I have ever known are those that have the largest premium lists. Too many fair managers say that they cannot afford it. I am here to say that you can afford it. No fair ever went to the wall that had a good, extended premium list for useful articles. Make it general.

Now we come to the judging. An expert judge has been spoken of. In the horse class it is harder work to find an expert judge than you may think. Too many fair managers think that if they find an expert horseman he is all right to judge horses. A man may be an expert horseman and know practically nothing about the fine qualities of the horse. He can handle a horse that is a little untractable, and has been a success in breeding up a horse for the market. and yet as a judge he is sadly lacking. Again, he may be a judge of the standard bred or trotting horse, and have but little knowledge of the horse for carriage or coach purposes, and vice versa. The same is true in the line of the draft horse. A man who may be an admirer of that class, and skilled in the fine points of the draft animal, does not know anything really about the points of a standard bred horse. So it is essential, as has already been indicated, to have a competent man for every class. If Farmer A brings something to the fair and competes with B and C and is defeated, it is his right, it is his privilege, it is his duty to ask of that judge wherein he is deficient, and it is the duty of that judge to be skilled enough so that he can answer the question intelligibly. Then he will know the reason for his failure.

In regard to the question of entertainment, give the horse trot if you will, enough so that people who love the sport can come and see it, but in preference to that encourage the farmer who is breeding the horse of ability and build up that industry; encourage him to come to the fair with his breeding stock and whatever he may raise upon his farm, and your fair will be a success, and your farmers in the future, in my humble opinion, will have their farms dotted with horses and colts, and their money will not be going out to a country that is not as well adapted to growing horses as this.

THE PURPOSE OF THE FAIR.

By Dr. G. M. Twitchell, Augusta.

(Stenographic Copy.)

Our agricultural fairs were created for two specific purposes, under the law, to promote agriculture and advance mechanics. I take it, Mr. Commissioner and ladies and gentlemen, that we are doing our duty by the State only when we seek to conform to the requirements of the statutes by and through which our agricultural societies have been chartered by the State. I believe that we have been kept away too much from those cardinal principles. It has been altogether too easy for us to introduce the attractions, to bring in the amusements, and in what I say I am classing myself with everybody else. We have been too well satisfied with the cheap entertainment that has been put upon the platform and have not magnified the importance of promoting agriculture and advancing mechanics. I think no better subject could have been brought to the attention of the people of the State of Maine than this subject which is engaging our attention today, because we are seeing all over the State, in all the departments of work, a very marked increase in agricultural sentiment. I was very glad when Prof. Hurd told me that he had 19 boys under his direction at the State University, more than at any time during the life of the institution. I wish it was 919 for the good of the State, because you and I must feel that if we are to make progress in the future, in our offices and upon our farms, we must see more, we must know more, and then we can do more. It seems to me that the fairs do a small part of that which they were primarily intended to do. They should help the people to see more, to do more, reaching the brain through the eye, stimulating thought, kindling ambition, provoking enthusiasm through competition, yes, and through education, and competition is the prime essential in promoting

Percheron Stallion Victor, 24,128. Five years old, weight 1,700 lbs.; sire and dam both imported.
Owned by Rex O. Church, Augusta, Me.

education in this world. We want more object lesson work at our fairs. I was very glad to hear the work in judging emphasized. I believe in a single expert judge. Some of you know that I also believe in the use of the score card. I believe in it for this reason, if for no other: I believe that the man who exhibits, whether he wins or loses, is entitled to all the information possible, to carry home with him, and so I believe in a record made by the judge. Every judge should be required to remain upon the fair grounds at least one-half day after his work is done, in order that he may meet exhibitors, talk with them, and give them his reasons for the awards, and so help to this sharper insight into the things which are all about us and which control us largely in the work we have to do. Because, whether we are growing fruit or keeping dairy cows we do not realize that we are touching mystery all the while. And when we have compassed all that is possible there is so much that we cannot fathom, that we want continually to be seeking to see a little more, to know a little more. Therefore the exhibition which seeks for its sole purpose the stimulating of the eye to a larger insight is the exhibition that is going to help most in the future. We want to put our money into exhibits and not into the cheap vaudeville. Too many of us are content with an entertainment given because it helps take up the hours, whereas the object should be to make the whole time educative in the line of exhibits, allowing the judging to be done where the public can see the most of it, where the exhibitors can ask questions and the man making the awards shall answer them, for if a man is not ready to publicly give a reason he is not fit to stand in the place of judge. These things come back to the people who make the exhibts. I think the crticism we would make today upon some of our exhibitions would really be charged back to the men who make the exhibits, because they have not demanded of the societies that they come up to these standards. The work which would do the most good the exhibitors have not demanded. We have been content to take our stock to the fairs, and take what we could get, whereas we ought to demand our individual rights and insist upon the reasons from the judge for making his awards.

There comes to my mind an object lesson which I saw upon the fair grounds at Woodstock, N. B. In the dairy test there were a large number of cows entered, and during the evening after the lecture the lights were turned on and there was a great crowd and considerable disturbance from the presence of the crowd. One of the cows that had tested 4.7 in the morning and 4.9 at night, the next morning tested 1.9, and of course there was a question as to the accuracy of the test and a second test was made with the same result. The expert then called the exhibitors together and used this as an object lesson and emphasized the necessity of appreciating what is involved in milk production and the necessity of keeping the cow under a uniform condition; showing that the nervous condition resulting from the glare of the electric light and the noise and disturbance had affected the per cent of butter fat in the milk. This only serves as a little illustration of the thought.

If these fairs are to be continued in the future, wherever they may be held, they must serve the purpose for which they were created under the law of the State. They must stimulate competition; they must help to a better education; they should serve the people by bringing the stock and products where the public can see the work of awarding the prizes, and every step be made helpful, so that the man who grows the product or shows the stock may go home seeing more of the great lessons which confront us all along the highway of life and which we must be solving in larger measure than we have in the past.

HOW TO RAISE FRUITS AND EXHIBIT THEM AT THE FAIR.

By John W. Clark, North Hadley, Mass.

(Stenographic Copy.)

You have been told what an agricultural fair should be and how it should be organized, and it remains for me to tell you how to take home the blue ribbon. No agricultural fair can be held today in which the fruits of the garden and orchard do not have a place and that place is much greater than it was a few years ago. A few years ago our fruits were considered luxuries, now they are necessities.

To produce fruits suitable to exhibit at the fairs means a great deal. Take the strawberry, for instance. The aim of the exhibitor is to produce the largest, best colored and best shaped berry that can be grown. All strawberries cannot be classed together because they vary so much; each variety must have a class by itself. The one strawberry that is exhibited at present more than any other is the Marshall. It is the best exhibition strawberry we have, because it is very large, of fine color and good shape. How shall we produce that large, fine colored strawberry? It cannot be done in one year. It is necessary to know the nature of the growth of the plant and how it must be treated. In order to produce a berry of the largest size, the work must be begun the year before the fruit is exhibited. A strawberry plant, in order to produce good sized fruit must be strong and vigorous, and in order to grow a plant of this kind you must give it plenty of food of the right kind and also room to grow. Good berries cannot be grown where the plants are much less than 3 or 4 inches apart. As they are usually grown the plants are matted together so that they are almost like hair. A strong plant, with a good crown, that will send up strong flower stalks cannot be produced in this way. It must be given plenty of room. Then the strawberry during its period of ripening needs a great deal of moisture and that moisture should not be above ground. The foliage of the strawberry should not be kept wet but in the ground there should be plenty of moisture. The reason why in our strawberry patches the berries are large to begin with but after they have been picked once or twice they begin to grow small is this. There may be food enough in the soil, but it becomes dry and there is not moisture enough to force these later berries to a large size. I know of some strawberry growers that have placed gas pipes all through the ground of their strawberry beds about a foot below the surface, with small holes bored every foot or so in the pipes, and have attached the city water, thus irrigating their strawberries from below. If you cannot do this it is a good way to make trenches between the rows and let the water run in these trenches. These should be perhaps 8 or 10 feet apart. If the foliage is wet and it is damp weather the strawberry will rot, but if you can give them plenty of water from underneath, and sufficient food while the fruit is ripening, there is almost no limit to the size and quality of berries you can produce. For example, a friend of mine who is probably the best strawberry grower in Massachusetts received an order from one of Boston's select clubs for a crate of choice strawberries. He had ten acres and he went over the whole piece to get the crate. I will not be positive as to this statement, but I think the average number of berries per quart for that whole crate was 12. That is somewhat different from 40 or 50 berries to the quart. This was done by extra care, and by giving the plants what they wanted. The strawberry needs nitrogenous food, also potash and phosphoric acid.

Now let us take the apple, which is our principal fruit. I was at the Pomological meeting at Auburn the other day, and looked the apples over, and was curious to know how the prizes would be awarded to the three best plates of Baldwins. In two of them the apples were quite large, those on the third plate were of medium size. The large apples were not uniform in size and they were not as well colored as the medium sized ones, but they were a little above the regular size of the Baldwin. As has been said here today, each fruit has its type. The exhibitors did not seem to know what the type of the Baldwin was. It is not the monster that we want to show at our exhibits, but the most perfect specimen of that particular fruit. The Baldwin is not as large as the King, and when we exhibit a Baldwin as large as the King we exhibit something that is overgrown. In the plate which was well colored the apples were all of about the same style and size, the stem of one looked just about the same as the stem of the next. In the other two plates the apples varied. Some had short and some long stems, some were fairly well colored, others were not. The premium was given to the plate of medium sized apples, because that was the nearest to the type of the Baldwin. Some people when they take their fruit from home think they have very fine fruit, but when they get to the fair their fruit does not look half as well as it did before they compared it with that of their neighbors. The trouble is simply that they did not know what the true type of that particular fruit was. The fair is to show us what that type is, and it also should teach us that we should try to produce fruit as near that particular type as we can. The fair teaches both the consumer and the producer. If the consumer sees fine fruit at the fair he will wonder why he cannot get something like that in the markets and will call for it. The old-styled way of growing fruit is past. We cannot put upon the market fruit that used to be placed there a few years ago, and get a paying price for it. The sale of mixed lots of fruit, poor and good, is past. To get the most out of fruit we must send that which would be fit to exhibit at our fairs because the market calls for it. A great deal of fruit sold is of poor color; to get a good apple it must be perfect in color. If it is a red apple, it should be red, not two-thirds green or yellow. If it is a green apple, like the Greening, it should be greenish in color, with a red cheek. It should not be a sickly green. We cannot produce a high colored apple if it is too much in the shade, and where two apples meet those apples will not be well colored. To grow an apple fit to exhibit we must see to it that it has light and sunshine, and then we must see that the foliage of the tree is healthful. Then we must know how to prevent disease and insects from affecting the fruit and the plants. In the case of the apple, you cannot take a wormy apple to a fair and win a premium; you cannot take a decayed apple to a fair and win a premium, if the judge does his work well. You must know how to prevent the worm from getting into your fruit, and how to prevent the disease from striking it. Then it must be put in perfect shape for exhibition. One thing was noticeable at the exhibit at Auburn, a great many of the apples had no stems. That is a small matter, perhaps, but if you exhibit fruit where it is judged as it should be, no matter how good the fruit is otherwise, if the stem is not there it will be thrown one side, it will not take a premium. In

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exhibiting fruit you must know not only the nature of each fruit, but how each particular fruit should be placed on the tables.

At the exhibit of the Massachusetts Pomological Society I heard one man say to another, "It is the aim of my life to beat you in growing such and such a fruit, and if I live I will do it." He was working his very best to take the blue ribbon from his neighbor. So the fair induces friendly rivalry between those who want to produce the best, and in this way they learn a great deal.

I want to say one thing in regard to arranging your premium list. The time has gone by when premiums should be offered for a collection of the greatest number of varieties of apples. People used to think that in setting out a dozen trees they must have about a dozen varieties, but that day has gone. When you offer premiums for the greatest number of varieties you are doing an injury to the apple industry. Each section of your State has certain varieties that will do well there and are profitable. The market calls for certain varieties and not for others. Those standard varieties which will do well in that section which the fair covers, and which the market calls for, should be put into your premium list, and you should not offer premiums for the greatest number of varieties that can be grown in that section.

Again, I think there is a mistake in simply offering premiums for the best plate, or two or three plates, of the varieties that are most profitable in the market. A man may have one single tree, planted in just the right place and given careful attention, that may not have more than a dozen apples on it but every one of those apples will be nearly perfect. He takes these to the fair and carries off the blue ribbon, while the man who has a large orchard and grows a great deal of fruit is cut out. Offer a premium for the best plate of these varieties to give the man who has but the one tree a chance, but in addition offer a premium for the best collection of one or two prominent varieties, such as the Baldwin and Northern Spy. This will give the man who makes fruit growing a business a chance to show what he can do, by bringing a large amount of fine fruit.

REPORT OF PROCEEDINGS

OF THE

STATE DAIRY CONFERENCE

HELD AT

Dover, December 1, 2 and 3, 1903.

The State Dairy Conference, under the control of the Maine Dairymen's Association and Department of Agriculture, held at Dover on Tuesday, Wednesday and Thursday, Dec. 1, 2, and 3, was one of the largest and most successful meetings of this nature held in recent years. On Tuesday evening from 8 till 9 o'clock a reception was given to the dairymen by the citizens of Dover and Foxcroft. Addresses of welcome were delivered by Hon. J. B. Peaks of Dover and Hon. W. E. Parsons of Foxcroft, which were responded to by Prof. G. M. Gowell of Orono, and F. S. Adams of Bowdoinham. Music was furnished by the local band. At 9 o'clock a banquet was served by the Association at which the dairymen and their wives, also a large number of the citizens of Dover and Foxcroft, were present. Toasts pertaining to many of the educational and agricultural institutions and prominent industries of the State were responded to by representative men in these lines, whose eloquence, wit and humor were highly appreciated by all present. This social feature of the meeting was so much enjoyed that we believe the banquet will have a regular place upon the program of the annual meeting of the Maine Dairymen's Association.

At the sessions of Wednesday and Thursday addresses of much interest and value were given, many of which appear in the following pages. A good exhibit of dairy products and dairy machinery was made, the quality of the products comparing favorably with that of former years. The following are the officers of the association for the year 1904: President, F. S. Adams, Bowdoinham; vice president, C. L. Jones, Corinna; secretary, L. W. Dyer, Woodfords; treasurer, R. Alden, Winthrop; member of Experiment Station Council, R. Alden.

ADDRESS OF WELCOME.

By Dr. C. C. Hall, Dover.

Gentlemen of the Maine Dairymen's Association and Department of Agriculture: It gives me a sense of personal pleasure to be able to stand here this morning, in response to an invitation to act as the spokesman of the people of these twin towns of Dover and Foxcroft, and in their behalf to extend to you a cordial welcome. We are not all of your profession; it would not be wise for all of us to join in the same business, for then there would be no market nor would there be competition to stimulate enterprise. It is necessary and wise that our ills should be treated, that we should be warned as to the causes of disease, that the laws should be construed to us, that the many and various manufactures should be encouraged, and that our multitude of wants should be abundantly supplied. It is necessary that we should build railroads to carry us and our products; it is necessary to have a merchant marine and it is necessary to have an army and a navy. But these things could not exist without agriculture and dairying. On the other hand, agriculture and dairying might exist and flourish on a limited scale without any of these things. Whoever knew a great country without an agriculture of its own? In time of peace a manufacturing or a mining country can flourish, but it cannot stand a blockade. Its accumulated food would soon be exhausted, and its people, however proud, must fall. Our own Alaska, abundantly supplied as it is with mineral, with coal, with timber and with water power, would rapidly develop into a rich and flourishing new municipality did it possess the resources of agriculture and dairying. We have in our community many first class farmers and dairymen, whose products are among the best. We welcome you among us, hoping that we may benefit you and that you may benefit us by showing us your improved methods and products, and your improved machinery, and thus teaching us how to produce on a better and broader scale. Dairymen are furnishing us at the present time with very palatable products; but there is one thing to which I wish to call your attention, not in the spirit of criticism but simply as a suggestion to the Maine

Dairymen's Association, and that is the matter of sterilization or cooking of milk products. This subject has been discussed in medical and sanitary journals to a considerable extent. Many physicians believe that tuberculosis and other diseases may be transmitted from the cow to the human being through the medium of milk. Now if this is true it would seem to me that the time had arrived when we should devise some means whereby this danger may be avoided. Many dairymen raise their milk and cream to a high temperature. I know many good dairywomen who boil their milk before making cheese, and to my taste the cheese is much improved thereby. They claim that they meet with a readier sale and get a higher price for it on account of the procedure. Creameries raise their milk to a temperature of 160 degrees F. before separation, presumably to keep it from souring. This leads me to the question, Why would it not be well to raise these temperatures to the boiling point, the temperature required to destroy disease germs? Why would it not be well as a practice to sterilize milk and cream before manufacturing into butter? If you will consider, you will see that this item of dairy products is about the only item of food which we can take from the animal kingdom that we consume in a raw state. It seems to me that it would be just as well to have this come to us in a cooked state. I see no reason why it should injure the palatability of the product.

I hope the Association will pardon me for devoting this time to the consideration of that subject. I thought it might be well to discuss the matter, and if found practicable to invite the inventors of dairy machinery to devise some means by which milk products can be quickly and economically sterilized.

Again, I extend to you a cordial welcome. May your stay with us prove pleasant and profitable.

RESPONSE.

By R. ALDEN, President Maine Dairymen's Association.

It is very gratifying to us as members of the Maine Dairymen's Association to receive this generous and cordial welcome which you have extended to us ever since our arrival in your beautiful village. The reception you gave us last evening was a high tribute to the dairymen of Maine and should have a tendency to elevate the dairy interests of our State. May you all feel assured that we fully realize and appreciate the great amount of work that has been done by the people of your town and county to make this meeting a grand success. At the close of the year, when the crops are all harvested and the stock comfortably housed in our warm stables, what can be more beneficial to us than to meet together and listen to the best thoughts that research and investigation have developed in our business? Are we taking advantage of what is being done by the experiment stations all over our broad land and by the deepest thinking minds to aid and instruct us in our dairy industry?

My mind is carried back to six years ago, when our Association was first organized, and I can but feel gratified and proud of the growth and progress we have made. It has been accomplished by the united efforts of our dairymen, and today we have one of the best associations in this country.

It gives me great pleasure as chairman of your committee chosen at our last annual meeting to formulate a bill asking the legislature for a dairy instructor, to report to you that we were entirely successful in carrying out the wishes of the members of our Association. The bill was presented and given a unanimous passage, appropriating $3,000 per year. Commissioner Gilman judiciously appointed S. C. Thompson of Winterport to fill the position of dairy instructor, and he has done some very valuable work along the lines of improvement of our dairy interests, especially by getting the creamery men organized and united in working together to improve our dairy products. We regret that Mr. Thompson is unable to be present at this meeting, but we are pleased to know that he is at one of our leading dairy schools fitting himself for the position he has accepted.

Dairying is the key note to the future prosperity and development of the State of Maine. Do we fully realize the importance and magnitude of the dairy industry to the State of Maine? Are we aware that the most careful estimates of our dairy products this year will reach the grand total of $12,000,000? I am no prophet, but I predict that we are on the eve of great agricultural prosperity. Already the tide of emigration is turning from the Middle and Western States to the State of Maine. Our cheap farms are attracting men here and hundreds of our farms have been sold, and within the next year hundreds more will be sold if our dairy and fruit interests are represented at St. Louis as they ought to be. Our forests are rapidly disappearing and being ground into pulp wood. Let the dairyman and the cow follow the axe and develop our great northern borders.

Education should be the watchword of the day. While our neighbors just over the line in New Brunswick are making the finest butter in the world let Maine take no back seat, and let us not be satisfied until we have reached the score of 100 points. We can accomplish this and we will if the dairymen of Maine will continue to work together to improve the quality of our butter.

PRODUCING AND HANDLING MILK FOR THE RETAIL TRADE.

By GEO. H. ELLIS, Boston, Mass.

As I expect to be more or less personal in this matter, leaving you to draw general conclusions, I shall to a considerable extent tell the story of our own producing and handling of milk for the consumer. The first point that we undertook to cover was what it seemed to me should be covered so far as possible in all handling of milk for use as milk. I do not agree with our friend, Dr. Hall, that milk should be sterilized. I believe that the nearer milk can be kept to its natural condition the better. If it is to be treated at all, I would do nothing more than pasteurize it. Whatever may be said of the desirability of sterilized milk, for myself, and I am a large milk drinker, I do not want cooked milk. I want my milk just as near the condition it came from the cow as possible, provided the cow is healthy and clean, and the man who drew the milk the same. We now are producing and selling daily to retail customers, nearly all within the city of Newton, between 1,900 and 2,000 quarts of milk and 45 quarts of cream running from 40 to 45 per cent butter-fat. That trade has been built up simply because other people wanted just what I want,—good, pure, clean milk, as nearly fresh from the cow as it is possible to get it. I realize that any talk along this line does not directly apply to you here, as it is impossible to handle milk at a distance from the cities in just the way that we handle it, and yet I believe that our system can be approached. It goes without saying that this could not be done at the present prices of milk. The producer is today, I believe, furnishing as good milk as he is paid for, and the only way that we can better the production is to ask the consumer to pay a good, fair price for a good article.

First, with us, is the cow. We are situated in an old Jersey town. The people of Newton are interested to a large extent in Jersey cattle. They have become accustomed to very rich milk, and in catering to that taste we are keeping a herd of Jersey and grade Jersey cattle, the average test of the milk being just a little over 5 per cent. For that milk we received, until a year ago, 8 cents a quart, while all other milk in that city was sold at 6 and 7 cents. When the cost of feed went up, the retailers in Newton agreed that they could not supply milk at the old prices, and all agreed to go up one cent; so that since a year ago the first of November we have been receiving nine cents a quart for this milk, delivered in glass jars, and almost immediately from the milking. The secret of keeping milk wholesome, keeping it sweet, as I see it, is the instantaneous cooling. First have good, clean, pure milk, then cool it just as soon as it is drawn from the cow, bringing it down to as near 40 degrees as possible. Then if the milk is fairly well handled, there will be no souring. Of course this cooling will not affect the germ of tuberculosis, or any other disease germs, except as the cold may hold them in subjection for a time.

I think I will say a word on the matter of tuberculosis and the tuberculin test at this time. I found that I had tuberculosis in my herd, and I was among the earliest of those who tested with tuberculin. With our first test we took out 25 per cent of the cattle. We made subsequent tests at times, varying from six months to a year, until with the last test we took out only 2½ per cent, and of that 2½ per cent only one did the inspector of beef object to passing for beef. That is to say, the tuberculosis in all the other animals was so light, that while it might have progressed and injured those cattle later, none of us would object to using the meat at that time. To my mind that is the way to take care of tuberculosis.

One of the things to which we first turned our attention was the question of barns. I do not at all believe in the old-fashioned barn. So far as we have found it possible to do so we have built our cattle barn entirely independent from our hay barn. We built with the monitor roof, giving us an abundance of sunlight and ventilation, which are important factors, I think, in doing away with tuberculosis. I am firmly convinced, in these days when we are running sanitariums for the cure of tuberculosis in the individual simply by the fresh air treatment, that the same treatment is just as good for the cow as for the man, and what we want is fewer close stables and better air. The stables need not necessarily be cold, but they should be well ventilated. In our own case, the temperature sometimes goes so low that the water freezes in our barns, but that does not trouble us half as much as to have them close and bad smelling in the morning. We want the pure air, anyway, and we undertake to get it.

One of our barns, which I think on the whole is the most satisfactory and the plan of which I think I should follow if I were to build again, contains pens seven feet by nine. No cow is tied up; they are all in pens. The pen has no floor, but is on gravel, on the top of which we put four or six inches of sand and on the top of that planing-mill shavings. The sand is removed as often as need be, sometimes once a month, sometimes not as often. The pens are cleaned out every day and fresh shavings put on. The cows are loose all the time, and while it is not easily susceptible of proof, I believe that our cows are a great deal better off for that treatment. The cows are in the barn the most of the time the year around. In the summer they are only let out for two or three hours a day in any sort of pleasant weather, and they get exercise in the pens, which I think is better for them.

We have a manger that turns up to the floor when the cows are not feeding from it, so that no filth can get into it. It is hinged, and when the cows are through feeding it is turned up, and by loosening a hook it drops back.

Our men at the home farm milk fifteen cows each per day. The milk as soon as drawn is carried to a tank where it is strained, and flowing through a tube into the milk room passes over a Star cooler, through which is pumped brine from a refrigerating plant at a temperature of from ten to twenty degrees. This cools the milk to about 36 degrees. By the time it is in the bottle and the stopper is placed in the bottle, it will be just about 40 degrees. That milk, so treated, will keep almost indefinitely. The only complaint we have had during the past two years on the question of souring was from some of our customers who said they did not know how they could sour the milk. Of course we have one advantage that cannot come to the ordinary farmer. We are situated almost in the middle of the city. The center of Newton is said to be on its circumference; *i. e.,* there are thirteen villages served by stations on the circuit railroad. We serve seven of these different villages, all within the same municipality, and in no case does the team go more than 3½ miles from our barns. Our morning's milk is nearly all delivered before 11 o'clock, and our afternoon's milk nearly all before 7 o'clock. Of course we carry forward some milk from morning to afternoon, and some from afternoon to the next morning, but it is a very small proportion. There we have the ideal conditions. And yet these can always be more or less approached, because, as I have said, if the cows are kept clean and the milk is treated in this way it will keep almost indefinitely, and if it were not furnished to the consumer until the next day there would be no question whatever as to its condition. I want to say again that one of the principal secrets is instantaneous cooling, because a few years ago I did not myself believe that this would accomplish what it does, and I understand that many others cannot believe that the instantaneous removal of animal heat will have such a decided effect on the milk.

We could not get the price of nine cents per quart if we were not situated as we are, with our barns always open to inspection; but the very situation carries with it heavy expenses. The home farm is but 25 acres, and considerable of that is taken up by woodland in which our cattle have the run for exercise. We keep at that farm 150 cows or more, and no hay is grown anywhere in the vicinity. We buy all our hay for that farm, and as you will readily understand we do not always get the best hay. We buy wholly clover or clover mixed. We do raise, or undertake to raise, ensilage, but that is raised on leased land, none of which is nearer than about three miles to the farm, and some of it is seven miles distant. So you see our problem is an entirely different one from that of the ordinary farmer. Not only do we get a higher price for our milk, but we have a much heavier cost in producing it. We have built silos in our corn-fields, on these leased lands, and the corn is put directly into those silos in the field. minimizing the cost of filling the silo. Then when we close up for the winter, we begin at once to draw the manure from the farm to those lands and bring back the ensilage. A four-horse load of manure is taken to the field, the wagon emptied, swept clean, and then loaded with ensilage. Loading both ways enables us to handle the ensilage from a distance without the expense that would be otherwise entailed. For the last two years we have not got good returns from our ensilage. This year it gave us not more than one-third of a reasonable return, and last year not more than 50 per cent. As we had 230 acres in corn, this is a material item with us, and you can readily see the reason why we must get an increased price for our milk, unless we were making a large profit at the old price, which we were not doing.

The question of where to get cows was a very live one with us. We think we have solved it by taking on outlying lands in the town of Barre, Mass., about 65 miles from Boston, a very fine grazing country, with heavy clay soil, and there keeping a part of our cows and raising our young stock. We have also an intermediate farm at Kendal Green in Weston, of 150 acres.

In the production of our milk our process is this: we keep at the Barre farm all our dry cows and young stock. As fast as the cows come fresh, a car-load at a time, we ship them to the West Newton farm. In the winter we use the Arms Palace car, with good ventilation, so that there is no injury to the cows. This costs us 25 cents a head more than the ordinary stock-car, which is perfectly satisfactory in warm weather. When the car-load of cows reaches the West Newton farm, the 20 or 22 cows giving the least milk are moved to the Kendal Green farm, and the same number of cows giving the least there are shipped to Barre that night. So there is a process of revolution with all our cows, and the milch cows are at all of those farms at some time during the year. This is far from being the ideal way, as I think all cows should be kept in their own stanchions; then if there is any disease it can be controlled better. But we simply cannot do this. At Barre we separate the milk and ship the cream, which is pasteurized but not sterilized, to West Newton, via Waltham, having the skim-milk for our calves, of which we raise, at the present time, in the neighborhood of 80 or more a year. We had at the Barre farm last year 160 heifers over four months of age, but not yet with their first calf. We raised those by the use of the skim-milk and, to a considerable extent, linseed meal. I am not able to give the exact figures of the cost of raising them, but I have approximate figures, and the cost to us of raising those heifers to the age of 31 months, which was just the average age that all our heifers came in in 1901, was inside of $40.

We have tried to make comparisons as to the cost of raising and the cost of buying good cows. I suppose you know as well as I can tell you that the cows we buy in Brighton are not always the best cows, but we buy with as good judgment as we possibly can. To institute a basis of comparison, I took the cows that we bought in Sepember, 1901. In two successive weeks we bought 22 cows, Jersey grades of as good quality as we could buy, and promising cows. They were presumably fresh in August. Thirty-four of our own heifer calves came fresh in that year, and they averaged to be fresh in the same month, August. We weigh the milk from all our cows, and know just exactly what every cow gives from the time she comes in until she goes to the butcher. Of these 22 cows, inside of four months we found that four would not pay us to keep, and we sold them. That brought the cost of the remaining 18 up to sixty-one dollars and some odd cents for each cow. As I have said, our heifers cost us less than $40 to raise. Of those heifers that came fresh in 1901 we have today 32. We killed two as not worth keeping, and it is a question whether it would not be better to kill two more. This would cull the 34 down to 30. The 22 cows which we bought we have culled down to 12, for various reasons. For the year 1902 those 32 heifers, averaging to have come fresh in August, 1901, gave us an average of just a fraction over 6,000 pounds of milk each. That was with the first and second calves, because most of them came fresh again during the year 1902. This includes all those that went wrong in any way. We had some cases of abortion, which reduced the average. The cows averaged 5,691 pounds during the year 1902. They are past their prime, presumably at least, and the heifers are coming to theirs. The heifers without culling gave 139 pounds of milk more than the cows that had been culled, in the year 1902. That is pretty good proof that we cannot afford to buy our cows, we must raise them. I do not mean to intimate that everybody in Massachusetts is going to raise his own cows, and you cannot sell Maine cows there. But if on a leased farm, for which we pay a pretty fair price, we can raise heifers as good as those for $40 each, it will not pay us to buy our cows. The ordinary milkman about Boston will pay for any cow that will be guaranteed to do for him what those did for us at least fifty per cent. more than it would cost to raise his cows.

The essential points in the production and handling of milk are these, as I have stated: Good cows, good care, clean handling of the milk, and instantaneous cooling.

QUES. What breed are the heifers that you raise?

ANS. They are from either registered Jersey cows or grade Jersey cows by registered Jersey bulls. Several of these to which I have referred were by our bull, Sir Michael Stoke Pogis. He was by Stoke Pogis 5th, out of Angela Grand, large milking strains. We are looking for large production as well as for rich milk.

QUES. Will you tell us about your system of feeding?

ANS. When we have good ensilage we feel that there is nothing equal to it for a part of the feed. We usually feed 40 pounds a day. We have fed even more than that, but never more than 45 pounds. We are furnishing this milk to a pretty critical trade, and we never have complaints because of our ensilage. I do not think any one will have any trouble with the proper feeding of good ensilage. When the corn is well matured, in the glazing stage, and goes into the silo well eared, we get a product that I believe, if it does anything, improves the flavor of the milk. We use the largest corn that will mature in our vicinity, which is the Leaming, and we cut it all fine and carry it into the silo, ears and all. With good ensilage we never feed corn-meal. Our present grain ration, which is giving pretty good satisfaction, is a mixture of 1200 pounds of bran, 550 pounds of middlings, 800 pounds of corn-meal, and 600 pounds of cottonseed. This mixture will weigh almost exactly one pound to the quart, and the cost at the prices we are now paying is $1.177 per hundred. The corn-meal is to take the place of the corn in the silage, as there were no ears on the corn this year. We have a car-load of gluten on the way, and as soon as that comes the ration will be changed, but the proportions will be kept about the same. We find that clover hay, the lowest priced hay on the market, is by all odds the best hay that we can feed, except alfalfa. I have made five experiments with alfalfa on our own land, but have failed every time, and I do not know of any one who has succeeded in raising it except Mr. Geo. Mixer in the town of Hardwick, Mass. He put in some alfalfa a year ago last summer which this year has produced well. How it will stand the second winter no one can tell. The winters are rather severe, we have a clay subsoil, and the ground freezes and heaves a good deal. I do not believe we can raise alfalfa to any extent. Two years ago we made some experiments with feeding alfalfa, which we bought, as against clover hay. Of course we did not get the best hay, not as good as we are raising. The best conclusion we could reach, and I think we were fully justified, was that the alfalfa hay was worth one-third more than the clover hay, which was good average clover.

Ques. Would you decrease your grain ration as the cow dries up?

Ans. Our ration is varied somewhat in proportion to the amount of milk the cows give. At the home farm, where all our fresh cows are, we feed from 8 to 12 pounds a day of the mixture which I have mentioned, 8 to those that do not readily respond, and 10 or 12 to those that do. The feeder is all the time watching the results, and it is his business to see that if a cow is going back on her feed in any way a less amount is given.

Ques. What kind of gluten do you feed?

Ans. The car-load coming was sold to us as the Chicago gluten, I suppose what you would call Chicago gluten meal.

Ques. Do you feed grain from the close of the milking period until the cow is fresh again?

Ans. We have not heretofore, but with our poor ensilage we are intending to feed a very small ration of grain this winter. With good hay, and we have that at Barre, as that is a fine hay country, we do not think the cows will need very much grain. They will shrink somewhat in flesh after leaving the home farm before they come around fresh; and just whether we are wise in not continuing the grain ration under any circumstances I have not fully determined, but with good ensilage I should not do it.

Ques. Do you feed your heifers heavy rations?

Ans. Yes, if they respond with the milk. We feed them almost as heavily as we do the cows. We would give the cows more if they would respond to it.

Ques. Do you give them anything to stimulate their appetites?

ANS. Nothing, except that in the fall every year we have turnips, and I think they are sort of a tonic. Theoretically, of course, they are of but little value, but we found a material drop in the amount of milk when we got through feeding them in the fall. It is entirely possible that with tonics we could increase the product, but we do not care to try it.

QUES. I would like to ask how you salt your cattle.

ANS. They are given a little salt every day, just how much it would weigh I do not know. If they eat it readily the man is likely to give them a little more. He judges somewhat by the taste of the cow.

QUES. How do you water them?

ANS. In our barns at home there is water before the cattle all the time.

SCORE CARD AND COMPARISON JUDGING, IN SHOW RINGS.

By G. M. GOWELL, Professor of Animal Industry, University of Maine.

I am well aware of the difficulties I have to contend with in the discussion of this subject. I do not presume to know all that is to be known in connection with the score card, but if I can say some things that shall right some of the misunderstandings I shall be very much pleased. I expect criticism, I ask only for fair criticism.

When the first cattle shows were held in New England and in Maine some 30, 40 or 50 years ago, you know what the system of judging was. The first consideration was size. Prizes were offered at our old fashioned cattle shows for the largest steers, oxen and cows. Cows were judged then because of their size and their fitness to become the mothers of beef steers, and it was not the eye alone that enabled the judge to decide between them, but it was the girting chain. We remember when every farmer or breeder carried in his pocket a girting chain so that he might take the measurement of the animals he came in contact with and decide which were the better. That was taken as the standard. And following the girting chain came into use the scales. The chain was regarded as unreliable, but the scales were a sure test. You know how the old prizes for trotting horses were offered. They were only for those that could trot the fastest, and there would be but few horses in a community that would compete. Then classes were made, so that we had a class for the horse that had not beaten 3 minutes, for the one that had not beaten 2.40, etc. Gradually from that crude beginning down to the present time there has been an advance in the work; it has been more of an educational nature. Now prizes are offered for the best cow—the best milch cow. What is the best milch cow? If this is to be determined by the amount the animal will produce, it is very easily answered, and we are answering it very satisfactorily at the fairs by offering prizes for the cows that will yield the most milk in 24 hours, or the most butter fat in 24 hours, a matter very easily determined by having the cows milked at a certain hour tonight and at a certain hour tomorrow night, and determining the composition of the milk. Then you have a measure of the actual production of the cow for that time. It is simply a matter of the scales and the test. That means simply the capacity of the animal to produce. I want you to distinguish between a dairy cow simply as a producer, and the Jersey, or Holstein or Shorthorn. We do not measure our dairy cattle today by the amount of butter fat they will yield alone. There is something else which comes in for consideration. Our fairs should be great educators, a great means for helping young men. When the first cattle from England were brought to this country, you know in what way they were judged. They were carried to the show ring and there judged as to which was the best cow, which was the best three-year-old, or the best yearling, or the best calf, male or female. The animals were examined by the judge, or by three judges usually. The discussion went on among this committee of three and when the award was decided upon, the blue ribbon was hung upon one, the red upon another and the white upon another, and the animals were dismissed. The men who were leaning over the fence watching this matter of judging knew nothing about it until the ribbons were hung upon the animals. You know that our boys, when they were trying to learn types of animals, went to the fairs for that purpose. Here was a young man, raised among the hills, who had a desire to engage in breeding Jersey cattle. What is a Jersey cow? He has heard of Jersey cows, but he is not at all familiar with them. He goes to the fair and sees a collection, a dozen herds represented by 50 or 75 animals. He goes about among those animals, he sees the form, he takes his first lesson. Later on he watches for the winners. He finds those that win the blue ribbon, the red ribbon and the white ribbon and he examines them. He sees that this one is first, that second and the other third. He will say, I see some points in this animal that has won the blue ribbon that are superior, but what is it about this animal that makes it better than the other? I see some points in the other which are better than in this one. Why is this the best? Every year we have at our fairs a lot of boys and men who are not skilled in cattle matters who go to the fairs for the purpose of studying animal forms and learning the points of the different breeds. They are hanging about the stalls questioning the owners, examining the animals, listening to the discussion among cattle breeders and trying to pick up every scrap of information they can. But when the judging is done, the animals are simply sent back as first, second and third, and no man in the fair knows why the awards are so placed unless he has the courage to go to the judge and ask him for his reason for making the decision.

The score card is simply a close, detailed examination of the animal. We will assume that I am a cattle judge and capable of doing the work. If I were examining a class of animals I would go in and look at the first cow, I would take in her form, I would judge her function, I would estimate her qualities; I would take the second one and look her over, and the third, and the fourth, then I would come to the fifth and say, this is the best cow. Why do I say that this is the best cow? I have taken into consideration all the points of each one of these animals, and have decided that this is the best. You can readily see that a judge must be very well grounded indeed. If he is judging Jersey cows, he must carry in his mind the typical Jersey cow. The score card is a detailed description of the animal that is arrived at by representatives, or by the owners, of all the registered cattle in each breed. For instance, the owners of the Jersey cattle in America came together at one time and decided what was a true description of the Jersey cow. That description was not accepted until it had been discussed very thoroughly. The head of the cow was discussed, her form was discussed, her height, the size of her legs, the length of her legs, the form of her tail, her udder; every phase of the animal was discussed very thoroughly, and finally a description was drawn up which showed plainly what the parts most desirable and undesirable were, and their true valuations. I have here the score card of the American Jersey Cattle Club. It is the same score card that we are using at our fairs today. It represents a knowledge that is gained by the study of many animals, men coming in contact with men who are the best breeders in the land, men who have had to do with the foundation of herds. An unskilled person or a person with considerable skill can hardly take one of these score cards in his hands and commence to judge an animal and do it understandingly. He must have a large amount of knowledge of the subject so that when he closes his eyes or turns in another direction he has a picture before him of the ideal Jersey, or Ayrshire, or Holstein. When he judges one breed he must be able to shut out all others. He must be able to have in mind the perfect animal of the breed he is judging, or as near as he can approach to it. It is an easy matter to pick out the first, second and third best, but how near perfection are they? When we take our cattle to a fair and they are judged by incompetent men, we feel that we have gained nothing. We have a right to demand that the judging be done by experts who know when they examine our animals critically how near the standard they approach. It requires skill, it requires knowledge. It is the same kind of skill that we are trying to teach down at the University. Our boys are studying score cards and studying breeds. We do not expect to make skilled judges of them, but we do expect to teach them so that they can complete the work by themselves.

Let us consider this score card for the Jersey cow. The head, of course, is an important part of the cow, but you will notice that it is given a valuation of only two points. If you will follow down the card you will notice that the udder is given a larger valuation. The fore udder is given thirteen points and the hind udder eleven points, and the teats are given ten points, making thirty-four points given to the udder and teats of the cow. I want to ask you whether the score card is a myth or a practical thing; whether it is based upon the working parts of the animal or what we might term unimportant parts. You will see that the eyes and horns together count for but one point. This is assuming that the eyes are not wild or staring and that the cow has horns, at least. If she has not good eyesight, of course she is shut out as a blemished animal. Do you know, my friends, that when the American Jersey Cattle Club was first established, years ago, it was considered an important point that the horns should be small, incurving and waxy, that the tail should be black and should trail, and that the tongue and roof of the mouth should be black? There was a time when if the switch did not drag on the ground, if the tongue and the roof of the mouth were not black, or if the horns were horny rather than waxy, it would take $100 off from the value of the cow. This was the case in the great Cooper sales of New York.

But after a few years the Jersey cow became a worker for the people, and then she began to be regarded as a practical animal, a money maker. There has been a great change in this respect. The score card has become a utility card; but it is not a score card of the dairy cow in general, but of each particular breed. We are talking about the score card for the Jersey cow, and there are important points in the Jersey cow that do not fall out of sight as they might in the dairy cow. If we had a large udder on the dairy cow, that reached well up behind, with four large, long, well-shaped, well-placed teats, and if she had a large barrel, a good deal of constitution, and a good skin, it was about all we could ask for, because it is about all that would have to do with production. But when we come to the Jersey cow we have some other important points that must be given valuation, and what is true of the Jersey cow is true of the Ayrshire, the Holstein, and all the other breeds. A different score card must be used for each breed.

We will now look at the score card for the Jersey cow in detail. The judge commences with the head. He first looks the cow in the face to see if she a fine face, representing effeminacy and constitution. He looks at the width between the eyes, because he wants a large storehouse for the brain. The head should be narrow between the horns, which also indicates effeminacy. Breadth at the horns is demanded of the beef cow. The next point is the length from the eye to the muzzle. She should have a long, dishing face. In the beef breeds we have the straight, possibly the outcurving face, but in the milk breeds the incurving line. The face should have a reasonable width. If the judge gives it full score he will say two points.

He examines then the eyes and the horns. Are the eyes mild, large, placid; those restful eyes that indicate the type of the mother? If so, and if the horns are small, thin, amber-colored and incurving, those are ideal horns and ideal eyes and would score one point. Suppose the horns are a little coarse, a little lacking in color, or the eyes a little staring. How much shall we cut them? If we take off one-half a point that would be a rank cut of fifty per cent. In judging by the score card we can rarely cut them more than one-fourth of a point.

We will next consider the neck, from the setting on of the horns to the shoulder. It should be long and lean, joining the shoulders not smoothly, as in the beef breeds, and without dewlap; narrow on top; heavy through the neck vein; strong in its connection with the head and without coarseness at the throat. That long, lean neck we would give a score of eight points. Why should it be regarded with so much importance? What has this to do with the producing capacity of the cow? This long, flat neck indicates the function of milk production and not of flesh production. If too long and thin it indicates weakness. In the beef animals we find a short, round neck. If it were a little too heavy at its connection with the throat, a little too rounding, we would cut it one, two or three points. The judge would mark it whatever he thought was right. Should the judge who was doing that work be a man who had come in contact with animals but little, or would he have to carry in his mind the ideal neck of the Jersey cow, long, straight, smooth and fine, yet strong in all its parts?

The back should be level to the setting on of the tail. This is not so important and is given but one point; it has to do with beauty. We may call it a fancy point, which has but a small valuation. Take the width of the loin. Standing behind the cow, place the hands on the right and left loin and carry them far forward, seeing how wide it is in the rear and in the front, having in mind the ideal Jersey cow. How does this compare, not with the other cow but with the standard, the ideal cow?

We have considered the back and the loin, now let us turn our attention to the barrel. Are the ribs well sprung? Has she a large barrel, broad and deep at the flank? The animal must have a large barrel, with ribs well sprung, and it must be carried high. A pendulous barrel is objectionable. If she comes up to the ideal in this respect she gets ten points. This cow which I have on the chart I give nine points. Why do I cut her a point? Because her ribs are a little too close together, she is tucked up a little too much. If the barrel is too pendulous she should be cut two, three or four points.

Now we will take the hips and the rump. The hips should be wide apart, the rump long. The length of the rump from the hip bone to the buttock point and from the hip bone to the hock should be considered. The judge measures with his ideal the width across the hock, the width across the buttock, and the fullness and width of the rump. So a critical examination is made, and that part is given eight, nine or ten points, as the judge thinks is due.

The legs are to be straight. She is not to toe out. The gambrels are not to come so near together that when the cow walks she will rub the udder. Are the legs long enough? Are they too long, too fine? Are they round or flat? The judge compares them with the ideal legs and marks them two points, if perfect.

The tail should be strong at its junction with the body, becoming very fine, with a nice switch. Suppose it was very strong and very short? He could cut it only one point if he cut out the whole, while the barrel is given ten points. The barrel, udder and teats are utility points. And yet how many a judge might say, this is a mean animal because she has a mean tail. She does not suit me. He might give her no award at all because she had a defective tail, while she was perfect in other parts.

Now we come to the color and mellowness of the hide. This is an important point, and one on which some of us might, perhaps, quarrel with the score card makers. If I alone were the maker of the score card I should give the skin more import-

Guernsey cow owned by A. A. Oakes, Farmington Falls, Maine.

ance than five points, but fortunately the score card is not the creation of one man. It is not my ideal of the score card for Jersey cows, but it is the judgment of all men who are engaged in the breeding of Jersey cows. I would be glad to place the color and mellowness of the hide at more than five points, but I should be one man in ten thousand, and the judgment of the other 999 ought to be worth more than mine. The judge puts his fingers on the hide, but he does not pinch it, he feels of it delicately, rubs it between his fingers and finds the softness, pliability and thickness of it. We know that the softness of the hide fairly reflects the digestive and assimilative powers of the animal. I know of no external markings that indicate more of the true functions of the cow than does the texture of the skin. It should be a soft, pliable skin, not a papery one. Another point in connection with the hide is its color. Look at the folds under the udder, the rear of the udder, or the inside of the ears, —every exposed place, and see if she has a yellow skin. If so, and the texture is right, we can credit the creature with five points. If she should be cut, how much? How much too thick and too hard is her skin, and how much lacking in color? Must it not be an expert who shall answer? Could a man who had been breeding Shorthorns all his life and had just commenced to breed Jerseys answer these questions? We have a neighbor who is a breeder of Brahma hens. He has been a breeder of Brahmas for thirty years, and he goes everywhere in New England to judge the Brahma class, but he cannot be prevailed upon to judge in any other class because he says he is not skilled in other classes. And yet we employ judges to judge our dairy and beef breeds, butter and swine, and cheese and fruit, simply because the man comes without much expense.

Now we come to the udder. The ideal Jersey udder is a full, level udder, very much like the Ayrshire udder. That is what the score card calls for. The cow we have here on the chart has a pot-shaped udder. This is quite typical of many Jerseys, but it is not regarded as a thing of beauty. There is no reason why we may expect more milk from an udder of that shape, and if it is not a better working udder why should we not substitute one that is beautiful. This is a very good udder. Taking the center of the udder and reaching forward to its attachment to the abdomen of the cow we find a good long line of connection. We will say, perhaps, that the fore udder is a good one and should be given thirteen points. If it does not extend quite far enough forward, the judge decides how much it shall be cut, and gives it ten, eleven or twelve points. Then he examines the hind udder, following back from the center to its attachment with the body. If he finds it in perfect condition, full and reaching far up behind, he can call it eleven points. Perhaps he finds one side a little smaller than the other, or in some way defective. In that case he must cut down from eleven points.

Now we consider the teats; they are to be far apart, well placed, of medium size, straight and smooth and hanging perpendicularly. They should be far apart from front to rear and from right to left. Perhaps we may find them bunched, or out of condition; the judge cuts them three or more points and the clerk marks it down.

Next we take the milk veins. The judge places his hands on the udder of the cow and follows forward, following the milk veins and finding how much they are branched, how tortuous they are, how many openings and how large they are. These are valuable. If they are ideal they are worth the five points, otherwise not.

We now come to the disposition. This is a matter which may be judged by the general appearance of the cow. The judge has handled her, and if he finds her gentle, not restless—a good cow so far as her handling is concerned—he gives her five points for her disposition. If she is slightly vicious this figure has to be cut.

We have as the last marking the general appearance and apparent constitution. It is the hardest question there is to answer, in connection with the examination. What is the general appearance of that animal? When she goes into the show ring does she walk along smoothly and easily? Is her head up, showing to you that she has a lot of constitution, strength and vigor? Is her hair sleek and her eye bright? Does she move about in such a way as to impress you with her vigor? Suppose she had a high pelvic arch or carried her head down, she would not strike us favorably. What would you think of a man who goes slouching along? He is not prepossessing; you would make up your mind against him. In regard to the apparent constitution, the brightness of the eye, the thickness of the skin, and the size of the neck are to be considered; also the depth and breadth through the heart and the placing of the legs. We decide upon those two points together,—the general appearance and apparent constitution. These are given ten points on the score card, if perfect. Now we have completed the examination of one cow. We go to the next one and go through the same performance. The outsiders are looking on but they have not heard a word. They are simply seeing us go over the examination. What are the results? The clerk has had time to make his additions as we have gone along, and when we stop we look over those dozen cards. Here is one marked 97, one 95, one 93, one 89 and so on. This is the result of a careful examination of every one of those cows, in every part. We have examined every feature, from the head to the udder and the feet as carefully and critically as we could, devoting, perhaps, six to ten minutes to each cow. We have done our best. Not a single point has escaped us. We take the blue ribbon and hang it on this cow, the red on that one, and the white on that one, and the cows are led back to their stalls. Now what does the public know about it? Not a thing. The score card was given to the boy who led the cow back to the stall. He commences to look it over. The other boys congregate around. They find the judge has taken two points off the neck. She is not full enough at the throat, too narrow in the neck veins. She is perfect in every other way. The owner says, my cow is faulty only in her neck; she is an ideal cow everywhere else. Who judged her? The expert breeder, Valancey Fuller, or George Blanchard. That man has his lesson.

The other parties have their score cards, and they look the cows over and find where they are defective. They go all around and examine the cows and discuss them, and the men on the outside participate in this discussion and examination. They have the best work the judge could do, and they are discussing it and getting all the lessons out of it there are for them to learn. They take the score cards home and examine them and apply them to the rest of the animals in their herds, and in this way they are able to establish in their minds what a typical Jersey cow is like.

I want to say just a word more. Last winter, at a demand made by this Dairymen's Association over at Waterville, the legislature passed an act that judges shoud be employed who should use the score cards in judging all classes of pure bred animals, at the state fairs, or else the societies should forfeit the appropriation from the State. Every county society receiving $300 or more was also required to do this. They got the score cards and took them to the fairs and got judges to go there, but they had some difficulty in getting the judges to use the score cards. They had never had any difficulty in getting judges to come and say, this is the first, that the second, etc., but how near perfection did they come? The man who leads the cow home says, I have the best cow there was at the State Fair, but has he any idea how good she is? If she is the best one, to his mind she is the perfect cow. You will see how imperfect a standard the man has before him, when every cow and sheep and pig is judged by comparison, not with a standard but with each other. The judges attempted to use the score cards but they were not familiar with them, and a great deal of dissatisfaction was created.

Now, are we going to lose what we have gained? Here is an attempt to help educate our boys along the lines of animal industry, and are we going to allow it to be thrown away simply because we do not understand it and because it was so imperfectly conducted this season?

Guernsey Herd of John F. Buker, Bowdoinham, Me.

HOW TO BREED AND CARE FOR A PROFITABLE DAIRY HERD.

By W. S. Keene, Boston.

I am glad of the privilege of being with you this afternoon, and by the consent of your chairman I am going to add to my topic and speak to you on "How to Breed and Care for a Profitable Dairy Herd," also "Why I Believe the Holsteins are the Most Profitable Dairy Breed."

I fully realize that the Holsteins are not the favorite breed with most of you Maine dairymen, but that is not the fault of the breed, it is the lack of knowledge on your part as to their dairy qualities. You have been told by the friends of other breeds that the Holstein cow gave skim-milk, and you as dairymen should avoid them as you would a pestilence.

Now, my friends, I take it for granted that you are in the dairy business for profit. If you are you do not want to let sentiment enter into your business; you do not want to get married to a particular breed because your father bred them years ago or because they are the prevailing breed in your neighborhood, unless they are paying you a profit; if they are, stick to them, if they are not, dispose of them. The time has come when the cows that will not make over 200 pounds of butter or give over 4,000 pounds of milk in a year must go. Why? Because they are not paying their board, and I believe the farmers of this good old State of Maine are too bright and smart to keep a cow for her company, especially when they can get one whose company will be much more agreeable, that will pay them a profit.

Holland, the richest agricultural country in the world, has been made such by its cattle, the Holsteins. It could hardly be otherwise than that. A thousand years of careful breeding, weeding and feeding, should result in a race of cattle taking a front rank as profitable producers. Prof. Roberts, of Cornell University, in addressing a dairymen's convention said: "Here are a people occupying lands which are seldom sold for less than $500 an acre, frequently $1,000 and upwards, producing butter and cheese and placing it on the European market in competition with that produced on lands of less than one-tenth this value." It has been said that the Holsteins are in more countries, occupying more territory, producing more milk, more butter and more cheese than all the other dairy breeds combined. Whether this be true or not, the fact still remains, that the Dutchman's phlegmatic spotted cow is very much in evidence in all parts of the world. The United States, from Maine to California, from Texas to Minnesota, is thickly dotted with herds of Holsteins that take second place to no other breed. In the State of Wisconsin, now the greatest dairy state in the Union, the Holsteins are far in the lead. The chief business of the Friesian dairymen, the originators of this breed, is butter making. One of the cows of the earliest permanent importation yielded 4,008⅞ pounds of milk in nine weeks, the biggest day's yield being 76 pounds. This and other similar records of the breed were received with widespread incredulity. In 1880, the cow Aggie made a record of 18,004 5-6 pounds of milk within one year from date of calving; this record was almost universally regarded as an impossibility.

Among those that joined in this view was Prof. Long of England, then publishing a large work on dairy husbandry, which was widely subscribed for in this country and issued in quarterly numbers. Thus the capacity of this breed for milk production became a matter of more than ordinary public interest. In August, 1885, the owners of Aggie commenced a record of the cow Clothilde. They invited public scrutiny of this record during its full progress. A number of persons interested themselves in it in order to learn the amount of her production beyond a doubt, among whom were leading men of dairy publications. At different periods, including one during the last week of her record, she was under the official watch and care of the superintendent of Holstein-Friesian Advanced Registry. Her record for the year was 26,021⅛ pounds. During the closing week, commencing 358 days from dropping her calf, she gave from 53 to 56 pounds daily. So thoroughly was the public convinced of the correctness of this record that higher records have since been received without an intimation of former incredulity.

Pietertje 2d in her eleventh year produced 30,318½ pounds, and Princess of Wayne in her twelfth year 29,008 11-16 pounds; the latter gave 3,182⅛ pounds in thirty days, the highest day's yield being 113 1-16 pounds.

Seventy-seven cows have been received to advanced registry that have produced from 15,000 to 30,000 pounds in periods of ten months to one year. These official records place the Holsteins in a class by themselves as milk producers.

Yes, but you say that we sell cream or make butter and we have been told that Holsteins are useless as butter makers; let us see. Realizing the public demand for reliable butter tests as a guide for determining the productive capacity of the dairy cow, and appreciating the importance of furnishing reliable data as to the merits of the Holstein-Friesian as a butter producer, the Holstein-Friesian Association of America in 1894 offered in prizes the sum of $1,000 for cows and heifers of this breed making officially authenticated butter records, the competing animals in all cases to be tested for one week at the homes of the owners and under the personal supervision of representatives of the experiment stations in the different states where the cows were tested for competition. These tests are all made with that friend of the dairy farmer and enemy of the inferior cow—the Babcock test. This offers a clear and comprehensive method to the dairy farmer from which he can draw accurate conclusions as to the merits of the breed from the standpoint of practical dairy work. This prize test brought out officially authenticated butter tests of 35 cows and heifers. Of this number, 10 were two-year old heifers, and their yield ranged from ⅞ to 11-1 pounds butter fat per week. Ten were heifers three and four years old, the remaining fifteen were of maturer age, making a total of 25 over three years of age. Their total seven days' yield of milk was 1,124,266 pounds, or a daily average of 64.2 pounds of milk per cow; their total week's yield of butter fat was 397.5 pounds, an average of 15.9 pounds of fat per cow per week. Ten animals on the list made yields of more than 17 pounds of butter fat per week, and four of the number produced over 20.1 pounds, and one made the enormous yield of 21.26 pounds of fat for the seven days.

The Holstein-Friesian Association, assisted by the different experiment stations, has continued this method of conducting weekly official tests up to the present time, and the most flattering results have followed. The results of these tests for prizes for the year ending May 6th, 1903, were as follows:

Class 1—cows five years old or over: Sadie Vale Concordia gave in 7 days 694.3 pounds of milk, average per cent of fat, 3.53, pounds of butter fat, 24,508, amount of butter, 28 pounds, 9.5 ounces. Number competing in this class 185, average pounds of milk, 434, average per cent of fat, 3.42, average pounds of butter, 17 pounds, 2.6 ounces.

Class 2— four and a half years old and under five: Best cow gave 633.2 pounds of milk, per cent of fat 3.70, butter 27 pounds, 5.1 ounces.

Class 3— four years old and under four and a half years: Best cow gave 499.3 pounds of milk, per cent of fat 3.63, amount of butter, 21 pounds, 2.1 ounces.

Class 4—cows three and one-half years old and under four years: Best cow gave 599.2 pounds of milk, per cent of fat 3.66, amount of butter, 25 pounds 9.8 ounces.

Class 5—cows three years old and under three and one-half years old: Best cow gave 417.3 pounds of milk, per cent of fat 3.77, amount of butter, 18 pounds 5.9 ounces.

Class 6—cows two and one-half years old and under three years: Best cow gave 362 pounds of milk, per cent of fat 4.24, amount of butter, 17 pounds 14.7 ounces.

Class 7—heifers under two and one-half years old: DeNatsey Baker, two years, two months, seven days old gave 377.8 pounds of milk, per cent of fat 3.69, butter fat 13.953 pounds, butter 18 pounds 4.5 ounces.

Now, my friends, when you realize that these tests are all correct and you can believe them as truly as if you had seen them made on your own farm, I am sure that you will abandon the idea that Holsteins are no butter cows. There is evidence enough to fill a large book that Holstein butter in quality is as good in every particular as that made from any other breed, so I will call your attention to only one instance as proof of this fact.

At the New York State Fair of 1890, a very interesting competition for a special butter prize of $100 for four cows of any breed, three days' milking, resulted in competition of four such herds, one Guernsey, one Jersey and two Holsteins. The Guernsey herd yielded 7 pounds finished butter, the Jersey herd, 5 pounds 9 ounces, and one of the Holstein herds, 6 pounds 11 ounces. Finding that the differences of weight were slight, the committee in charge of the cows decided to submit samples of the butter of the various herds to the expert judge, he to be uninformed as to the herds producing them and upon his decision to award the prize. He pronounced the butter of the Holstein herd best in quality, grain, flavor, and color, and the prize was thus awarded.

For making veal the Holstein stands without a peer. It is very seldom that a calf will consume the milk that a dam gives. The result is that the calves grow rapidly and fatten quickly. The Holsteins make most excellent beef, juicy, tender and well interlarded with fat. The weight of full blooded and grade steers at a year and a half or two years old can be put at 1,200 to 1,500 pounds; consequently they can be made to show a handsome profit when bred for beef.

If there is anything more you want in a dairy or general purpose cow that I have not mentioned, just speak of it and I will show you that it is in the Holstein, only that I have omitted to mention it. The fact is that the Holsteins stand at the head as producers of milk and butter for profit, and if you want to veal a calf or raise a pair of steers you have in the Holstein a breed from which you can do so at a profit, and when you are through with the cow for dairy purposes, she will bring as much for beef as any of the beef breeds.

Now I ask you to think over what I have said carefully, and if you find I have told you the truth and you want to get a dairy herd of this breed, they are within the reach of every dairyman of the State of Maine. I will give you a few suggestions as to how this can be accomplished:

First, get the idea firmly fixed in your mind that breeding on scientific and intelligent lines will improve your herd as persistent and heavy milkers and as large butter producers, without increasing proportionately your cost of maintenance and that the increase in the money making capacity lies in the adoption of new and improved methods. When you do this you will have approached the prime economic facts in dairying.

Second, remember the simple fact that the sire is half the herd. By the use of the very best class of bulls and raising only the calves from your best cows the production of your herd can be doubled in a very few years. The greatest hindrance to the success of the average dairyman is the use of the poorest class of bulls, merely because they are a little cheaper.

The Holstein bull possesses a vigorous constitution, above, I believe, that of any other dairy breed, hence his value for grading up ordinary dairy herds. Never breed from anything but a thoroughbred registered bull.

I will give you my experience in building up a dairy herd, as this may interest you, for they are right here in Maine and many of you have seen them. I began nine years ago, bought six of the best common cows I could find, and paid $50 apiece for them. I worked along and used scrub bulls and raised a few calves for three years, but I did not get ahead any for the reason that I had no means of knowing what my cows were doing. I mean by this that I did not keep an account with each cow to see what she was doing. Six years ago I began to keep an account with my cows. I bought a set of scales and put them in the tie-up, and from that time to the present every cow has had to stand on her own merits. I bought a registered Holstein bull and began to raise my own cows. Today I have about 40 cows and heifers and this fall I won 50 ribbons at the Bangor and Lewiston fairs. My standard when I began was 2,800 quarts a year, and today my two-year-old heifers are averaging 4,000 quarts a year and my mature cows about 5,000 quarts. I am able to get $10 apiece for all my grade heifer calves when a few days old, as against $1 when I was breeding from scrub bulls. My grade bull-calves sell readily for from $5 to $10 at the same age, to feed for veal or raise for steers. I have never sold any of my registered heifer calves because I am getting my whole herd into registered stock, but my thoroughbred bull-calves sell at $30 to $40, when dropped, and I sold one at five months old for $80. Now the only way I ever got started was in knowing first what every cow was doing. Lots of cows start out with a big mess and dry up in a few months, so that they do not pay their keeping. I sell that kind as soon as I find them out, but I never could find them out if I did not weigh their milk. I produce milk for the Borden Condensed Milk Co., their factory being at Newport. They buy milk by the pound, so that I do not test my milk for butter fat, but they test all the milk they buy about once a week and they report that my milk tests on an average about four per cent, and that they say is good enough for them. If I was selling cream, I would send a sample of every cow's milk to the creamery about once a month and have them test it for butter fat, and in this way I would weed out any cow that was not profitable as a butter maker. My best cow to date was Lady Felker, who produced in 365 days 17,694 pounds 14 ounces, and her milk at factory prices sold for $199.73. She was a thoroughbred and raised by Henry Boardman of Bangor who several years ago started a herd of Holsteins that were second to none and would have been a great benefit to the dairymen of Maine if they had been appreciated and continued. This cow I rescued from a butcher when she was two years old, for $38. I have another thoroughbred that is giving between 14,000 and 15,000 pounds this year and has a day's record of 75 pounds 10 ounces, and in thirty days gave almost 2,000 pounds. I have a grade that has just closed her year and gave 14,600 pounds, an average of 40 pounds per day for the year, and the milk sold for $186. One of my grade three-year-olds is giving over 13,000 pounds with her second calf, and gave over 10,000 pounds with her first calf. One of my thoroughbred two-year-olds is just closing her year with a record of about 10,500 pounds. So you will see that I have succeeded in improving the capacity of my herd in the past six years, and I hope to keep on improving it for years to come, and what I have done and hope to do, you may all do by using the same methods. The best mark of a dairy cow is her net income to her owner, and that is the weak point on your score card system, that you go too much on dairy form and ignore dairy performance. Feed the calves liberally and keep them growing, from birth to maturity, as you never can make a profitable dairy cow out of a stunted, half-starved calf.

Keep the cows clean; one of the worst faults of the average dairyman is his tendency to keep his cows during the winter season in a nasty, filthy condition. When we realize that a large per cent of the milk produced in this country is consumed in its whole state, and that infants and invalids are fed almost wholly on milk, it is really criminal for dairymen to be so slack in this most important branch of dairying, and you, Mr. Gilman, as commissioner of agriculture, can engage in no work that will be more humane or result in a greater profit to the Maine dairymen than to vie with the management of the creameries, butter factories and milk factories to compel the slack, filthy dairymen to reform and be decent and clean or go out of the business. I thank you all for your kind attention and I give you all a most cordial invitation to visit my farm in Palmyra, and see for yourselves the noble black and whites and when you do I am sure that you will say the Holstein cow is the aristocrat of the farm yard and needs no defense, but is fully able to defend herself against all invaders.

DAIRY BREEDING.

By Hon. Z. A. Gilbert, North Greene.

It is of the highest importance that dairymen should breed and raise the cows needed to replenish their herds. With the dairyman, as with all other farmers, improvement should ever be an object in view. He should strive each year to exceed the results reached in the year preceding. Hence he should aim to have the cows he breeds and grows excel those whose places they take. Those who are breeding and growing stock have learned that this is not a simple problem. To breed from the best is an axiom all can endorse, but we who have long been in the business have learned there are many disappointments along the way, and that improvement is slow and decidedly uncertain. Breeding from the best does not always produce offspring equal to the animals from which they were bred, to say nothing of improvement. Hence the number of superior cows in a herd increases slowly.

Breeders of dairy stock, so far as I am read up in the business, in their desire for better cows, keep their efforts centered on a single object—they are after more milk. All other factors involved are lost sight of in the effort to breed or obtain cows that will produce more. In the coupling of breeding animals this has been the sole thought.

In the feeding and care of the cows now in the dairy herds the chief concern is more milk. In the compounding of rations, now so attentively studied, more milk is the only thing thought of. Every variation made is with the view to make the subject give more milk. Experimental feeding of dairy cows, at the stations and with private herds, has been to learn the combination that will squeeze a little more of product from the cow. The direction coming to the novice in feeding from the highest authorities among us is to increase the feed so long as an increase of milk is the result. To such extent has this milk-giving propensity been cultivated, with many susceptible cows, that as their year's production is rounded out there is little of physical power left. Their vital powers have been surrendered to the never satisfied demands of the milk pail.

This is just what is going on among breeders of dairy stock at the present time. Not a thought is given, apparently, to any other factor involved in the improvement of the dairy herd. Even scientific investigators, those who stand before us as our teachers, are wont to illustrate the dairy cow as a "machine" into which a balanced ration is dumped, to be ground out into milk and cream. If the cow were only a machine there would be a parallel in the comparison, and sense in the illustration. But instead of an inanimate machine, the cow is a living organism. It takes power to be a great producer. Unless that power is sustained while production is being continued, the vital energy of the cow will be weakened. So long as feed and care are directed to the forcing of more milk, and the vital powers behind it are neglected, weakness must follow.

Is not here a reason why the standard of many herds is so rarely kept up in the offspring? Some of you will recall having seen at the State Fair Mr. Russell's notable cow, "Old Creamer," that set the pace of over two pounds of butter fat in a single day. Any breeder would know at a glance that with vitality so reduced by drafts for the pail as this cow showed, it could not be possible that she could reproduce her equal through her offspring, much less improve upon it.

To breed and grow a better cow, then, there must be an increase of vital power to meet and sustain the added demand of a larger milk flow. A balance between the larger production and the power to sustain it must be maintained. Instead of breeding for a phenomenal milk flow, the sensible course would seem to be to breed and build up an animal capable of giving a large flow of milk. Too many calves, even from well bred cows, are born weaklings. Such calves never can be made the strong, producing, valuable cows dairymen are all after and so few possess.

I do not like to leave this subject without calling attention to a further point which I consider of importance in connection with the rearing of dairy animals. The proper breeding of dairy animals is not enough. They should be reared in such a way as to render their breeding of greatest advantage to their owners. Pure air and exercise are essential to the health, strength and highest usefulness of all domestic animals. Through our solicitude for the comfort of our animals, and in the hope to entice a little more milk from the cows, many are going to the other extereme. Especially, I claim, is this true of young and growing animals soon to become the principals of the herd. Pure air is an absolute necessity to health and therefore a necessity to the highest thrift, and of far more importance in those directions than the matter of temperature. There is no denying the fact that we are gradually raising up too many weaklings in dairy herds. What gives the strength and vitality to Ayrshire cows and their offspring but generations of out-door freedom where pure air and exercise develop the power needed to make them the strong and profitable cows they are? No hot house product are they nor are they less profitable cows for this early training. It takes an all-round strong animal to be a profitable producer and bring forth a calf that will develop into the equal of its dam. Developing the milk-giving propensity is not enough. Good breeding is not enough. The physical powers must be built up and strengthened to go with the improved breeding. Until intelligent attention is given to these important matters dairymen will continue as now, to find it a troublesome matter to build up the quality of their herds from heifers of their own raising.

THE RELATION OF STATE TO RURAL SCHOOLS.

By Prof. J. W. Sanborn, Gilmanton, N. H.

(Stenographic Copy.)

There is no audience in New England, unless it be an audience from Northern New Hampshire or Vermont, before whom this question could be discussed with so much appropriateness as before an audience of Maine farmers, and therefore I am fortunate in my audience. Maine is the imperial agricultural state of New England. Her resources, so far as I may judge, far surpass the popular impression of the resources of Maine. When they are fully developed, as they sometime will be developed, it will be the garden state of New England; and its granary house, so far as New England is concerned. It is a state peopled with an educated people, capable of supporting millions of people from its own soil. I am fortunate, then, in discussing with you the schoolhouse, the source of the power that is to make Maine the final rounded, imperial agricultural state that she is destined to be. I say this because here in its greatest purity is probably found both the blood and the spirit of the fathers who founded our public school system. The Pilgrim Fathers, as you know, when driven by persecution and violence to this country, because of the bigotry and superstition of their ignorant neighbors, declared that ignorance was the parent of this superstition and bigotry and to ensure the perpetuation of the democracies they were about to found, they planted the schoolhouse by the side of the church, and put over against every pulpit a teacher's desk; rightly holding that knowledge would loose from the throats of State and Church the grip of superstition and bigotry. In due time the schools accomplished the work that the fathers hoped they would. But in the development of that work they took on a widening range of purpose, each step carrying the school to a higher and higher vantage ground and public utility. Religious bigotry and persecution are dead, and sectarian ill feeling is disappearing, and today, at the close of over a century, schools are the hope of struggling poverty, and the measure of the wealth, strength and happiness of our people. The constitution of Maine declares in effect, that the diffusion of knowledge being essential to the perpetuation of a republican form of institution, the legislature shall require the towns to support and maintain public schools. My own state declares through its constitution that intelligence being essential to the perpetuation of Republics, schools shall be founded and maintained. In the same spirit in which the fathers founded our State constitution, the United States Congress, when it organized the great western territories out of which have grown rich and powerful empire states of the West, made provsion for a free public school; declaring, as our own state constitutions have declared, that liberty, both religious and civil, rests upon a general diffusion of knowledge among the masses, and provided that schools and seminaries of learning should be forever maintained. They gave to every state a couple of townships to found a university and to every town sections of land to found free public schools.

Catching this later and wider spirit touching our rural schools, the western states have provided large funds for their maintenance, and now such states as Nebraska from the public treasury every year assess a mill and a half on the dollar to support the township schools, aside from the munificent grant of Congress and subsequent grants by states. The State of Illinois annually appropriates two mills from the State treasury to free public schools. The Territory of Utah, where I had the pleasure of living for several years, had so organized its public school system that this state, which we supposed to be the home of superstition and bigotry, is third in the Union in the ratio of people that can read and write. In the county in which I lived, a rich, rural county, there was turned back from the state treasury of Utah more money to support the schools of that county than the whole county paid in as state tax.

I invite your attention to the language of the constitution. The schools were not founded for the benefit of the student or the parent, but for the sole purpose of preserving the life of the State. Borrowing the language of Horace Greeley, "Unless reason is a fool and mathematics a lie," as schools are founded for the sole purpose of perpetuating the life of the State, it is the duty of the State to provide the entire education of its children.

Children are the wards of the State for the purpose of education.

When these town schools were founded, population and wealth were distributed throughout the entire area of the state quite evenly, for no railroads existed, and no inequality of burden was put upon the people. But when the steam horse awoke the sleeping energies of the East and the West, and centralized men in great townships, withdrawing the wealth and culture from the country towns, an immense disparity of burden grew up. In Hillsboro county, New Hampshire, which has 34 towns, there is only one town, I believe, where the wealth per child does not exceed two thousand dollars. In about one-half of them the wealth per school child exceeds four thousand dollars, and some of them pass the five and six thousand dollar mark. In the rural county of Grafton, joining your own State on the east, with seventeen towns, only two towns in the whole county reach the sum of four thousand dollars per school child; some are as low as thirteen hundred and most of them under two thousand. In other words, under these changed conditions, growing up since the constitution was formed, the burden of supporting the country schools is four fold more upon some towns than it is upon other towns. And worse than that, in those rural towns the schools have dwindled down to four and five and ten students. They are not graded, and one teacher hears the entire round of studies for the district, from A, B, C up to the final work in mathematics, so that but a very few moments can be devoted to each class; while on the other hand, the sum raised in cities provides graded schools, charts and eye methods of teaching, secures teachers fitted for each department, affords a large number of students in each class and a long period for each lesson. Many fold the time can be devoted to each subject that can be devoted to it in the rural school. In the rural school the pay is so low that no one makes a profession of teaching. In my own school district, where I have lived ten years, since returning from the West, I believe but once has the same teacher taught twice, and the children begin each term at the foot of the declivity they tried to climb the term before, study becomes a mechanical routine, incentive loses edge and ability to concentrate the mind becomes weakened and habits of study irresolute. Better one year of clear thinking under the guidance of a master in the art of leading out the mind than years of desultory and purely perfunctory habits of passing over studies.

I want you to observe that out in the rural districts, among the people that have made this nation what it is in its institutional life and spirit, if an education is acquired it must be through private expense at the high schools and academies of other towns. In these centers of wealth and culture the boy has spread before him a magnificent opportunity for education, equal to the old-time college education, while the sons and daughters of those who have made the country what it is must decline into a state of ignorance and that of European peasantry, and must occupy a subordinate place just as sure as intellect has supremacy over muscle. I think it was the old Chinese philosopher Mencius who, three thousand or more years ago, said, "Those who labor with their minds govern those who labor with their hands and those who labor with their hands are governed by those who labor with their minds." As certain as this is one of the fixed truths of the rolling centuries, just so certain the country boys of New England who have made this country what it is will be governed by those who are becoming educated in our city graded schools unless they at their own expense obtain, or somebody provides for them, the education which is their right.

I am here tonight to protest against the existing state of affairs. I say here directly that it is the business of the state to give every child in the state an equal opportunity for education. I proclaim it in the name of humanity. Every citizen is taxed to support the school, and the feeling now is that, intellect being the measure of the power of men and the largest capital possible to put into the hands of a young man, it is the duty of the state to see that every child of the state is fitted to run the race of life; to put him squarely on his feet and by equitable laws give him a free and fair field in which to run, and say to him, "Now, young man, run the race! If you fail the fault is your own." I believe it to be the duty of the state, as I now understand the matter, to provide for every child within its borders that best of all patrimony, the opportunity to obtain a good education that will fit him for the struggle of life.

More than that, the state's highest interest is involved in the question of the education of every citizen. We have come to understand that the industrial output of a people is measured by the intelligence of the people. That is true of agriculture, as of every other industry. I have had occasion, at your institute meetings, to call attention to the relation of intelligence to the outcome or the output of a people. I secured statistical data perhaps a score of years ago, which I used for the information of my students. In the New England group of states, the output of the staple crops is 25.6 bushels per acre. In Michigan, Iowa, Minnesota and Wisconsin, where 4.85 per cent of the people cannot read and write, the output is 23.4 bushels. In New York, New Jersey and Pennsylvania, 5.35 per cent of the people cannot read and write, and their average crops per acre go down to 22.8. Illinois, Indiana and Ohio have 6.9 per cent of people who cannot read and write, and their crops are 20.1 bushels. Delaware, Maryland and West Virginia have 22.8 per cent who cannot read and write and their crops average 16.4 bushels. Kentucky, Tennessee, Arkansas and Virginia have 32.4 per cent of inhabitants who cannot read and write, and their products are 11.4 bushels per acre. In North Carolina, South Carolina, Georgia, Wisconsin and Alabama 45 per cent of the population could neither read nor write, and their crops were 8.4 bushels per acre.

The same truth applies to the European countries. From the data which I have here I will give only a single illustration, which compares France with Germany. France, the richer agricultural country, had at that time 51 per cent of people who could not read nor write, and her products averaged 18½ bushels per acre. The much poorer agricultural section of Germany, where practically all of the people can read and write, under their magnificent school system, turned out 22 and a fraction bushels per acre. Intelligence on the farm is the measure of the output of the farm. The agricultural products of our country are measured, not by the fertility of the soil but by the fertility of the intellects of those who cultivate the soil; and, my friends, just as certain as that truth is eternal, just as true as the saying of Emerson that "Intellect is primary and matter secondary," just so sure shall the magnificent school system of the West, supported by the state as I have indicated, make it impossible for you to maintain your civilization and culture on the level of others unless you bring the little red schoolhouse of Maine up to the level of the school system of the West. If agriculture, as Socrates says, is the nurse and mother of all industries, the highest interest of Maine is to see to it that the sons of the farmers, whose industry is the primary source of all wealth, have the finest education of any of its citizens. It is not only the duty of the state from the humanitarian standpoint, but the interest of the state herself will be best subserved by making education the common property of every child of the state, particularly of the rural child. But how shall we enable him to acquire this education, or put it within his reach? I do not know, my friends, of any practical way of reaching the children of the rural school through the state except by the system of transportation of students. I want to repeat, before I enter this field, that I mean to carry to its logical result the proposition that the state herself must provide the resources or funds to support these schools. If the premises upon which I have founded my discussion are true, let us not shrink from the full consequence of the logic, but be true to truth and not rest until our rights to the utmost are secure.

When we have the funds provided, how shall we reach the student of the country in a practical manner? I advocate the adoption of the system that has sprung up in Ohio and extended beyond her borders. I have not time to discuss this matter in detail, but will say that in Kingsville, Ohio, some years ago, some of the brightest citizens discovered, or thought they did, that the effective power of graded schools was twice or thrice that of the old-time schools, and that there might be economy in concentration of school work. The constitution being in the way, they applied to the state for the individual right, as a town, to form one central high school, and to transport all the students to that high school. Now, after years of trial, I am told by those who have visited those schools and by those who know, that there is no one who would return to the old system; that the actual expense per child is less under the new system, while the increased power for education of the graded schools and the superior talent of the teachers who are made permanent, has raised the whole level of the educational work of that township, and so striking has been this result that other towns have applied for the same opportunity, until the outcome is that Ohio has entirely revised her laws relating to the matter and now there are many towns in Ohio which transport their children to a central school. There is not, and probably there never can be, an effective system of rural education until the schools are graded and the children transported to those schools. There arise in my mind at the moment all the objections you will raise to this system. I must for lack of time brush them all aside by simply saying that in practice it has worked out a splendid success, and that nowhere among the hundreds of towns that have adopted the system has a single town returned to the old way, in the broadest sense of that statement.

But, my friends, I want to go one step farther with you. If we are to transport these children to a central school, the topography of towns, the convergence of roads for economy's purposes, will be greatly interfered with by the little republics called towns, or by town lines. I know it is not always wise to speak the whole truth, but I see but one logical outcome of the whole situation, and that is to sweep utterly away the township lines in the state system of education, and make one district of the state, and then organize the central school where roads converge and where the topography of the ground and population would force the natural site of the school. And I believe not only that the whole educational system of Maine would cost no more under such a method but that it would be at least several fold as effective for the dollar as it is now.

I can only present outlines of the broad subject which I have selected. You ask me what we shall teach in those schools. I want to say a little on this subject. I do not know, my friends, what constitutes a good education. I have thought upon the subject a great deal, but on being asked to define what constitutes a good education I should give up the problem and say that I not only do not comprehend myself what constitutes a good education, nor do I believe that the twentieth century has settled this problem. At the moment I am forced to say simply this,—in my opinion no child should enter the public school at the youthful age he now does. A sound body must be the home of a strong mind. When it takes nine years to go from the A, B, C start until you close up the grammar department, and have to show for it only a little common school arithmetic, a little language, a little physical geography, a little history, I say to you here, and I do not think it is susceptible of challenge, that nowhere along the domain of civil and industrial life is there so little to show for nine years of work and energy as the outcome of the nine years that carry our boys out of the grammar school. A mature mind ought to learn what of value there is in it in a year's time.

I would eliminate the first three years of the beginning of the boy's life, and not accept him before eight years, unless in a little kindergarten work, and let him play and grow, and then I would eliminate all memory studies as such, holding that the student who is acquiring useful information in nature studies and other studies has the best disciplinary matter for memory. I would eliminate much of mathematics, holding with Elliott that the form of logic which we get in mathematics is the form of logic least used in the life of most citizens, and only used where the most absolute accuracy is required. And I would make other eliminations. But into the rural schools must come, not nature studies as we now understand them, but nature studies with an agricultural bias. All our elementary schools, in the new system, must teach the elements of agriculture, and it will be no favoritism, for the increased productive power of the farm means cheaper food for every citizen, a new impulse to every industry, taking out of your ranks men who can go into other occupations and increase the products which add to the comfort of all. The state's highest interest would be served by such a course of studies. If we have the graded system, these farm studies may go on until they take a higher form in the graduating class of the high school, the cap stone of the agricultural system being the State University, where teachers of agriculture, agricultural professional men, and those who want to go to the root of the sciences that have their application to agriculture should be educated. I do not expect your people will deal with the situation until agitation and reflection have crystalized into purpose. But when we deal with the problem, without hesitation I would say, put elementary studies in agriculture into the common schools. Are they not pressing into the schools of Missouri? Does not Missouri, through her University, educate teachers in agriculture for rural schools? Do not the several normal schools of Missouri have a chair of agriculture in each school to teach her to-be teachers how to teach the elements of agriculture? Has she not erected a magnificent system of agricultural education that will make harder and harder your efforts to compete with her until you match each energy directed towards higher education with hers? Is it not true of Illinois and other states that elementary education in agriculture is coming into the common schools? If we must have our present system, I would erect in every county a high school of agriculture and let that fit the boys and girls for the State University.

I regret that for lack of time I must leave my subject thus brokenly handled. I will take one moment to say that in my review of the educational system of Europe I was struck by the magnificent organization in Belgium. It is a country far under the size of the State of Maine, with very much inferior agricultural resources but with a population of millions—I think several millions. She has her system of education for the farmer that places in every province—and a province is smaller than a county in Maine— a lecture course each year in a series of fifteen lectures. In every one of these 250 provinces a professor of agriculture is elected, with an assistant professor of agriculture, whose busness it is not only to work with the school force, but go out to the creameries and aid them, and also counsel with the farmers as to fertilization and experimentation and aid them with counsel in both the science and art of agriculture.

This bears on the direct education of the farmers. Then for her rural schools she has a primary school in agriculture and horticulture, for women as well as men. Then she has secondary schools where a little broader agricultural education is acquired, and then there is the central Agricultural College. Were Maine equipped as Belgium is equipped, you would have scores of agricultural schools and a powerful state central agricultural college.

TECHNICAL TRAINING FOR PRACTICAL LIFE.

By Dr. Geo. E. Fellows, Orono.

(Stenographic Copy.)

In speaking on such a subject as this, it is necessary that we define our terms. A great deal of effort is wasted in this world, in the way of public speeches, by talking on generalities, or upon things with names which other people understand to mean something different from that which the speaker himself means. So in the beginning let us ask ourselves two questions—What is technical training? and what is practical life? If we understand clearly our terms, we shall have no difficulty in reaching a common conclusion.

What is technical training? It is training in the way of materials and tools as distinguished from general knowledge of the subject. A simple illustration or two will bring it more clearly before us. Suppose you wish to engage a preacher in your community. You have a man who is learned in church history, who is profound in his Christianity, who is an excellent pastor, who has learned the dogmas of all theology, who has all of the general training and depth of character which you desire in a preacher, but if he lacks skill in argument, force in his delivery, or practical use of logic, the mere technical points which put together make a skilful sermon, he is not the preacher that you want. Possibly you would prefer to have him in your community to some man who is a better preacher, but, if a preacher is what you want, all of the breadth of learning or depth of character or knowledge of Christianity will not take the place of the technical training. He needs all of these to be a proper pastor, but he must have training in the definite exercises which bring his knowledge before the people, or his knowledge, training and character are of no value to the people whom he serves. Just so there are men who are called doctors who have the theories of medicine, who have been through the schools, and yet who have never learned to use a surgeon's knife with such skill that you would wish to trust the life of your child in their hands. That is the difference between technical training and knowledge of the subject.

What is practical life? The most obvious answer every one has in mind. It is an occupation in which the hands, perhaps, are used more than the brain. That is not the correct answer; it is not my answer, it is not yours when you stop to think. Anybody says a machinist, a blacksmith, a farmer, a newspaper man is a practical man. Most people would say off hand that a lawyer, a physician, a minister, is not a practical man. I offer this as a suggestion. The definition of a practical man is any one who lives in the world and produces anything of use to himself and the rest of the community. A man who lives in the world and does not produce anything either from his brain or from his brawn, I think perhaps is out of the class of practical men; but a practical man may be just as well a physician as a farmer, just as well a lawyer as a blacksmith, if he produces something.

Now, then, does the practical man need the technical training? Is knowledge all sufficient for existing in the world and having the responsibility of earning a livelihood, and of caring for the lives and the health and the property of children? Of course it is not. A knowledge of a subject is not all that is necessary, by any means. A man may know the theory of almost any business, but unless he has command of the tools and of the materials, his knowledge may be almost useless to him. It certainly will be useless to others, if it is not useless to him.

There are two purposes in technical training. There may be more, but two are obvious. One is for the protection of the public and the other is for the success of the individual. Certain laws have been enacted which compel every one who will practice the physician's art, or who will practice before the courts as a lawyer, or who will dispense drugs from a pharmacist's store, to have gone through a certain series of technical lectures and practices in some school or institution established for the purpose. He has to pass an examination which proves that he has prepared himself in these lines. No man may prescribe for a fever, may amputate a limb, may plead before the courts except in his own behalf, or may compound medicines legally who has not had this training in some authorized institution and who has not a diploma or a certificate to show upon demand to those who would employ him. This is necessary for the protection of the public. We all demand it. We do not wish quacks to practice upon our families, we will not have pettifoggers to look after our property, we will not risk taking carbolic acid in place of sulphur. We must have people who know the difference between the right and the wrong in their occupatons. Is it not strange, though, that we do not demand with the same insistence that the people who practice other things that have just as much to do with our present and eternal welfare as the man who would give us poison in place of food, should have the same technical training? My predecessor spoke about the inefficiency of schools in certain districts or localities. We send our children, whom we think have eternal souls, to have those souls moulded by the most inefficient teachers that can possibly be found. People who cannot earn through the labor of their hands or the exercise of their brains above twenty or thirty dollars a month, at anything which is actually productive for the community, may possibly find occupations in the schools in some places. Of course it is not where any of you live, but there are people in certain places who can find employment as teachers who cannot find employment in any other occupation. You know Will Carleton had a poem about the man who was going to make an editor out of his son because he was good for nothing else. In some places they make preachers out of those who are good for nothing else, and in a great many places they make teachers out of those who are good for nothing else. Why should we not demand technical training for the teachers as well as for the doctors?

Technical training is obviously necessary for the protection of the public. It is also necessary for the success of the individual. That, I think, hardly needs an illustration. Probably there is no one in this audience who would have to think one moment before he would remember some one of his acquaintance who, with technical training in some line, no matter what it is, has achieved success, while others who had apparently the same knowledge, the same opportunities in life, have achieved at least less success. It is true that many people come to the front without technical training, that is, training in the schools. If every one was quick witted, a close observer, drawing correct conclusions from his observations, he might not need the technical training. But unfortunately, or possibly more fortunately, there are not many geniuses in the world. There are none in my family, and I have not heard of any among my immediate ancestors, nor am I expecting them in my posterity. It may be that some of your families are not supplied with geniuses. In that case, we need something which we would not need if we had genius. The genius may succeed without training, but other people need it. Many of us are in the category of the other people. No one claims that technical training is all that is necessary for the practice of any profession or occupation. So far only the laws have taken us—a physician, a lawyer, a pharmacist, must have certain technical training. It is possible, then, to enter the practice of these professions with nothing but the technical training, that is, without the education of a college or university, or of any higher institution of learning, in some cases even without the high school preparation; but at least the public has recognized that a technical training must be provided. Apprenticeship, which at one time was the road to the professions, is no longer able to lead to the success obtained through a technical training. An unprepared man needs to be told what to observe, and then he may observe the wrong thing, or he may draw wrong conclusions from his observation. I have no doubt that almost every one in the audience has had experience with some one in his employ whom he has told to go and observe something and if so and so results, to do certain things. He has gone there and either having observed the wrong thing or drawn the wrong conclusion, the result has been disaster to your cattle, your money, or some other thing in which you are interested. The time for the mastery of professions and occupations by mere practice has gone by. Schools of art, institutions of technology, schools of design, were never invented for the mere mental exercise of invention. They would never have been established if there had not been a demand for them, a demand on both sides, demand by the workers themselves for superior training, and demand by the public for workers trained in a superior manner. The very existence of schools of technology, of agricultural colleges, of schools for textile training, for watch making, and the innumerable other devices for teaching the actual practice of something, which you see advertised in all your papers, show that there is a demand for these things or there could not be a supply. Demand precedes supply. I think that is a safe economic proposition. Supply does not always create demand, but demand will always bring about a supply. The competition in modern life has become so keen that the artist who would practice his profession may not have merely a keen eye for color and a skill in handling his brushes, but he must know the actual anatomy of the animal which he would paint. One of the greatest artists of the mediæval times, and because the greatest artist of that time the greatest of all times, spent more years in the study of anatomy, in order that he might know how to paint the flesh upon the human frame, than nine-tenths of the physicians that are practicing medicine and have your life and my life in their hands. He studied anatomy although he was to be a painter and a sculptor, and thereby he surpassed other men who did not follow the same method.

We could pick out an illustration from almost every walk in life where the demand of a man of superior mind for a superior training has resulted in the eclipsing of all rivals in the field in which he worked. Competition is constantly growing in everything. We have heard it talked here this morning and this afternoon in the dairy business; in the making of butter, in the production of milk, in the making of cheese, in all of those lines in which this conference has assembled to give instruction. And it is the same in every assembly of men who meet together to discuss those problems which come up because of the close and keen competition in all the lines in which they are occupied. Nothing but the sharpest wits and the best training of those wits enable a man to win success at the present time.

But after we have granted that something is good we are often asked, or are apt to ask ourselves, does it pay? How many good things there are that we think at first do not pay. There are two kinds of "pay," possibly more than two. We educate our children; misfortune comes to them, some accident makes a cripple of one and dire disease comes to another. We watch patiently for weeks; we are weary through their suffering; we employ skill; when our own strength is exhausted we employ professional nurses to watch over the little sufferer; and the disease, perhaps, passes or the misfortune is overcome, and the child grows to maturity. We have spent our life and our energy and our money in the rearing of the child or the group of children. Are we looking for pay in cash? When the child has reached his maturity do we immediately demand that he shall earn money and pay us back and pay us double time for the nights we have worked during his illness? How many of you would collect double pay in cash for working after six o'clock over a sick child? It is so absurd that your face wrinkles with scorn at the thought. You do not want pay in money for that kind of work. You would not have it if it were offered to you. The most that any indulgent parent would ever care for from the children for whom he has cared in their youth is kindness and thoughtfulness in times of weakness and old age. It is the wealth of affection. Does it pay? Is there one who would say that weeks or months or years of the tensest strain in caring for an unfortunate one in his own family did not pay? For one smile, for one moment of ease from pain of that loved one, for the success in life of the one who has recovered from the disease, who has become useful to others, we would go through it all again, any of us, all of us. It pays, then. That is only one illustration. A thousand things in life pay in this way. They are worth doing for themselves, they are worth doing for the feelings that we have within us for having done them.

Then there is another practical side to it. Suppose we have no money. Suppose that many of these trials that have come upon us have brought us into debt, and we have no one upon whom we may call for assistance in a financial way. Then the question must come, whether we will or not, does it pay in dollars? Technical training pays in almost every other way than in dollars. We may grant that. Does it pay to spend five hundred dollars in travelling in various parts of the earth, to stand in awe before those immense pyramids in Egypt, constructed of such immense blocks of stone that even the modern engineer trembles to think of the possibility of reconstructing them? Or to stand before some of the magnificent works of nature, and hear the thunder of the cataract at Niagara or see the mountains that lift their heads five thousand feet above the earth; to stand in admiration before the pictures and sculptures that were made hundreds of years ago, possibly thousands of years ago; to watch the towering of the spires in some of those magnificent cathedrals in Europe, like the Cathedral of Milan, where the spires are like forest trees in number and beauty? Does it pay to do all of those things, in other ways than in cash?

But it pays in cash to have a technical training. The physican who takes pains to get the broadest education possible, who takes the ordinary technical training which gives him his diploma and makes him a doctor of medicine, and afterward takes graduate courses, and studies in hospitals, who is a continual student and learns of every possible case which will bear upon his specialty in his profession, finds himself so far in the forefront of his profession that he has scarcely time to attend to the important cases that come to him. It is almost universally true that this is the case. There are men whom you would rather consult and pay a fee of one thousand dollars, if you had to borrow every cent of it and work for years to pay the debt, than trust that same case to some other physician who lacked the skill and the reputation of the one first mentioned. When those things come home to us we feel their truth. When you are on trial for your life you employ no pettifogger, but a man who has the training, and the training on top of the natural ability, whom you think can save you in this great crisis.

Here in the Dairy Conference we are shown plainly that those who have taken technical training in the business in which they are engaged are more successful financially than those who have not this training. The man who is a graduate of an agricultural college, who has studiously followed all of the bulletins sent out by the Department of Agriculture of the United States and the agricultural journals, who has consulted with others in such meetings as this, finds himself better able to handle his farm and market his products than the one who blindly shuts himself up and says that his experience and that of his father will suffice. One of the best illustrations we have occurs right here in our midst. The legislature last winter passed an appropriation to employ an expert in the dairy business, to go about this state and see what good he might do. He began his work and after a short time he discovered what perhaps he knew before, what we all know when we stop to consider it, that any man to be a success in any line, however narrow, must be broader than his profession. A man who is only just wide enough to fit the niche he is to fill will soon find himself rattling around in that niche. He must be broader than the niche he is placed to fill. So this dairy instructor, after a little experience, finds that he must know something more than the actual practice of what he is sent out to teach, and he goes away and studies, spends a large amount of money to go to an institution which is famed for its knowledge and skill in dairy work. And when he comes back, whether he gets paid another cent more for his expenditure, he will live a broader life, he will be of more value to every man with whom he comes in contact, and the State of Maine will be proud that somebody who is to serve it has broadened himself beyond the attainments he possessed when he secured the position. He could have held his position, probably, without this. No one of us can afford to be narrower, or as narrow, as the business we practice.

Does technical education, then, pay? It seems to me that it pays from every possible standpoint. Ordinary ability trained is greater than magnificent ability untrained. How many of us have friends or acquaintances of whom we say, if that boy or that girl had had training he would have been an artist, a musician, a machinist! But he lacked the training, fortune did not give it to him, he did not have the opportunity, some burden fell upon him so that in his youth he could not obtain it. All honor to the man in middle life, or even approaching the years of old age, who feels that he will recover from the misfortune of his youth by going away and training himself in some line of work. I have been in some of these institutions of learning and seen men old enough to be my father studying under men young enough to be my son, and they are getting their remaining years enriched and broadened so that if they have but one year more to live they will enter heaven with a broader view and will walk the golden streets with a lighter step and their crown will be much more sure to fit, and their harp will not be out of tune, because of that study. I hope that you agree with me that technical training is a necessity for practical life.

THE COW THE FRIEND OF THE FAMILY.

By R. W. Ellis, Embden.

(Stenographic Copy.)

We have heard two very able lectures this evening, rather off from the general trend of this meeting, and I am to occupy a few moments in bringing you back to the main theme. I will give you a little of my first experience in dairying, and the reasons why I selected that as my business for life. My father was a Methodist minister of sixty years ago, and if you know anything about their lives, you will know that it was not a very remunerative business. They relied for their living upon whatever the people pleased to give them. If they were good beggars they would get a pretty fair living. If they did not believe in begging, sometimes they would go pretty short. My mother was a good, Christian woman. She believed it was my father's duty to preach, and she never murmured. She did the best she could with her little family, but finally she thought she had stood it as long as she could, and she said to my father, "If you will buy a little place and one cow I will go to it with the three children and with what you can give we will try to get a living." He bought a little place and one cow, and, my friends, I never shall forget that cow. She was a red cow with a white face, and she looked good to me the moment I saw her. I was eleven years old at that time. I took care of the cow and milked her. We called her Charity Sweeten, and she truly represented that name, for many and many were the deeds of charity she did to this little family, and she certainly sweetened our lives all the way along. My mother was a good butter maker and she made a good lot of butter from that cow, and she and I used to take it to the store and trade it for the groceries that we must have, and the children lived principally on the milk. I have lived on bread and milk for a great many days, and I like it today just as well as I ever did. We did not have milk that came very near the top. The cream had to be taken off. The first calf was a heifer and after she got to be a cow, those two cows supported the family in good shape; and

Jersey cow Queen, 2124, Record, 2.676 pounds of butter in one day. Owned by A. P. Russell, Leeds.

with what my mother could earn with her needle and what my father got we soon paid up for the little place. I drifted away from home and staid for six or eight years, and when I came back and settled down for life, was it not perfectly natural that I should remember the good cow, in looking for a business? I knew what she had done, and was satisfied what she would do for me. We started in with four cows, and have kept at the dairy business from that time to this, and those cows have stood by us and have fed us and clothed us and given us a competence all through life. We have raised six children, and they have fed and clothed them and educated them fairly well. They enabled me to help my children to a better start in life than I had myself, and they have left with me enough to carry me through. That is what the cow has done for me and for my family. I am asked to speak of the cow as the friend of the family. What does she do? It is easier to enumerate the things that she does not do. Many and many are the things she does for the family. Her milk is the foundation of all infant foods. Not only does she raise our young children but she raises all our young—our calves and pigs, our cosset lambs, our colts, our puppies and kittens. Every domestic animal she feeds and rears for us. And she spreads her golden coat over almost everything that we eat. She shortens our doughnuts, our pie-crusts and cakes. She makes many of our puddings and furnishes the sauce for many more. She makes our toast, our cream pies and cream cakes, she butters our beefsteaks; and by the way, if it were not for her we should have no beefsteak to butter. What would a young man do when he goes out walking with his best girl in the evening if he could not drop into a saloon and get a plate of ice cream? and what would we do with all our berries in summer time if we had not some good, sweet cream to eat on them? and what would we do if we sat down to eat our mush and milk and hadn't the milk? By the way, what would the good housewife do anyway if she hadn't the product of the cow? As well blot the sun out of the solar system as banish the cow from this country. So I say, long live the good, useful cow!

SOME EVERY DAY PROBLEMS ON A DAIRY FARM.

By F. S. ADAMS, Bowdoinham.

(Stenographic Copy.)

The subject that I am to speak upon is an important one. I have been coming in contact with these problems every day of my life for some twenty years and I find today that I know less about them than I thought I knew twenty years ago. The most important problem, to my mind, and the one that presents to me the most difficulties, is the problem of breeding. I want to say right here that I think we have made a decided improvement since we first held a Dairy Meeting at Winthrop. Every speaker at that meeting referred to the cow as a machine; at this meeting every speaker denies that she is a machine.

The great problem that confronts the dairy farmers in the State of Maine is how to breed a profitable dairy cow, whether she is Holstein, Jersey or Guernsey. I do not care what breed she is, if she is a profitable dairy cow. How can we get those cows? Many speakers at this Dairy Meeting say to us, and the agricultural papers say to us, you must have a cow that will produce 300 pounds, or 400 pounds of butter per year. If she does not do that, she is a beggar, she is a boarder, she is a thief. That may be true, but the serious problem is how to get these cows. You cannot go out and buy them. If a man has them he will not sell them. The only way left for us is to raise them ourselves.

To my mind there are three conditions that enter into the breeding of a profitable dairy cow. I heard a speaker a few weeks ago say that he could tell the character of a man by his dog, and he could tell the character of the woman in the house by the cat. I will go farther than that and say that you can tell something of the character of a country (I will take in the whole country) by the kind of stock that is kept. Our cattle are affected by the conditions that surround them, just as we are ourselves. Through the process of evolution we as inhabitants of this country and of this earth have come up from a savage state. I remember our old geographies spoke of people being divided into classes; it mentioned the civilized, the half civilized and the savage. It is not so very long ago, in comparison with time, when our ancestors were savages in the British Isles. Through certain moral influences, the churches, the schools, and other influences, we have been evolving and evolving until we have the intelligence and the civilization that are found in the State of Maine today. But let these moral forces cease for a time, and what would be the result? It would not be a great many years before we should be classed with the half civilized or the savage. It is a law of nature that man and animals deteriorate faster than they progress if the conditions are not favorable. To illustrate this point I want to refer to a story I read a short time ago, "The Call of the Wild." It represents a highly civilized dog, a Saint Bernard, who was owned by a rich man in the West, one of the most faithful and trusty dogs, noted all through that section for his faithfulness. But occasionally this dog felt the "call of the wild" in him. It happened after a while that he was stolen and carried into Alaska, there to transport mail across the frozen plains. He got into bad company, and had to steal or die. The call of the wild grew stronger and he commenced to deteriorate and he became the most successful thief in the dog team. As time went on and conditions became more unfavorable, he became virtually a wild wolf and joined himself to a pack of wolves.

One difficulty we have to contend with is the tendency of our stock to go back to the first condition, I will call it the "call of the wild." The important points to be considered are the surroundings, the feed and the breed. We are not going to try in our lifetime to make a different dairy breed. If we are starting out to breed dairy stock, I have found that it is wise to get the best foundation stock possible. See that they come from producing ancestors on both sides. Then you have good blood to start with; then give them favorable conditions. We hear a great deal today about the Jersey cow in the State of Maine deteriorating. I have heard successful farmers and successful breeders say that the conditions were such in the State of Maine that the Jersey cow would deteriorate, you could not hold her up to the standard. A gentleman since this meeting commenced has told me that years ago he could go out and buy better Jersey cows than he can now. There must be a reason for this. When the Jersey cow was first brought over here she found unfavorable conditions and surroundings. You know what the conditions were years ago. Our old New England farmers were hardy, strong and vigorous men but stern disciplinarians. They believed in the saying of Solomon, "Spare the rod and spoil the child." That saying they carried out in the care of their stock. The Jersey cow met with unfavorable conditions the moment she landed in Maine. Is it strange that she commenced to deteriorate, that the "call of the wild" grew strong, that she commenced to go back? But for the last twenty-five years there has been a most rapid advance in dairying in this State. We have learned how to handle and control these conditions, and the result is that in my opinion the Jersey cow today is improving. We are giving her as near as possible like conditions to those she had in her native country, and that is right.

Now, to look at the practical side, the quality in the Jersey cow is fixed, she gives a rich milk; what we want is the quantity. I think I have learned by my experience in breeding that in going out to buy a male to head our stock we should first see that it comes from ancestors that produce large quantities. In buying a Holstein, I should reverse this. I made a mistake when I first started in, by thinking that I could get a better breed. I commenced to cross Holsteins with Jerseys, and it was a complete failure. I learned that when you cross a Jersey with a Holstein you are just as liable to get the Jersey quantity and the Holstein quality as you are to reverse the operation. Occasionally you will get a grand good cow, but it is not a safe proceeding. In the State of Maine today there seems to be a turning away from special purpose cows and a looking after dual purpose cows. There have been more Shorthorns imported into the State the last year than any other one breed. The verdict has gone out that the Shorthorn is a dual purpose cow, an all-round cow. Now I am not very much of a believer in all-round cows. I have made a mistake along this line. I would not discourage farmers in some sections of Maine, in the remote sections, out of the reach of creameries and good markets from trying, perhaps, to find the dual purpose cow; but the dairy type and the beef type are so entirely different that the man in reach of a good creamery, getting a good price for his product,

Jersey Bull, Soules Pedro, 1384. Owned by A. P. Russell, Leeds.

or the man who has a good home market and is making private dairying a specialty, in my judgment cannot afford to fool with dual purpose cows. Did you ever hear of a man who was breeding trotting horses trying to get a trotting horse and a draft horse combined? An absurd idea, because it cannot be done.

The three points I want to make are these: First, start in with good blood; get good stock with good pedigrees. Then you must give the right kind of feed, and then you must have favorable conditions and surroundings. You know in the vegetable kingdom, by giving our corn plant, that we think so much of, unfavorable conditions one year, it will fail to produce ears, fail to reproduce itself. We see the result quicker in the vegetable kingdom, because the life of the plant is short, but the process is just as surely going on with our animals. Unfavorable conditions mean deterioration. If you are raising your own stock, a great deal has to do with the care of the calf. In the first place, he must be well born. I think many farmers make a mistake, I know I have, in allowing heifers to drop their first calves too young. With a great deal of pleasure I heard Mr. Ellis say yesterday that his heifers came in on the average at 31 months old. It has been the custom to a great extent to have calves dropped at two years, or often less, and the heifer is not fully developed. She has not got her growth and, in my judgment, we do not get the strong, vigorous cow that we would get if we should not let the calf come until the heifer is older.

Another mistake is this: the Jersey is a very persistent milker. She has a tendency not to go dry, and many of them are milked year after year. I once heard a man say that he had a cow which had been giving milk continually for nineteen years. I believe that the cow should have a rest of at least six or eight weeks. Then you get a stronger, more vigorous calf.

The question now comes, How shall we rear that calf from its babyhood? Do you know that this nation is a nation of dyspeptics? Why? Because the little boys and girls before they get their growth are dyspeptic, they are not reared right, they have not the right kind of food. We often raise our calves under conditions that make them dyspeptic in the cow sense. This little calf should be given food that will completely develop him along all lines, and never food that contains a large amount of fat. Give him skim-milk and ground oats. I do not think we farmers appreciate the value of ground oats. They are a good food for all kinds of stock, and there is nothing like them for growing stock. Watch the heifer calf all the way and when she comes to maturity perhaps you will be pleased and not disappointed.

But the most difficult problem of all, and one which I have not yet solved, is this: with all the conditions which I have mentioned faithfully observed, how may we be sure of raising good calves? Take all the pains I can, and get good blood on each side, not more than half the calves that are dropped in my herd are worth raising. Why, I do not know. They do not develop into ideal dairy cows. They are lacking in various parts, and in my observation in the State of Maine, of the Jersey cow in particular (I know more about her than any other breed), they are more lacking in the development of their fore udders than in any other one point. If we can ever solve the problem of how we can breed good dairy cows every time, a great work will have been acccomplshed for the dairymen in this country.

Another problem that confronts dairymen is the feed. The question of starch foods has been solved in this State. There is no excuse for any dairyman in Maine, in my judgment, to buy one pound of corn meal or any of the starchy foods unless we have unfavorable years and have failed to produce a corn crop. Our farms are wonderfully adapted to raising those kinds of food rich in starch. The other kind, those which contain protein, it is more difficult to produce here in Maine. I have been working all my life on this one problem—how to raise more of that kind of food and not buy so much of the miller. It is not gratifying when you have been to market with your butter, to leave two-thirds or three-fourths of the money to pay for grain. When we have so much cheap land that is producing nothing, it seems that we might raise it here. I have not solved that problem entirely, yet I have to some degree. I have found that by raising oats and peas we get that protein which we get in cottonseed meal, and I have found that we can raise them successfully in the State of Maine. They are natives of a cold climate and they get just the conditions that they want. I have also solved that problem somewhat by raising clover, but clover is a difficult plant to raise. If I could raise alfalfa here, as I know it can be raised in some of the western states, I should be happy. I have a brother in Arizona, and he states that the alfalfa crop there is enormous, 20 to 25 tons to the acre. But I fear that with the competition we shall get from those states, we cannot raise alfalfa. Unless there is some method devised, or some alfalfa plant found that we can raise, I fear that the West and the Middle West will defeat us in this line, under the old adage of the "survival of the fittest." There is no plant that will produce so much food on an acre as alfalfa.

Our next best hope is the clover crop, and my method with clover, in brief, is this: I sow my corn land to clover along in July, when the corn is well up, sowing nothing but clover. In attempting to raise clover we make this mistake—we sow clover, timothy and red top mixed together. Could we raise corn under those conditions—mixing corn, barley and oats? We do not give the clover a fair chance. Sow the clover alone and give it a chance to grow and get fairly rooted in the ground before the long, cold winter. A year ago last July I sowed five acres in clover in the corn field, and I had a magnificent stand of clover. If you think the clover would fail to make a good stand, sow on a little commercial fertilizer; even 50 or 100 pounds would have a wonderful effect. Try to get it strong and vigorous so it will stand the winters. You remember the severe drought last spring, and how dubious it looked for the State of Maine. We thought we should not raise any hay, and I made up my mind at that time that, as our Editor of the *Maine Farmer* has always maintained, Hay is King of the State of Maine, and if the hay crop should fail for one or two years there would be a famine. But the clover came up well and I had a wonderful crop. I mowed that clover the last of June and the first of July got it in, and a second crop immediately came up, and the second crop was equal to the first. I revolved in my mind the problem whether I had better plow it in or cut it. I concluded that it would be an expensive fertilizer, and I made up my mind that I would turn in a few cows. I picked out 12 Jersey cows, practically fresh cows, and during five weeks I did not feed those 12 Jersey cows one spoonful of grain or one bit of food of any kind. They actually got their living on that five acres of clover, and they produced on an average 100 pounds a week. I had saved quite a feed bill, and I am going to repeat that experiment this year. Perhaps you will say that is a wasteful practice, and I am not sure, myself, whether I should not cut it and put it into the barn.

It is along this line of raising clover that we are going to solve the question of raising protein, and are going to compete with the farmer who is growing alfalfa.

DAIRY LAWS AND THEIR ENFORCEMENT.

By GEO. M. WHITAKER, Dairy Inspector U. S. Department of Agriculture.

(Stenographic Copy.)

I am here today by order of the Agricultural Department at Washington, to bring to you its greetings and best wishes, and to convey to you its deep interest in Maine dairying and the Maine Dairymen's Association. At your meeting a year ago, I notice by the printed proceedings you adopted a resolution complimentary to Major Alvord, the Chief of the National Dairy Division. He would have been glad to be here today, and to thank you personally and extend to you his congratulations at the success of this pleasant and profitable meeting. But the National Department must be represented in many places at the same time, and he is attending a meeting similar to this with the dairymen of Pennsylvania.

Dairying seems to me the most important subdivision of agriculture for three reasons: First, on account of the magnitude of the business. The dairy products of the country are said to be worth as much annually as the gold production of the world. The census places dairying in a prominent position, and if the statistics were analyzed it would be found that perhaps nothing except cotton ranks ahead of dairy products. In the official figures meat production outranks dairying, but meat production includes pork and beef, which are entirely separate and distinct specialties. Corn and hay outrank dairying, but that to a great extent is a duplication, for much corn and hay are produced for feeding dairy animals, beef animals or hogs. So that when we look at the exact facts of the case, the product of the more than 20,000,000 cows in this country, with the investment in farms, barns, creameries and other appliances, puts dairying into the very front rank.

A second reason for the importance of dairying is its universality. It would require a stretch of imagination for one of your dairymen here in Maine, with the ground covered with snow, to hail a cotton planter of the South as a "brother farmer," or to grasp the hand of the wheat grower of the West as a "brother farmer." But dairying is pretty much the same everywhere, and is practiced in every State of the Union. The Maine dairyman could drop into a dairy convention in Ohio, Texas, Florida, or California, and discuss intelligently with the men there such problems as the nutritive ratio, commercial starters, the Babcock test, and pasteurization. He would feel perfectly at home, and that the fraternity of common practices, troubles and investigations knits together the dairymen of the whole nation.

A third reason why dairying is very important is that it calls for more skill than any other agricultural specialty. Dr. True, in a recent lecture in New Hampshire, subdivided agriculture for the purpose of a scientific course of study in our colleges into five departments—crop production, animal production, the conversion of raw materials, rural engineering and rural economics. Many farmers get along with a knowledge of only one or two of these branches. The dairyman, however, must know something of all. He must know something about animal production in order to have the best cows. He must know something about crop production in order to raise the crops to feed those cows. He must know something about the conversion of raw material in manufacturing butter or cheese from milk or cream. He must know something about rural engineering and the questions that pertain to ventilation, sewerage, irrigation, location of buildings, and the planning of the creamery, the barn or the dairy room. And last of all he must know something about economics in order to sell to the best advantage. So that dairying includes a knowledge of something of all the five subdivisions of agriculture, and therefore calls for more skill than other specialties that require a knowledge of only one, two or three of them.

If dairying is so important by reason of its universality, of the skill required and of its importance statistically, we may reasonably infer that it is a proper subject to receive much attention from our state experiment stations; and it is also fitting that dairying should receive considerable attention from the National Department of Agriculture. You may be interested to know what the Department, through its dairy division, is doing for the dairymen of this country, but in the closing half hour of the last session of this convention there is hardly time for me to go into details. I can say in brief that national power can do many things which it is impossible for states to do. For instance, suppose we want to know something about the composition of the butter that is found for sale in different markets, Chicago, St. Louis, Boston, Providence, Philadelphia. No one state could undertake that, but the national government can get samples from all of these different markets, can analyze them and tabulate the results, and publish a very important and useful bulletin on the composition of butter. Again, the national government can study the foreign markets, examine the butters found therein, and make suggestions and give information along these lines. The department can also do work in co-operation with state experiment stations, in studying problems that are of more than local importance and really belong to a group of states or a section of the country. The national department has recently issued a valuable bulletin on the sale of milk in the large cities of the country, including a description of the methods of distribution all the way from Boston to San Francisco.

Up to this point I have been speaking of the educational work of the National Dairy Division. It does, in addition to that, work of a different nature. At your meeting a year ago you passed this resolution: "Resolved, That renovated butter is second only to colored oleomargarine as a counterfeit and fraudulent competitor of all genuine fresh butter, and should be subjected to similar legal restrictions. The provisions for taxing and stamping renovated butter included in the so-called Grout bill are approved and the regulations for identifying this article when sold, which have been made by the Secretary of Agriculture, are fully commended. That officer is respectfully urged to require strict compliance with those regulations."

I can say that your request has been faithfully complied with; not that the law has been perfectly enforced, there is nothing perfect in this world, but there has been an honest intention to comply with your desire, with a corps of inspectors all over the country. That law requires, first, that every tub or box of renovated butter coming from the factory shall have upon it a revenue stamp, a label and a brand showing unmistakably what is in the package. Then every package, whether print, box or tub, must have the words "Renovated Butter" impressed into the butter itself. And if it is in prints the wrapper must bear the words "Renovated Butter," which must be the largest of any on the wrapper, and there must be no fraudulent, deceptive or misleading trade mark or advertisement. Further, the renovated butter must be sold only from the original package. Then, again, the factories where renovated butter is manufactured must be inspected by the department in order to make sure that nothing but what is wholesome is used, that the methods are cleanly and that no adulterants are employed. And finally, no renovated butter can be exported, unless it has been inspected and bears a certficate of the inspector of the Dairy Division.

Perhaps you may inquire, "Of what use is all this to Maine dairymen?" I will partially answer with a little personal experience which is not wholly complimentary. In carrying out the instructions of this law and of the department, I paid a visit to Lewiston one day last summer and spent some time in looking around among the grocery stores. I went into several stores and asked, "What kind of butter do you have here?" The answer was, "We keep two kinds, creamery butter and farmers' butter." It developed that with the grocers of Lewiston, at least, the expression "farmers' butter" is a kind of trade name meaning second class butter. Consumers who want first class butter buy the creamery butter; for the cheaper trade the grocers have "farmers' butter." I hope the influence of this dairymen's association will be such that as the years go by the stigma will be removed from the word farmer, and that it will not be synonymous for a second class article. But the point I started to make was that if these grocers should supply the demand for a second quality butter with renovated butter the demand for the product of the Maine dairymen would be greatly curtailed; hundreds and hundreds of pounds of farmers' butter which are now reaching consumers in the cities of Maine would not find a market—being replaced by this renovated butter. It is a wholesome food—pure butter—and when marketed honestly it is a legitimate article of commerce. But when sold under conditions which restrain deception, Maine farmers' butter has a fairer chance, both articles standing on their own merits.

It is now too late to take up exhaustively the subject which you assigned me on the program. I will say in brief that if you had allowed me sufficient time to deliver the lecture which I had prepared, I should have developed five points. The first is that dairy laws should not ask too much. We are hedged about by natural laws of business which cannot be violated, and also by certain requirements of state and national forms of government. Hence there are some things which legislation can do and there are other things which it cannot do. An intelligent request for legislation must be based upon a knowledge of those facts; nothing should be asked unless it seems to be constitutional and unless it is within the range of economic reason. Second, no law will enforce itself. We often hear this remark in ordinary conversation, "Such a thing is wrong and there ought to be a law against it." But the mere spreading of criminal law upon the statute books will not wipe out vice. You must have some one to enforce those laws. They will not take care of themselves.

The third point I would impress upon you is this: evidence is a fundamental necessity in enforcing law. When I was enforcing dairy laws in Massachusetts once in a while some one would say to me, "Why don't you shut up A or B?" I would say, "Where is the evidence?" "Oh, everybody knows they are violating the law," was the reply. You cannot convict anybody in court on what "everybody knows." There must be specific information. Accurate evidence in cases in court is like the breath of life to humanity. A fourth point to be considered in the enforcement of dairy laws is the human element in judges and jury. Many people have an idea the machinery of criminal laws is like some great automatic buzz saw, relentlessly attacking that which comes in its way. Some think it only necessary to find out that some one has been violating the law, then press the button and he will come out of court convicted and sentenced. Courts do not work in that way. There is a human element in judges and jury that must be taken into account.

Fifth, and finally, the Supreme Courts have to be taken into account. Sometimes after the best of efforts they will upset a law or modify it by their decisions.

To recapitulate, if I had been allowed to develop the subject as I wished, I should have made these points: First, the statute laws must be within the limits of the laws of business and the possibilities under our state and national constitutions; second, laws will not enforce themselves, there must be some prosecuting officer like a dairy commissioner; third, the inspector or the law officer must have facts, evidence, something absolutely seen and done by some witness; fourth, the machinery of our courts is in the hands of human beings, and is not an inexorable, automatic mechanism; fifth, the influence of Supreme Courts in construing law must be taken into account.

In closing I would again express the congratulations and best wishes of the National Department of Agriculture and the earnest desire of the Dairy Division to be in as close touch as possible with the dairy interests of each state and to be of the greatest possible service to the Maine Dairymen's Association, as well as similar organizations.

REPORT OF STATE DAIRY INSTRUCTOR.

I herewith submit my report, as Dairy Instructor, for part of year, from May 12, 1903, when appointment was made, until November 1st, when I left for Wisconsin to take the Winter Dairy Course at the University.

The greater part of the time was employed in visiting creameries and dairymen in the different parts of the state.

I also attended several Grange meetings and other farmers' gatherings and spent some time at Institutes and Fairs, as directed by the Commissioner.

The following shows the number of days in each branch of work:

Visiting dairymen and creamery patrons, 34 days; visiting factories, 32 days; attending meetings (mostly Grange meetings), 15 days; attending fairs, 14 days; attending Institutes, 11 days; attendance at the office, Augusta, 10 days; attendance at University of Maine, 5 days; attendance at Creamerymen's Association, 4 days. This does not include time on road or while doing the office work at home.

I find that the amount of business done by the factories shows an increase of 10 per cent. over the preceding year, and the prices paid to the producer, an average increase of ¾ cent per pound.

An organization of the creamerymen has been perfected during the year which has for its object, "To promote the dairy industry and to constantly improve wherever possible the creamery product of Maine" and the one rule which they have put in force is the paying of higher prices for the best product, and less for the inferior; thus giving the man who takes the care of his product he should, some incentive for so doing, and thus paying the most money for the best product, as should always be done.

The special dairy meeting at Presque Isle was a success, and while most of the farmers are too much occupied with potatoes at present to do extensive dairy work, there is no doubt but that the seed sown will sometime bear fruit.

The quality of the products of Maine creameries that ship cream seems very satisfactory, and this product has a good reputation, which our factories are striving hard to maintain, with evident success.

The quality of butter made in those factories which make a specialty of butter is excellent, and it is being sold to the most critical dealers in New England, showing that our factories, under the same conditions, can make just as good an article as those of any other state. But every factory receives more or less cream which is unfit to be used for sweet cream, and must of necessity be made into butter of inferior quality, and it naturally finds its way to the commission houses in our large market places and this has a bad effect on the reputation of our factory butter, while but little of our good product goes to commission houses. There seems to be but one remedy, which is to reduce the amount of poor cream so manufactured, by educating the producer to take better care of his product. The percentage of poor cream received at the factories is very small, but when we consider the vast quantities of the sweet cream, shipped as such, we can see at once that the percentage of butter made from this poor cream is large. As no one would put it out to regular fancy trade, it must of necessity go on the market for what it will bring, and gives us a market reputation which is not as enviable as is our cream reputation. We have in the state 62 creameries, 80 per cent. of which are selling sweet cream. Ninety-five per cent. of all the business done is by factories selling sweet cream, which shows that to be the general way of marketing our product. The cheese industry has fallen off considerably during the past five years, many factories having been converted into creameries or skimming stations. This is undoubtedly caused by the low prices of cheese for a few years and the demand at good prices for cream; but in the past two years, the price of cheese has rapidly advanced to a figure where cheese making is profitable even in competition with cream, and in consequence, many more factories will be operated this coming year. And as we are importing into the state large quantities of cheese, the outlook seems to be good, and localities not near to a creamery or transportation can undoubtedly make dairying profitable by operating a cheese factory, as it requires comparatively few cows for successful operation.

The dairy butter of the state should be considered in two separate and distinct classes; first, that which is made and delivered to customers direct by the producer and which is in most cases of fine quality and commands fancy prices. This is usually very profitable, though it requires considerable valuable time to prepare and market it, which must be done always by the same person if the standard is to be maintained and this is necessary to be profitable. The other class is that made usually by people having few cows and no established market. This class is far from satisfactory and is unprofitable, first from lack of care of product, second, because cream has been kept too long before there is enough for a churning and consequently a poor butter is the result; third, because the market does not care for this class of butter at profitable prices, as every lot is of different color, flavor and general appearance.

The work of the Instructor in this state is much more varied than in most others and the conditions are a great deal different, but the industry is now where a great deal can be accomplished by Maine dairymen, if they can be made to see their opportunities, when compared with the dairy states farther west.

Respectfully submitted,

S. C. THOMPSON,

Dairy Instructor.

Statistics of Agricultural Societies.

OFFICERS OF AGRICULTURAL SOCIETIES.

Name of Society.	President.	P. O. Address.	Secretary.	P. O. Address.	Treasurer.	P. O. Address.
Maine State Agricultural	B. J. Libby	Oakland	George H. Clarke	Auburn	E. G. Eveleth	Auburn.
Eastern Maine Fair Association	F. O. Beal	Bangor	Ezra L. Sterns	Bangor	S. D. Benson	Bangor.
Maine State Pomological	Z. A. Gilbert	North Greene	D. H. Knowlton	Farmington	Charles S. Pope	Manchester.
Maine State Poultry and Pet Stock Association	E. E. Peacock	Kents Hill	A. L. Merrill	Auburn	Thos. H. Schlater.	Auburn.
Androscoggin County	J. L. Cummings	Livermore Falls.	J. L. Lowell	Auburn	I. B. Clary	Livermore Falls.
Aroostook County	James Archibald	Houlton	Geo. T. Holyoke	Houlton	L. O. Ludwig	Houlton.
Aroostook, North	Frank P. Grant	Fort Fairfield	E. T. McGlauflin.	Presque Isle	A. E. Irving	Presque Isle.
Aroostook, Madawaska	Eloi Albert	Up'r Madawaska	Remi A. Daigle	Up'r Madawaska	Alexis K. Cyr	St. David.
Cumberland County	J. L. Robinson	South Windham	C. H. Leighton	Cumberland M'ls	F. D. Scamman	Gorham.
Cumberland, North	Q. M. Chute	Harrison	R. W. Fogg	Harrison	Geo. P. Carsley	Harrison.
Cumberland Farmers' Club	M. W. Pearson	Cumberland C'tr.	....	....	N. M. Shaw	Cumberland Ct'r.
Cumberland, Bridgton Farmers' and Mechanics' Association	Geo. A. Sawyer	Bridgton	W. E. Crosby	Bridgton	Frank A. Webb	Bridgton.
Cumberland, New Gloucester and Danville	E. K. Merrill	R. F. D. 2, Auburn	J. P. Witham	Upper Gloucester	Geo. W. Haskell	New Gloucester.
Cumberland, Lake View Park	Arthur Dyer	Sebago	A. L. Brackett	East Sebago	J. P. Fitch	East Sebago.
Cumberland, Freeport Poultry Association	A. P. Winslow	Freeport	George P. Coffin	Freeport	L. E. Curtis	Freeport.
Franklin County	J. H. Crowell	Farmington	R. S. Sampson	Farmington	Geo. M. Currier	Farmington.
Franklin, North	D. D. Graffam	Phillips	M. S. Kelley	Phillips	A. E. Bunnell	Phillips.
Hancock County	F. P. Merrill	Blue Hill	C. S. Snowman	Blue Hill	M. P. Hinckley	Blue Hill.
Hancock, North	H. T. Silsby	Aurora	J. H. Patten	Amherst	J. H. Patten	Amherst.
Hancock County Fair Association.	H. E. Davis	Ellsworth	H. F. Whitcomb	Ellsworth	H. J. Joy	Ellsworth.
Hancock, Eden	D. G. Hall	Eden	Ephraim Alley	Eden	W. L. Alley	Eden.
Kennebec County	E. R. Mayo	Manchester	L. O. Tebbetts	Readfield	C. H. Stevens	Readfield.
Kennebec, South	George A. Moody	Windsorville	A. N. Douglas	R.F.D.9, Gardiner	Jasper S. Gray	Windsorville.
Knox, North	E. E. Thurston	Union	Geo. C. Hawes	South Union	H. L. Grinnell	Union.
Knox, Camden Trotting Park Association	H. M. Bean	Camden	R. L. Bean	Camden	Guy Carleton	Camden.
Lincoln County	A. M. Card	Alna	B. A. Woodbridge	North Newcastle	F. M. Rafter	Damariscotta.
Lincoln, Bristol	Albert C. Fossett	Bristol	George A. Huston	Damariscotta	C. B. Woodward	Damariscotta.
Oxford County	Wm. J. Wheeler	South Paris	W.O.Frothingh'm	South Paris	W.O.Frothingh'm	South Paris.

Oxford, Riverside Park Association	H. S. Hastings	Newry	L. A. Hall	Bethel	E. C. Rowe	Bethel.
Oxford, West	J. A. Farrington	Lovell	B. W. McKeen	Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	J. W. Thompson	Canton	O. M. Richardson	Canton	D. W. Goding	East Peru.
Oxford, North	George O. Huse	Andover	John F. Talbot	Andover	Owen Lovejoy	Andover.
Penobscot, West	B. P. Hubbard	Stetson	F. E. Jewett	Exeter	F. E. Jewett	Exeter.
Penobscot, North	S. T. Mallett	South Springfield	B. D. Averill	Prentiss	E. A. Reed	North Lee.
Penobscot, Orrington	Albert G. Dole	South Brewer	N. A. Nickerson	Orrington	N. A. Nickerson	Orrington.
Penobscot, Lee Union	Nathan Averill	Lee	George B. Lowell	Lee	S. S. Foss	Lee.
Piscataquis County	Willis E. Parsons	Foxcroft	F. W. Leland	Sangerville	C. C. Dunham	Foxcroft.
Sagadahoc County	Wm. S. Rogers	Cathance	Geo. R. Tedford	Topsham	Lyman E. Smith	Brunswick.
Sagadahoc, Richmond Farmers' and Mechanics' Club	U. M. Lancaster	Richmond	Daniel Brown	R.F.D.13, Gardiner	D. W. Alexander	Richmond.
Somerset County	J. M. Hilton	Madison	J. F. Withee	Madison	J. F. Withee	Madison.
Somerset, East	J. A. Goodrich	R.F.D.2, Pittsfield	E. A. Webber	Hartland	Lewis Fish	Hartland.
Somerset, Central	S. W. Gould	Skowhegan	H. A. Archer	Skowhegan	E. D. Packard	Skowhegan.
Somerset, Bingham	Amon Baker	Bingham	John Redmond	Bingham	Edmund E. Hill	Bingham.
Waldo County	Giles G. Abbott	Belfast	B. H. Conant	Belfast	Fred Rackliffe	Belfast.
Waldo and Penobscot	W. B. F. Twombly	Monroe	F. H. Bowden	Monroe	F. L. Palmer	Monroe.
Washington County	Albert E. Lincoln	Dennysville	Sidney A. Wilder	West Pembroke	Clifton Laughlin	Pembroke.
Washington, West	J. E. White	Columbia	E. F. Allen	Columbia Falls	Willis H. Allen	Columbia Falls.
York, Shapleigh and Acton	Zebulon G. Horn	Horn's Mills, N.H.	Fred K. Bodwell	Acton	Wm. P. Ferguson	Springvale.
York, Ossipee Valley Union	R. G. Pease	Cornish	H. Lorin Merrill	East Parsonsfield	J. Merrill Lord	North Parsonsfield.
York, North Berwick	B. A. Parker	North Berwick	Charles M. Boyle	North Berwick	W. H. Furlong	North Berwick.

ANALYSIS OF EXHIBITION.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of animals for beef.	Number of cattle shown in herds.	Total number of neat stock.	Number of sheep.	Number of swine.	Number of poultry (coops).
Maine State Pomological	–	–	–	–	–	–	–	–	–	–	–
Maine State Poultry and Pet Stock Association	–	–	–	–	–	–	–	–	–	–	600
Androscoggin County	78	28	47	52	68	20	48	215	42	35	120
Aroostook County	62	24	32	23	4	–	12	95	60	12	17
Aroostook, North	103	32	76	49	12	–	62	169	41	9	25
Aroostook, Madawaska	28	1	–	4	12	5	–	22	21	3	–
Cumberland County	67	12	42	48	186	18	42	348	21	66	85
Cumberland, North	24	4	6	8	70	6	20	114	7	18	4
Cumberland Farmers' Club	10	5	36	17	54	10	20	132	–	18	44
Cumberland, Bridgton Farmers' and Mechanics' Asso.	22	11	71	18	66	4	30	200	–	40	26
Cumberland, New Gloucester and Danville	27	6	8	19	22	4	–	59	15	33	18
Cumberland, Lake View Park	14	1	–	–	–	–	–	1	–	–	6
Cumberland, Freeport Poultry Association	–	–	–	–	–	–	–	–	–	–	450
Franklin County	75	38	71	53	122	32	65	381	169	19	90
Franklin, North	46	9	37	48	164	24	36	318	30	15	58
Hancock County	20	6	5	25	30	16	–	82	15	30	10
Hancock, North	7	–	1	9	4	1	–	15	9	–	1
Hancock County Fair Association	21	10	17	27	12	–	–	66	20	12	43
Hancock, Eden	4	1	4	5	–	–	–	10	–	2	4
Kennebec County	42	13	28	53	172	32	65	363	39	48	98
Kennebec, South	25	19	18	39	124	18	27	285	8	7	20
Knox, North	32	6	16	27	38	3	44	130	14	4	16
Knox, Camden Trotting Park Association	10	3	12	–	2	–	12	25	–	–	10
Lincoln County	28	15	27	25	64	12	28	171	12	30	24
Lincoln, Bristol	17	1	3	11	30	–	–	45	9	–	8
Oxford County	60	37	63	93	148	20	48	409	132	40	52
Oxford, Riverside Park Association	20	22	33	39	34	30	24	124	31	10	4

Oxford, West	87	25	60	20	210	18	25	315	28	25	50
Oxford, Androscoggin Valley	40	10	15	12	56	–	8	101	10	2	50
Oxford, North	23	5	21	19	46	4	12	95	12	4	14
Penobscot, West	40	17	48	32	38	2	18	155	29	24	19
Penobscot, North	35	2	–	25	2	–	10	29	–	–	8
Penobscot, Orrington	11	1	–	7	–	–	–	8	18	7	4
Penobscot, Lee Union	4	4	14	6	8	–	–	32	–	–	–
Piscataquis County	–	–	–	–	–	–	–	–	–	–	–
Sagadahoc County	47	51	127	117	112	14	105	421	9	54	300
Sagadahoc, Richmond Farmers' and Mechanics' Club	24	4	16	12	18	10	10	70	–	12	19
Somerset County	20	10	8	56	34	10	–	118	93	–	2
Somerset, East	57	5	17	197	56	47	172	258	127	37	73
Somerset, Central	46	8	18	20	60	6	–	112	23	20	35
Somerset, Bingham	25	1	1	–	26	–	10	38	–	–	–
Waldo County	35	8	5	14	28	–	12	67	31	9	10
Waldo and Penobscot	73	18	46	73	96	47	88	368	44	19	14
Washington County	46	5	11	37	4	–	24	57	23	29	16
Washington, West	72	13	25	40	32	–	12	122	160	54	13
York, Shapleigh and Acton	8	1	–	11	110	12	–	134	4	1	26
York, Ossipee Valley Union	36	9	19	28	90	6	9	161	–	6	–
York, North Berwick	35	5	2	25	50	4	–	86	6	6	25
Total	1,606	506	1,106	1,443	2,574	435	1,098	6,526	1,252	760	2,511

ANALYSIS OF AWARDS.

Name of Society.	Amount of premiums paid trotting bred stallions.	Amount of premiums paid trotting bred brood mares.	Amount of premiums paid draft stock stallions.	Amount of premiums paid draft stock brood mares.	Amount of premiums paid family horses.	Amount of premiums paid gentlemen's drivers.	Amount of premiums paid matched carriage horses.	Amount of premiums paid colts.	Amount of premiums paid horses for draft.
Androscoggin County	$22 00	$9 00	$10 00	$10 00	$9 00	$10 00	$12 00	$54 00	$27 00
Aroostook County	13 00	6 00	47 00	6 00	5 00	5 50	–	22 00	3 00
Aroostook, North	5 00	10 00	8 00	10 00	13 00	13 00	–	61 00	25 00
Aroostook, Madawaska	1 50	–	–	1 50	–	–	1 50	4 50	4 50
Cumberland County	30 00	20 00	–	–	–	15 00	10 00	28 00	32 00
Cumberland, North	3 00	5 00	–	–	–	–	–	8 00	70 00
Cumberland, Farmers' Club	6 00	4 00	–	–	–	–	–	5 00	–
Cumberland, Bridgton Farmers' and Mechanics' Club	–	7 00	–	–	7 00	25 00	18 00	23 00	48 00
Cumberland, New Gloucester and Danville	8 00	3 00	2 00	3 00	3 00	5 00	5 00	5 50	–
Cumberland, Lake View Park	–	4 00	–	–	3 00	–	–	–	24 00
Cumberland, Freeport Poultry Association	–	–	–	–	–	–	–	–	–
Franklin County	14 00	9 00	10 00	6 00	20 00	20 00	16 00	23 00	29 00
Franklin, North	–	9 00	7 75	4 50	6 75	7 00	4 50	13 00	6 00
Hancock County	12 00	8 00	–	–	3 00	5 00	2 00	15 00	–
Hancock, North	–	2 00	–	–	–	–	–	3 50	1 00
Hancock County Fair Association	22 50	5 00	12 50	5 00	–	–	–	17 00	–
Hancock, Eden	–	2 50	–	–	–	–	2 50	–	–
Kennebec County	11 00	16 00	11 60	14 00	9 00	20 00	9 00	11 50	18 00
Kennebec, South	4 35	–	2 25	–	2 65	2 00	3 75	20 15	–
Knox, North	5 00	2 00	–	2 00	3 00	2 50	3 50	16 00	30 75
Knox, Camden Trotting Park Association	8 00	–	–	–	8 00	8 00	–	11 00	28 00
Lincoln County	5 00	6 00	2 00	1 00	3 00	–	3 00	8 00	7 50
Lincoln, Bristol	–	–	–	–	–	–	–	–	–
Oxford County	53 00	27 00	–	–	24 00	25 00	25 00	54 00	64 75
Oxford, Riverside Park Association	12 35	56 00	–	–	–	–	–	10 77	50 00
Oxford, West	13 50	9 00	–	–	5 00	25 00	14 50	22 00	35 00

Oxford, Androscoggin Valley	19 00	10 00	–	–	–	10 00	8 00	21 00	54 00
Oxford, North	–	3 75	3 00	2 00	–	–	2 50	9 25	20 00
Penobscot, West	5 00	4 00	2 00	3 00	–	6 00	–	39 00	100 00
Penobscot, North	–	–	3 50	4 00	3 00	–	3 00	20 00	5 50
Penobscot, Orrington	–	–	–	2 50	–	4 50	–	5 50	–
Penobscot, Lee Union	–	–	–	–	–	1 00	–	3 00	–
Piscataquis County	13 00	6 00	13 00	6 00	6 00	6 00	6 00	25 00	15 00
Sagadahoc County	17 00	15 00	–	–	–	32 00	–	28 00	16 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	–	–	75	1 50	–	1 25	–	2 55	3 00
Somerset County	2 00	3 00	–	2 00	–	–	2 00	11 00	20 00
Somerset, East	12 50	5 00	1 25	9 00	–	5 00	3 75	36 50	124 00
Somerset, Central	8 00	6 00	3 50	–	–	2 00	3 00	11 25	9 00
Somerset, Bingham	–	–	–	–	3 00	1 00	1 00	–	10 50
Waldo County	6 00	2 00	4 00	–	–	–	3 00	9 50	12 00
Waldo and Penobscot	30 00	12 00	4 00	9 00	6 00	16 00	8 00	30 00	54 00
Washington County	2 00	3 60	–	3 60	–	–	–	10 40	4 40
Washington, West	30 00	–	–	–	5 00	75 00	–	72 00	56 00
York, Shapleigh and Acton	–	–	–	–	3 50	3 00	–	–	–
York, Ossipee Valley Union	16 00	6 00	–	–	–	5 00	3 00	17 00	20 00
York, North Berwick	–	–	–	–	–	–	–	6 00	–
Total	$409 70	$295 85	$147 50	$105 60	$150 90	$355 75	$173 50	$792 87	$1,026 90

ANALYSIS OF AWARDS—Continued.

Name of Society.	Amount of premiums paid thoroughbred bulls and bull calves.	Amount of premiums paid thoroughbred cows, heifers and heifer calves.	Amount of premiums paid grade cows, heifers and heifer calves.	Amount of premiums paid herds.	Amount of premiums paid working oxen and steers.	Amount of premiums paid matched oxen and steers.	Amount of premiums paid trained steers.	Amount of premiums paid beef cattle.	Amount of premiums paid town teams.	Amount of premiums paid oxen and steers for draft.
Androscoggin County	$56 00	$87 00	$90 00	$20 00	$39 00	$30 50	$9 00	$16 00	$68 00	$52 00
Aroostook County.	45 50	55 00	37 25	24 00	–	4 00	–	–	–	–
Aroostook, North	143 00	249 00	32 75	13 00	15 50	-	–	–	–	–
Aroostook, Madawaska	75	–	4 50	–	1 50	–	–	1 50	1 50	2 50
Cumberland County	39 00	56 00	93 00	36 00	66 00	26 00	18 00	22 00	16 00	81 00
Cumberland, North	12 00	4 50	6 00	25 00	6 00	25 00	12 50	6 00	15 00	78 00
Cumberland Farmers' Club	15 50	30 00	16 50	25 00	38 50	14 00	–	9 00	28 00	30 00
Cumberland, Bridgton Farmers' and Mechanics' Association	69 00	70 00	45 00	10 00	15 00	40 50	7 00	13 00	42 00	65 00
Cumberland, New Gloucester and Danville	12 00	15 50	20 00	–	2 00	2 00	3 00	4 00	20 00	10 00
Cumberland, Lake View Park	2 00	–	–	–	–	–	–	–	–	–
Cumberland, Freeport Poultry Association	–	–	–	–	–	–	–	–	–	–
Franklin County	57 50	95 90	64 24	65 00	50 00	40 00	3 00	19 50	79 00	50 00
Franklin, North	9 50	20 00	16 90	17 00	10 90	9 75	2 00	6 25	44 00	10 00
Hancock County	25 00	15 00	31 50	–	23 50	9 50	–	8 50	–	20 00
Hancock, North	–	1 00	7 50	–	–	3 00	–	1 00	–	–
Hancock County Fair Association	30 00	38 75	41 65	–	27 25	–	–	–	–	–
Hancock, Eden	3 00	8 50	5 50	–	–	–	–	–	–	–
Kennebec County	30 00	50 00	60 00	20 00	40 00	20 00	3 00	20 00	45 00	58 00
Kennebec, South	34 00	35 00	34 05	19 25	18 75	21 50	10 65	21 50	57 00	22 75
Knox, North	6 50	16 50	17 00	12 00	8 00	7 00	–	3 50	5 00	10 00
Knox, Camden Trotting Park Association	5 00	–	2 00	9 00	–	–	–	–	–	–
Lincoln County	8 50	12 00	11 00	3 00	9 50	18 00	–	4 50	24 00	22 50
Lincoln, Bristol	1 00	5 00	2 50	–	–	–	–	–	–	–
Oxford County	156 00	172 00	196 00	42 00	131 00	64 00	–	22 00	101 00	139 00
Oxford, Riverside Park Association	131 25	80 00	36 00	24 00	14 25	9 37	5 00	9 00	24 00	34 00
Oxford, West	48 00	119 50	23 00	12 00	22 50	33 00	19 00	19 75	62 00	93 00
Oxford, Androscoggin Valley	19 00	27 00	7 00	5 00	20 00	26 00	–	9 00	20 00	28 00

Oxford, North	5 00	15 00	10 75	9 00	12 25	8 50	2 50	2 50	7 00	21 00
Penobscot, West	52 50	112 50	48 50	30 00	47 00	15 00	–	5 00	–	–
Penobscot, North	3 00	–	7 00	7 00	–	–	2 00	–	–	–
Penobscot, Orrington	2 00	–	7 00	–	–	–	–	–	8 00	–
Penobscot, Lee Union	4 00	8 00	–	–	3 00	–	–	–	–	–
Piscataquis County	40 00	24 00	53 50	37 00	16 00	10 00	–	–	10 00	–
Sagadahoc County	133 25	216 50	134 50	59 00	66 00	33 25	9 00	12 00	63 00	55 50
Sagadahoc, Richmond Farmers' and Mechanics' Club	1 40	5 80	4 00	1 00	2 05	3 05	50	1 20	–	–
Somerset County	7 00	7 50	34 25	–	12 25	7 25	–	6 00	14 00	14 00
Somerset, East	10 00	23 50	60 50	43 50	14 00	–	–	33 50	15 00	17 50
Somerset, Central	10 25	18 50	21 50	–	19 25	15 00	–	8 00	5 00	9 00
Somerset, Bingham	–	–	1 00	3 00	–	4 25	–	–	–	2 00
Waldo County	8 00	6 00	15 50	4 00	19 00	2 00	1 00	1 00	–	9 00
Waldo and Penobscot	63 00	104 00	58 00	104 00	20 00	20 00	9 00	58 00	43 00	38 00
Washington County	3 20	5 00	12 00	10 40	2 80	–	–	–	–	–
Washington, West	86 00	128 00	79 00	22 00	64 00	–	–	–	–	28 00
York, Shapleigh and Acton	1 00	–	11 25	–	6 00	33 00	–	6 00	45 00	12 00
York, Ossipee Valley Union	23 00	42 00	39 00	12 00	37 00	32 00	–	9 00	30 00	25 50
York, North Berwick	11 00	4 00	31 00	20 00	5 00	5 00	–	5 00	16 00	14 00
Total	$1,422 60	$1,983 45	$1,529 09	$743 15	$904 75	$591 42	$116 15	$363 20	$907 50	$1,051 25

ANALYSIS OF AWARDS—Concluded.

Name of Society.	Amount of premiums paid sheep.	Amount of premiums paid swine.	Amount of premiums paid poultry.	Amount of premiums paid grain and root crops.	Amount of premiums paid fruit and flowers.	Amount of premiums paid bread and dairy products.	Amount of premiums paid honey, sugar and syrups.	Amount of premiums paid agricultural implements.	Amount of premiums paid household manufactures and needle work.	Amount of premiums paid objects not named above.	Total amount of premiums and gratuities awarded.
Maine State Pomological Society	-	-	-	-	$334 50	-	-	-	-	-	$334 50
Maine State Poultry and Pet Stock Association	-	-	$663 50	-	-	-	-	-	-	-	663 50
Androscoggin County	$24 00	$22 00	94 00	$88 00	75 00	$32 50	$13 25	$15 00	$97 75	$260 00	1,352 00
Aroostook County	46 25	24 00	21 50	5 50	75	7 00	-	-	7 70	1 75	387 70
Aroostook, North	48 50	20 00	22 50	64 65	48 85	18 50	15 50	3 00	54 55	214 95	1,109 25
Aroostook, Madawaska	9 00	1 50	-	14 00	2 00	1 00	-	2 95	21 50	3 00	80 70
Cumberland County	21 00	12 00	111 50	-	-	-	-	-	-	-	732 50
Cumberland, North	3 00	15 00	3 75	15 75	11 50	11 50	3 75	-	25 40	45 00	410 65
Cumberland Farmers' Club	-	3 00	19 75	27 50	26 00	10 70	-	-	33 15	5 75	347 35
Cumberland, Bridgton Farmers' & Mechanics' As.	-	30 00	23 00	69 00	-	-	12 00	20 00	30 00	30 00	718 50
Cumberland, New Gloucester and Danville	5 00	11 00	8 25	14 55	16 55	5 40	4 00	-	19 80	6 85	214 40
Cumberland, Lake View Park	-	-	3 00	9 55	6 50	4 00	1 50	-	6 50	-	64 05
Cumberland, Freeport Poultry Association	-	-	292 45	-	-	-	-	-	-	9 50	301 95
Franklin County	25 00	18 00	58 25	4 75	49 05	4 60	2 05	20 00	70 80	5 25	928 89
Franklin, North	8 00	4 25	21 80	16 05	9 15	4 50	2 70	-	21 50	-	292 75
Hancock County	11 00	10 25	9 75	81 00	29 00	9 00	5 05	-	17 00	-	350 05
Hancock, North	3 25	-	50	17 65	22 00	3 25	1 65	-	34 55	14 30	116 15
Hancock County Fair Association	18 00	17 50	31 75	59 75	36 85	23 50	6 75	-	53 95	23 00	470 70
Hancock, Eden	1 00	3 50	-	39 70	19 60	-	-	-	8 35	-	94 15
Kennebec County	10 50	18 00	39 50	79 75	70 00	32 50	8 00	-	92 00	5 00	820 75
Kennebec, South	6 50	1 00	10 55	18 55	33 60	11 70	1 50	-	52 85	7 00	452 85
Knox, North	7 50	3 00	11 80	16 10	19 40	6 00	8 80	-	38 14	-	260 99
Knox, Camden Trotting Park Association	-	-	-	11 50	14 80	8 30	-	-	9 75	18 80	142 15
Lincoln County	3 00	5 00	21 00	6 00	33 80	5 25	4 25	-	27 75	25 00	279 55
Lincoln, Bristol	4 00	-	5 75	20 75	6 90	4 75	-	-	38 80	-	89 45
Oxford County	89 00	25 00	33 80	39 25	57 25	38 75	17.25	5 00	48 85	186 00	1,835 90

Oxford, Riverside Park Association..	24 00	10 50	12 50	6 25	16 00	9 15	4 00	–	19 85	170 00	768 24
Oxford, West.	16 50	33 00	28 50	31 70	26 00	40 50	11 00	–	32 55	180 25	975 75
Oxford, Androscoggin Valley.	6 00	3 00	11 50	17 10	15 25	9 50	2 50	2 00	16 85	36 00	402 70
Oxford, North.	7 00	5 00	8 25	5 80	6 00	9 70	4 50	–	18 05	3 50	201 80
Penobscot, West..	18 50	11 50	11 50	16 85	33 40	9 50	–	–	105 15	137 12	813 02
Penobscot, North.	–	–	7 00	6 00	20 00	7 56	2 50	–	28 40	–	129 40
Penobscot, Orrington	5 25	2 00	2 00	16 70	22 55	3 00	–	–	23 50	8 50	113 00
Penobscot, Lee Union.	–	–	–	6 25	4 25	50	–	–	10 25	–	40 25
Piscataquis County	21 00	16 00	16 00	7 75	21 00	16 00	–	–	8 75	2 00	395 00
Sagadahoc County.	7 00	53 00	143 00	95 00	113 50	62 00	5 75	–	90 00	287 98	1,747 23
Sagadahoc, Richmond Farmers' & Mechanics' Club	–	1 15	3 35	9 90	11 15	2 85	50	–	8 85	6 75	72 55
Somerset County.	25 50	–	75	5 45	3 25	1 40	–	–	6 00	2 60	187 20
Somerset, East	41 00	10 00	39 75	20 25	13 00	10 00	5 50	–	12 25	42 50	608 75
Somerset, Central	17 50	7 00	28 00	13 75	8 75	–	2 00	–	8 75	2 00	237 00
Somerset, Bingham	–	–	–	3 75	–	–	–	–	–	–	29 50
Waldo County	19 00	5 00	7 00	7 25	8 50	8 00	–	–	23 25	2 75	182 75
Waldo and Penobscot..	39 00	33 00	18 75	49 75	53 00	35 50	1 50	–	121 85	–	1,038 35
Washington County	7 60	4 80	2 90	18 10	6 80	10 30	40	–	14 80	–	123 10
Washington, West..	147 00	56 00	16 25	168 85	82 95	26 25	4 75	–	123 60	42 30	1,312 95
York, Shapleigh and Acton.	2 25	1 50	14 75	65 00	35 00	12 00	8 00	–	30 00	72 25	361 50
York, Ossipee Valley Union	–	6 00	15 00	19 00	20 05	3 20	2 50	–	17 49	42 00	441 74
York, North Berwick	4 00	3 00	13 00	17 75	3 70	2 50	3 75	–	54 15	–	218 85
Total.	$751 60	$505 45	$1,907 40	$1,327 50	$1,447 15	$522 05	$167 15	$67 95	$1,584 98	$1,899 65	$23,252 01

FINANCES.

Name of Society.	Amount received from State.	Receipts for membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from all other sources.	Total receipts.	Amount expended in improvements.	Amount expended in trotting purses.	Expenses during the fair.	Amount expended for all other purposes.	Total amount paid out including premiums and gratuities.	Value of property belonging to the society.	Amount of liabilities.
Maine State Pomological	$1,000 00	$63 00	-	-	$25 66	$1,088 66	-	-	-	$714 50	$1,049 00	$1,460 00	$100 00
Maine State Poultry and Pet Stock Association	363 82	89 00	-	-	$1,044 65	1,497 47	-	-	$919 84	-	1,583 34	1,000 00	-
Androscoggin County	467 00	80 00	$600 00	$375 00	1,647 00	3,169 00	$800 00	$750 00	525 00	-	3,427 00	1,500 00	1,100 00
Aroostook County	-	-	-	480 00	1,647 30	2,127 30	-	1,200 00	627 98	225 76	2,441 44	-	314 14
Aroostook, North	227 50	71 50	-	240 00	3,813 54	4,352 54	576 56	600 00	838 82	1,116 00	4,240 63	5,000 00	1,000 00
Aroostook, Madawaska	21 59	43 00	-	-	20 21	84 80	-	-	2 00	-	82 70	-	-
Cumberland County	239 58	20 00	350 00	462 50	3,281 00	4,353 08	790 00	1,030 00	941 73	-	3,494 23	4,000 00	1,060 00
Cumberland, North	165 47	-	-	-	367 96	533 43	-	-	100 00	-	510 65	2,500 00	-
Cumberland Farmers' Club	119 29	13 00	-	183 50	965 17	1,280 96	-	400 00	216 66	150 51	1,114 52	3,000 00	275 00
Cumberland, Bridgton Farmers' and Mechanics' Association	218 62	-	-	222 50	1,337 96	1,779 08	126 25	545 00	268 23	121 10	1,779 08	3,000 00	-
Cumberland, New Gloucester and Danville	105 68	-	-	116 00	631 78	853 46	56 80	280 75	114 82	71 55	738 32	2,000 00	-
Cumberland, Lake View Park	30 04	-	-	28 50	253 22	311 76	60 00	152 00	48 50	-	324 55	750 00	15 00
Cumberland, Freeport Poultry Association	-	40 00	-	-	434 15	474 15	10 00	-	195 50	-	507 45	-	40 30
Franklin County	-	-	-	-	-	-	-	-	-	-	-	-	-
Franklin, North	79 20	301 00	-	210 00	790 07	1,380 27	25 00	520 00	275 00	167 25	1,280 60	3,990 17	2,571 50
Hancock County	108 81	-	-	77 55	1,120 95	1,307 31	100 00	437 25	400 99	-	1,288 29	-	-
Hancock, North	46 79	-	-	-	672 73	719 52	-	-	433 37	-	549 52	250 00	-
Hancock County Fair Association	136 29	-	-	128 00	1,645 79	1,910 08	215 35	650 00	645 84	-	1,981 89	10,000 00	607 33
Hancock, Eden	39 60	-	-	-	540 04	579 64	53 02	-	100 00	320 43	567 60	1,200 00	75 00
Kennebec County	280 66	2 00	-	210 00	1,952 53	2,445 19	50 00	700 00	475 00	140 00	2,185 75	3,500 00	1,450 00
Kennebec, South	150 46	-	-	50 00	1,749 11	1,949 57	40 43	540 00	389 88	416 92	1,840 08	2,000 00	-
Knox, North	96 98	-	31 15	71 25	1,589 37	1,788 75	-	402 50	322 60	752 80	1,738 89	2,000 00	500 00

Knox, Camden Trotting Park Association	-	-	-	745 00	-	-	1,200 00	1,750 00	925 00	-	4,017 15	32,000 00	6,491 00
Lincoln County	119 00	3 00	125 00	200 00	960 69	1,407 69	301 44	500 00	200 00	14 80	1,295 79	2,500 00	275 00
Lincoln, Bristol	37 10	25	-	-	252 66	290 01	39 74	-	113 44	40 50	283 13	1,200 00	150 00
Oxford County	630 54	22 00	-	477 50	5,246 11	6,376 15	-	1,250 00	520 74	3,366 97	6,973 61	10,000 00	-
Oxford, Riverside Park Assoc.	253 02	-	-	300 00	672 76	1,225 78	150 00	700 00	220 00	200 00	2,038 24	2,000 00	812 42
Oxford, West.	276 91	24 00	3,061 42	198 50	2,475 59	6,036 42	2,000 00	850 00	739 59	1,471 08	6,036 42	10,000 00	3,000 00
Oxford, Androscoggin Valley	139 11	10 00	1,260 00	399 00	2,379 74	4,187 85	1,700 00	1,025 00	200 00	654 77	3,982 47	4,000 00	3,450 00
Oxford, North	66 47	5 00	-	112 00	641 70	825 17	50 00	375 00	75 60	210 50	912 30	1,000 00	-
Penobscot, West	272 12	16 00	-	365 00	1,765 50	2,418 62	313 29	800 00	292 31	200 00	2,418 62	6,000 00	3,500 00
Penobscot, North	31 10	-	-	-	168 90	200 00	10 00	-	38 00	5 00	182 40	-	-
Penobscot, Orrington	41 33	-	-	62 50	552 88	656 71	25 00	235 00	60 75	207 47	641 22	1,100 00	240 00
Penobscot, Lee Union.	-	2 35	-	-	33 20	35 50	-	-	26 50	-	66 75	-	21 25
Piscataquis County	-	-	-	-	-	-	-	-	-	-	-	-	-
Sagadahoc County	539 77	544 00	1,000 00	681 25	5,365 56	8,130 58	200 00	1,087 50	2,000 00	3,095 85	8,130 58	7,000 00	450 00
Sagadahoc, Richmond Farmers' and Mechanics' Club	32 14	-	-	-	134 88	167 02	-	-	22 60	68 72	163 87	100 00	3 15
Somerset County	68 26	-	85 00	115 00	404 20	672 46	158 00	300 00	144 80	-	790 00	1,300 00	85 00
Somerset, East	167 40	104 00	-	380 00	1,431 36	2,082 76	-	1,050 00	150 00	-	1,808 75	1,500 00	800 00
Somerset, Central	62 53	-	-	165 00	972 47	1,200 00	-	450 00	751 47	-	1,438 47	2,000 00	800 00
Somerset, Bingham	-	29 00	-	7 00	2 04	38 04	-	-	8 48	-	37 98	-	-
Waldo County	71 51	10 00	-	265 50	961 65	1,308 66	175 31	725 00	110 92	-	1,193 98	3,700 00	-
Waldo and Penobscot	250 00	-	-	303 75	3,176 39	3,730 14	300 00	1,050 00	849 72	438 59	3,676 66	2,500 00	-
Washington County	81 29	-	-	175 00	645 25	901 54	-	400 00	724 19	101 33	1,348 62	1,700 00	1,045 08
Washington, West	337 98	1 00	-	310 00	3,091 52	3,740 50	150 00	750 00	1,115 00	353 92	3,681 87	2,346 00	1,040 21
York, Shapleigh and Acton	127 43	211 00	60 00	-	9 71	408 14	-	-	15 00	15 25	391 75	2,000 00	-
York, Ossipee Valley Union	200 00	-	-	390 00	1,657 20	2,247 20	372 82	910 00	522 64	-	2,247 20	6,500 00	1,420 25
York, North Berwick	55 52	-	-	143 50	1,416 75	1,615 77	158 60	600 00	596 50	41 82	1,615 77	4,905 00	500 00

BULLETINS

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EXPERIMENTS IN ORCHARD CULTURE.

W. M. Munson.

In accordance with the general policy of the Experiment Station, of conducting practical experiments in those sections of the State best suited to the particular industry under consideration, the orchard of Mr. Chas S. Pope, of Manchester, has for several years been used in the study of orchard pests and, during the past four years, in the study of various cultural problems. The orchard is situated in the heart of one of Maine's best orchard counties—Kennebec—and is much better suited for the purposes hereinafter mentioned than is the Station orchard at Orono. At the outset the writer wishes to acknowledge the uniform courtesy and helpful counsel of Mr. Pope and the faithfulness with which he has carried out the details of the work—often at a great personal sacrifice.

I. Culture and Fertilizers.

For a study of the comparative effects of cultivation and mulch, as well as the use of stable manure and commercial fertilizers, in the development and fruiting of apple trees, a young orchard of Tallmans and Gravensteins was selected in 1898. The trees were 8 to 10 years old at the beginning of the experiment.

HISTORY OF THE ORCHARD.

The trees were planted 25 x 30 feet apart as follows: three rows on the south, next to the old orchard, in 1888; the next row, 1889; rows five to eight, 1890. The soil was a rocky, sandy, virgin loam pasture with an eastern aspect. No cultivation was given and no special attention paid to the orchard, except to keep out the borers and give an occasional mulching, until May, 1898, when the work was taken up by the Experiment Station.

That portion of the orchard adjacent to the plot selected is planted to Kings, and remains in the condition the whole orchard was in at the commencement of the experiment.

In May, 1898, steamed bone, at the rate of 500 pounds per acre, was sown broadcast over the whole area. Twenty-eight trees (see plan of orchard, page 6) received a high grade complete fertilizer—Bradley's XL—in the proportion of 5 pounds, 10 ounces per tree on an area with a 10 foot radius; or at the rate of 800 pounds per acre. A like number of trees received a heavy dressing of stable manure—1-10 cord per tree—on an equal area, of 10 feet radius. In accordance with the plan, one-half of each lot was placed under thorough cultivation, and the other half heavily mulched with meadow hay or sawdust. Owing to a severe raid by the forest tent-caterpillar, the work of cultivation was neglected the first season.

In 1899, complete fertilizer and manure were applied, as before. The cultivated portion was thoroughly tilled and the trees made a vigorous growth. Both lots were markedly better than the adjacent untreated trees, as shown in figures 1, 2, and 3.

In 1900, fertilizer and manure were applied as before. The mulch was renewed and cultivation was continued during the season. There was a moderate crop of fruit, but, owing to the absence of the writer, no record of the yield was made.

In 1901, fertilizer was applied, but no manure. The season was very dry, but trees made a fair growth. There was no fruit except a few Gravensteins.

In 1902, neither fertilizer nor manure were applied. The mulch seemed sufficient, as all grass and weeds on mulched areas were held in check. The cultivated portion was plowed in June, and harrowed twice during the summer. The season was moist and many of the trees produced very satisfactory crops, though there was a great variation as shown by the subjoined notes.

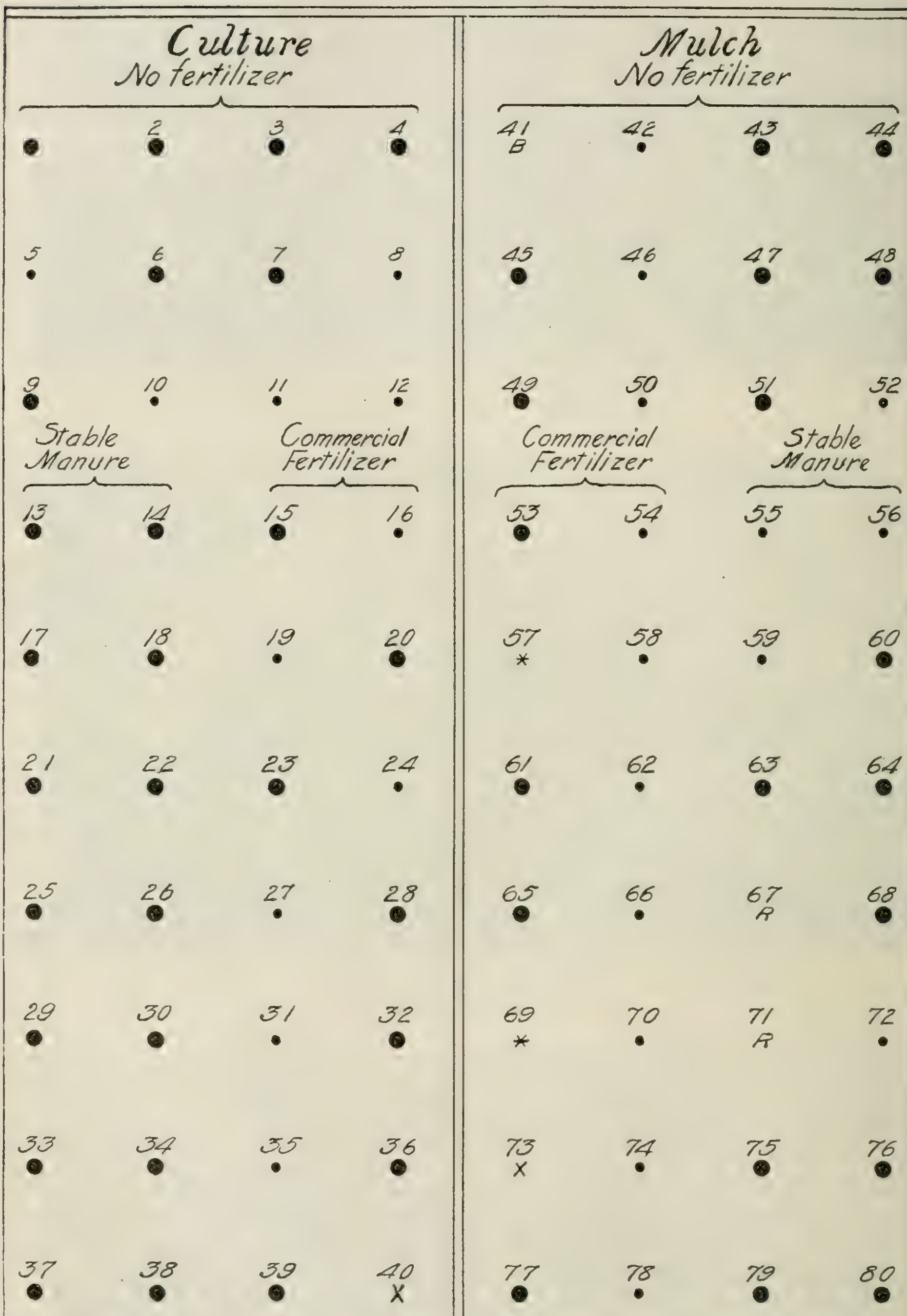
The diagram on page 6 will serve, better than words, to convey an idea of the relation of the trees mentioned in succeeding notes, also to indicate clearly just which trees produced fruit this year.

Figure 1 Untreated.

Figure 2. Mulched.

Figure 3. Cultivated.

DIAGRAM OF THE ORCHARD.



Explanation of diagram: The significance of the figures in the above diagram is as follows: ● = trees bearing in 1902; • = trees not bearing in 1902; × = vacancy; * = Belflower tree; R = Roxbury Russet; B = Ben Davis.

GROWTH AND CONDITION OF THE TREES, 1902.

The writer made a careful inspection of the orchard on September 12, and noted the present condition of every tree. Hereafter such inspection will be made each year, that the individual characteristics of the trees may be determined, and the annual yield of the different plots recorded. The following notes are transcribed from the field records and give a better idea of the conditions of the orchard than would be possible in a mere summary.

GROWTH AND CONDITION OF TREES ON CULTIVATED AREA.

Number of tree.	Growth in inches.	Crop.	Remarks.
1	6-8	Fair.......	Spreading; good, vigorous tree.
2	6-8	Fair......	Spreading; good tree, but not equal to No. 1.
3	8-10	Fair.	Vigorous, upright, spreading; good form.
4	6-8	Small.....	Vigorous, spreading.
5	8-10	....	Vigorous, upright; a fine tree.
6	4-6	Medium ..	Moderately vigorous; has been injured by borers.
7	8-10	Medium ..	Younger than the other trees; injured by borers.
8	10-14	....	Spreading; a fine tree.
9	8-10	Full......	Spreading, vigorous; good tree; fruit dropped off early.
10	10-12	....	Spreading, vigorous; good tree.
11	6-8	....	Spreading, vigorous.
12	10-12	....	Upright, vigorous.
13	8-10	Good......	Fine tree, vigorous.
14	8-10	Good.....	Fine tree, vigorous.
15	8-10	Small. ...	Fine tree, vigorous.
16	4-5	....	Rather small.
17	8-10	Medium ..	Fine tree; full crop 1901.
18	6-8	Medium ..	Fine tree.
19	6-8	Small.... .	Fine tree; half a dozen fruits.
20	8-10	Small.....	Good tree, but not large.
21	10-12	Full.......	Fine tree.
22	0	Full.......	Tree dying; defective stock.
23	10-12	Small.... .	Fine tree; vigorous.
24	6	Small.....	Fine tree; vigorous; half a dozen fruits.
25	6-7	Full	Spreading habit; one-half of tree in Roxbury Russet.
26	6-8	Medium ..	Upright, stock defective; set in 1892.
27	12	....	Upright, vigorous.
28	4-6	Full.	Spreading; large amount of fruit, thinned.
29	6-8	Medium ..	Spreading, vigorous.
30	6-8	Medium ..	Spreading, vigorous.
31	10	... .	Upright, vigorous.
32	12	Small. ...	Upright, spreading, vigorous.
33	8	Full... ...	Spreading.
34	10	Small. ...	Upright, vigorous.
35	6-8	....	Spreading.
36	8	Medium ..	Spreading; stock defective; dying.
37	6-8	Small.....	Upright, vigorous.
38	7-8	Medium ..	Spreading.
39	8	Medium ..	Spreading.
40	....	....	Dead.

GROWTH AND CONDITION OF TREES ON MULCHED AREA.

Number of tree.	Growth in inches.	Crop.	Remarks.
41	8-10	Full	*Ben Davis.* Fruit small; tree making fair growth.
42	4-6	....	Upright, spreading; fair tree.
43	4-6	Medium ..	Spreading; a good tree.
44	6-8	Medium ..	Spreading; a good tree.
45	8-10	Medium ..	Spreading; a fine tree.
46	2-4	....	Fair tree; attacked by borers.
47	4-6	Full	Spreading; good tree; close by side of a large boulder.
48	3-6	Small	Small tree; spreading.
49	8-10	Full	Upright; spreading, vigorous; very fine tree.
50	2-3	... .	Fair tree; attacked by borers.
51	6-8	Small	Spreading; vigorous.
52	2-3	....	Set later than others; moderately vigorous.
53	6-8	Small	Good tree.
54	3-5	... .	
55	4-6	....	Vigorous; fine tree.
56	8-10	....	Vigorous; fine tree.
57	10-12	Small	*Bellflower.* Vigorous; fine tree, but fruit knotty and poor.
58	5-6	....	Good tree.
59	4-6	....	
60	5-6	Medium ..	Good tree.
61	6-8	Medium ..	Vigorous.
62	4-6	....	Vigorous.
63	8-10	Small	Vigorous; fine tree.
64	10-12	Small	Vigorous; fine tree.
65	10-12	....	Spreading; vigorous; a good tree.
66	2-4	....	Healthy, no apparent reason for small growth.
67	10-12	....	*Roxbury Russet.* Good tree.
68	8-10	Medium ..	Spreading, vigorous.
69	12-14	Medium ..	*Bellflower.* Very vigorous; low head, giving forest conditions to soil.
70	8	....	Vigorous.
71	5-7	....	*Roxbury Russet.* Spreading, vigorous.
72	6-8	....	Spreading, vigorous.
73	....	....	Vacant.
74	1-3	....	Good tree; larger than some on cultivated plot.
75	6	Small	Upright.
76	6-8	Full	Spreading; fair tree.
77	10-12	Full	Spreading, vigorous.
78	4-6	....	Good tree.
79	8-10	Medium ..	Upright, vigorous; good tree.
80	8-10	Medium ..	Vigorous, spreading.

In the above notes Numbers 1-12 and 41-52 inclusive received no fertilizer of any kind. But the first mentioned trees were cultivated, while the second were mulched, as before mentioned. Numbers 13-24 and 53-64 respectively are Tallman. The remainder, except as noted, are Gravenstein.

As will be observed, there is a wide variation in the growth of trees receiving the same treatment. In general, however, the trees on the cultivated area made a better showing than those on the mulched land; though the latter, in the absence of trees for comparison, would be regarded as good, vigorous trees. It will further be noted that the number of unfruitful trees on the cultivated portion of the orchard was but half that on the mulched area. On both areas, among the Gravenstein trees, were to be found two very different types of growth, *viz.,* distinctly upright and broadly spreading: shown in figures 4 and 5. Between these extremes were other forms combining the characteristics of both. It will be interesting in the future to note whether there is a difference in the yield and characteristics of the product of the two forms. No special difference was observed this year

Figure 4. Gravenstein tree, upright form.

Figures 6 and 7 illustrate, more clearly than words can tell, the advantage to young orchards of thorough cultivation. Figure 6 shows, in the foreground, one of the Tallman trees on the cultivated plot as it appeared at the end of the first season of thorough culture. The rocky character of the soil and the marked vigor of growth are the most noticeable features. In figure 7 is shown the same tree three years later—September, 1902. The tree bore, this year, a little more than two barrels of fruit, of excellent quality. Further comment is unnecessary.

NOTES ON THE GROWTH OF TREES, 1902.

The following summary of the actual growth of the trees on the several plots under observation may be of use in future studies.

Variety.	Treatment.	Growth in inches; unfertilized.	Growth in inches; stable manure.	Growth in inches; commercial fertilizer.
Gravenstein	Cultivated ..	7½-9⅔ (12 trees)	7 -8 (8 trees)	8½- 9 (7 trees)
	Mulched... .	5½-7½ (9 ")	7 -8½ (6 ")	10 -12 (2 ")*
Tallman....	Cultivated ..	....	6⅔-8⅓ (6 ")	7 - 8½ (6 ")
	Mulched.....	2⅔-4⅓ (3 ")	6½-8⅓ (6 ")	5 - 6½ (5 ")

*These trees were in slight depression and next to the cultivated area.

Figure 5. Gravenstein tree, spreading form.

With a single exception, in which two trees had particularly good advantages, the growth on the mulched areas was less than on corresponding cultivated plots. On cultivated soil there was little increase in growth from the use of either manure or commercial fertilizer; while on the mulched land the growth was noticeably (2 to 5 inches) greater, as a result of adding plant foods. These facts would indicate that there is enough plant food in the soil to produce a fairly satisfactory growth if the mechanical treatment is such as to render it available, and other plants are not allowed to rob the trees.

The above facts are worthy of more than passing notice. The physical condition of soil is nearly always of more importance than mere richness in plant food. The chemical composition of a soil is not necessarily a measure of its productive capacity, since plant food is of no consequence unless the plant can make use of it. If now, there is sufficient material available to produce only a stunted growth of trees and grass at the same time, it is evident that the surface application of additional food may temporarily stimulate the growth of both. Hard, lumpy soils, however, will not produce good crops, no matter how much fertilizer may be applied, and there is no doubt that the number of "worn-out" farms in New England is much smaller than is generally

Figure 6. Cultivated plot in 1899. Tallman in the foreground.

supposed. The average New England hillside contains a sufficient amount of food material, or nearly so, to insure good crops if the land is properly handled; and tillage, by improving the texture of the soil is the key to unlock this store of wealth. By fining the soil, and thus increasing the feeding surface for the roots; by increasing the depth, and thus giving a greater foraging area; by warming and drying the soil in the spring; and by reducing the extremes of temperature and moisture, the physical condition will be rendered best for giving up the accumulated plant food. The increased water holding capacity of the soil, as a result of tillage, is also an important factor in successful crop production, since, as a rule, the amount of water which falls during the growing season is entirely inadequate for the growth of plants during that time.

Figure 7. Cultivated plot in 1902. Tallman shown in figure 6 in the foreground.

Naturally those soils which are open and porous, which contain a large number of spaces between the particles, will retain the moisture to better advantage, and will give better opportunity for the roots of plants to penetrate them and take up the food-laden moisture there stored, than will a compact soil—in the same way that a sponge will take up a larger amount of moisture than a block of wood. By deep plowing, thorough working, and the addition of organic matter by means of cover crops, this spongy condition desired is obtained, and the growth of orchard crops as well as of farm and garden crops is fostered.

But not all New England orchards are susceptible of cultivation. In such cases some other method of treatment must be devised. A heavy mulch of hay, leaves or sawdust (preferably not fresh sawdust) conserves the moisture and prevents the growth of robber plants—weeds; to this extent favoring growth of trees. The roots, however, are developed near the surface and in time of severe drough, especially if the mulching is not carefully renewed as required, the trees are liable to injury. The best treatment of such a rocky hillside as is shown in figure 8, is to fence off a portion of the orchard each year, turn in hogs and let them thoroughly work the soil. An added advantage of this treatment is the destruction of diseased and infested fruit. The testimony of orchardists who have practiced this treatment is, invariably, to the effect that the injury by the apple maggot (Trypeta) is greatly reduced.

Figure 8. An orchard not easily cultivated.

YIELD OF FRUIT, 1902.

The question of supreme importance, after getting a satisfactory growth of trees, is the quantity and quality of the product. As already noted, the present season is the first that the trees in question have fruited to any extent and, as might be expected, there was great variation in the amount and character of the fruit. The largest amount on any tree was about two barrels, and the quantity varied from that amount to half a peck. The following table gives a summarized statement of the yield on different plots, together with the number of trees producing fruit.

YIELD OF FERTILIZED AND UNFERTILIZED TREE, 1902.

Variety.	Treatment.	Unfertilized.	Stable manure.	Commercial fertilizer.
Gravenstein..	Culture.......	4½ bbl. (7 trees)....	7¾ bbl. (8 trees)...	1½ bbl. (4 trees).
	Mulch.........	2½ bbl. (8 trees) ...	1¾ bbl. (5 trees)...	4 bbl. (2 trees).
Tallman.. ...	Culture........	....	3⅓ bbl. (6 trees)...	¾ bbl. (3 trees).
	Mulch..... ..	....	1¼ bbl. (3 trees)...	1¾ bbl. (3 trees).

The above figures are of interest as showing the variation mentioned; but, of course, no conclusions can be drawn. The facts are published for purposes of record.

Leaving aside the question of fertilizers, it will be seen from the table given that, on the cultivated and mulched areas respectively, the following interesting results were obtained.

Variety.	Treatment.	Number of trees bearing.	Barrels of fruit produced.	Average per tree.
Gravenstein..	Culture.......	19	13.75	.72
	Mulch....... .	14	8.25	.59
Tallman.....	Culture.......	9	4	.44
	Mulch.......	6	3	.50

In case of the Gravensteins, the number of trees producing some fruit was nearly 50 per cent greater on the cultivated than on mulched land; and the average yield per tree was 72 per cent on the cultivated as opposed to 59 per cent on the mulched area. With Tallman the number of bearing trees is greater by one-half on the cultivated area, but the average yield is slightly less. It should be said, however, that most of the Tallman fruit on the cultivated area came from four trees; the remaining trees, in most cases, having not more than half a peck each. This feature of the experiment will be watched with interest in future work.

II. Do Potash Fertilizers Affect the Quality of Fruit?

To determine the influence of different salts of potash upon the character and chemical composition of fruit, as well as upon its susceptibility (if any) to fungous attack, a young Baldwin orchard was selected. The orchard, about twenty-five years old at the beginning of the work, is located on a good sandy loam soil, with a slightly southern or southeastern aspect. That portion of the orchard under consideration includes 45 trees, covering an area of .93 acre.

As shown by the accompanying plan the trees were divided into four lots, *viz.:* 10 trees receive an excess of muriate of potash; 10 receive sulphate; 10 receive kainite; and 15 are left without special potash treatment. The orchard is kept under clean cultivation.

EFFECT OF POTASH SALTS.—DIAGRAM OF ORCHARD.

Muriate of Potash. Fifteen pounds nine ounces muriate of potash. Apply on area of 15 feet radius about each tree; rate of 1,000 pounds per acre.	*	*	*	*	*
	*	*	*	*	*
Check. No special potash food...........................	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
Sulphate of Potash. Fifteen pounds nine ounces per tree, as above.	*	*	*	*	*
	*	*	*	*	*
Kainite. Fifteen pounds nine ounces per tree, as above.	*	*	*	*	*

HISTORY OF THE ORCHARD.

The trees were set (25x25 feet) in 1881-3, in a cultivated field. The land was kept under cultivation for four or five years and cropped with corn and beans. It was then thrown into a sheep pasture and left without treatment until 1891, when Professor Balentine started some work relative to the effect of Thomas slag and crude South Carolina rock. At this time, 1891, each row of five trees received an application of 15 lbs. nitrate of soda, 10 lbs. of muriate of potash and 50 to 130 lbs. of Thomas slag or South Carolina rock. The fertilizers were applied as a top dressing in the sheep pasture.

In 1893, no satisfactory growth being made, Professor Balentine's experiment, with his consent, was abandoned. An application of stable manure was then made and the orchard was plowed. It was seeded down the next year, however, and remained without further attention until 1898.

In May, 1898, the orchard was plowed and harrowed. Steamed bone at the rate of 500 pounds per acre, was applied broadcast over the whole area. The various potash salts were then applied at the rate of 1,000 pounds per acre on an area of 15 feet radius about each tree. As with the previous experiment, the work of further cultivation this season was prevented by the severe attack of forest caterpillars.

Figure 9. Neglected trees lose their leaves early.

In 1899, the orchard was plowed and thoroughly tilled and sprayed during June, July and August. Potash salts were applied as before. The result in the fall was most noticeable. The foliage was healthy and vigorous on all of the plots, and remained on the trees much longer than on the adjacent uncultivated and unfertilized trees. (See figures 9 and 10.) There was, however, very little fruit.

In 1900 the application of potash salts was repeated and the orchard was thoroughly harrowed during June, July and August. A heavy crop of fruit was produced, but owing to the absence of the writer from the State, no records were kept.

In 1901 the fertilizing was repeated, as in previous years. The ground was harrowed in June, July and August. A cover crop of rye was sown at the last harrowing, in August, but the season was so dry that the seed germinated poorly. The whole season was very dry, but the trees made a good fair growth and formed abundance of fruit buds for the next year.

Figure 10. Cultivated and sprayed trees retain their foliage late in the season.

In 1902 fertilizing was repeated as before, and the orchard was thoroughly harrowed in May, June, July and August. Rye and oats were sown at the last harrowing and made an excellent growth for cover before the season closed. Spraying was omitted. An excellent crop of fruit was produced, as shown below.

YIELD OF FRUIT, 1902.

As already noted, the orchard produced a heavy crop of fruit in 1900, and practically none in 1901. The present year, again, a full crop was produced, and it is worthy of mention that the trees under discussion were almost the only ones in the whole orchard—some 900 trees in all—which gave even a moderate yield. (The rest of the orchard is in sod as it has been for many years.) The following tabular statement of the actual yields is of interest as a matter for record and future reference.

DETAILED STATEMENT OF YIELD, 1902.

PLOT.	1st row (north). No. of tree; yield.	2nd row. No. of tree; yield.	3d row. No. of tree; yield.	Average yield per tree—bbls.	Total yield of plot—bbls.	Grade of Fruit. No. 1—bbls.	No. 2—bbls.	No. 3—bbls.
KAINITE	1—1 bbl 2—1½ bbl 3—2½ bbl 4—2 bbl 5—vacant	1—⅓ bbl. 2—1⅔ bbl. 3—3½ bbl. 4—2½ bbl. 5—1½ bbl.	....	1.8	16.5	9.5	6	1
SULPHATE	1—½ bbl 2—4 bbl 3—1⅓ bbl 4—2 bbl 5—1⅔ bbl	1—2⅛ bbl. 2—3 bbl. 3—2 bbl. 4—3½ bbl. 5—2½ bbl.	....	2.28	22.8	14	8	.8
CHECK	1—1 bbl 2—Lady apple* 3—2⅔ bbl 4—vacant 5—1 bbl	1—2⅓ bbl. 1—2⅓ bbl. 3—0 bbl. 4—4 bbl. 5—King*	1—2 bbl. 2—vacant 3—1½ bbl. 4—4 bbl. 5—4 bbl.	2.3	25.25	20.5	4.25	.5
MURIATE	1—vacant 2—2 bbl 3—3⅓ bbl 4—4 bbl 5—King*	1—⅓ bbl. 2—3⅓ bbl. 3—1⅔ bbl. 4—3¼ bbl. 5—2½ bbl.	....	2.6	20.5	18	2	.5

* When the orchard was originally top-worked, a few odd varieties were included

The total yield on the area under observation, nine-tenths of an acre, was 85 barrels, of which 62 barrels were commercially graded as "No. 1" and 20 barrels as "No. 2." The average yield per tree was a little less than 2½ barrels, and was remarkably uniform as between different plots. There was a noticeable increase in yield per tree and in the proportion of first-class fruit from the kainite plot to the muriate plot. This may be partly due to a slight difference in the character of the soil; the kainite plot being at the highest and the muriate at the lowest part of the slope, which, however, is very slight. The orchard was purposely left without spraying of any kind.

EFFECT OF POTASH ON APPLE SCAB.

One of the questions in mind at the beginning of this work was the supposed influence of an excess of potash in the soil as a means of warding off the apple scab fungus. Since this question was raised other experimenters have published data bearing upon the subject, but it has been thought best to carry out the work already begun. A comparison of the results here given with those published elsewhere is not without interest.

In a way, the commercial grading as given on page 18 might be taken as an index of the condition of the fruit on the several plots. In order to get exact percentages, however, four trees, representing, as nearly as possible, the average of the whole, were selected on each plot. From each of these, two and one-half bushels of fruit, taken indiscriminately from all parts of the tree, were carefully graded and counted. The results thus obtained may be regarded as fairly indictive of the character of the fruit on each plot.

POTASH AND APPLE SCAB.

PLOT.	Number of fruits examined.	Free from scab.	Slightly scabbed.	Badly scabbed.	Per cent free.	Per cent No. 1 fruit (as regards scab.)
KAINITE	199	79	81	39	40	80
	282	65	160	57	23	80
	383	49	243	91	13	76
	331	65	228	38	20	88
Average	**299**	**65**	**178**	**56**	**24**	**81**
SULPHATE	384	68	269	47	18	88
	395	51	213	31	13	67
	396	119	238	39	30	90
	371	190	175	6	51	99
Average	**384**	**107**	**224**	**31**	**28**	**85**
CHECK	383	142	229	12	37	97
	334	194	139	1	58	100
	272	142	124	6	52	98
	322	135	174	13	42	96
Average	**328**	**153**	**166**	**8**	**47**	**98**
MURIATE	332	190	140	2	57	99
	316	256	60	0	81	100
	390	166	222	2	42	99
	331	177	152	2	53	99
Average	**342**	**197**	**143**	**2**	**58**	**99**

As will be seen, the per cent of fruit free from scab increases regularly from the north to the south end of the orchard. The check trees, while producing nearly the same percentage of No.

1 fruit as the muriate plot next to it, gave 11 per cent less perfect fruit. On the other hand, the check trees gave 12 per cent *more* No. 1 fruit, and 19 per cent more fruit absolutely free from scab, than did the adjacent trees receiving an excess of sulphate of potash. The kainite plot gave the lowest percentage of both perfect specimens and commercially graded No. 1 fruit. As before noted, this plot is at the upper part of a very slight slope, and is perhaps a little dryer, though the trees were all making a very satisfactory growth and, during the present season, there was no lack of moisture. It may be said, however, that throughout our experience with this orchard, the worst cases of scab have invariably occurred upon the high gravelly knolls.

The results obtained agree, in the main, with those published elsewhere and it appears, from the figures given, that an excess of potash, in whatever form applied, has no effect whatever in warding off attacks of apple scab.

III. Orchard Renovation.

The work thus far detailed was conducted in young and vigorous orchards. As a further object lesson in the management of fruit plantations, an old Baldwin orchard, planted about thirty-five years, was selected in 1902. This orchard should be in prime fruiting condition, but through neglect and as a result of repeated attacks of caterpillars and leaf rollers, it has for several years been unprofitable. Since the work has been in progress only one season, no conclusions can be drawn; but an outline of the plan of the experiment, together with a brief report of progress, is given herewith.

The orchard is located upon the western slope of a high gravelly hill. The soil is a light sandy loam, 6-8 inches deep, with gravelly or sandy subsoil. The trees were set in 1866-70 in a cultivated field which had previously produced corn, wheat, and general farm crops; but after a very few years the orchard was used as a sheep pasture, the trees being frequently mulched while young. No further attention was given the trees, save an occasional slight pruning, until May, 1892, when the whole orchard received an application of bone and muriate of potash. The same summer hogs were turned in, and they thoroughly stirred the soil and started the trees into vigorous growth. A very large crop of fruit was produced in 1893 and again in 1896, but since that date the trees have done practically nothing. Since 1892 the orchard has received no treatment, except spraying, until the present year when a portion of it, as indicated in the diagram, was thoroughly tilled and variously fertilized.

The fertilizers used in 1902 were as follows:

Plat 1—Muriate of potash 75 lbs; acid rock 75 lbs; nitrate of soda 50 lbs.

Plat 2—Muriate of potash 75 lbs; acid rock 75 lbs.

Plat 3—Nitrate of soda 50 lbs; acid rock 75 lbs.

Plat 4—Acid rock 75 lbs.

Plat 5—Muriate of potash 75 lbs.

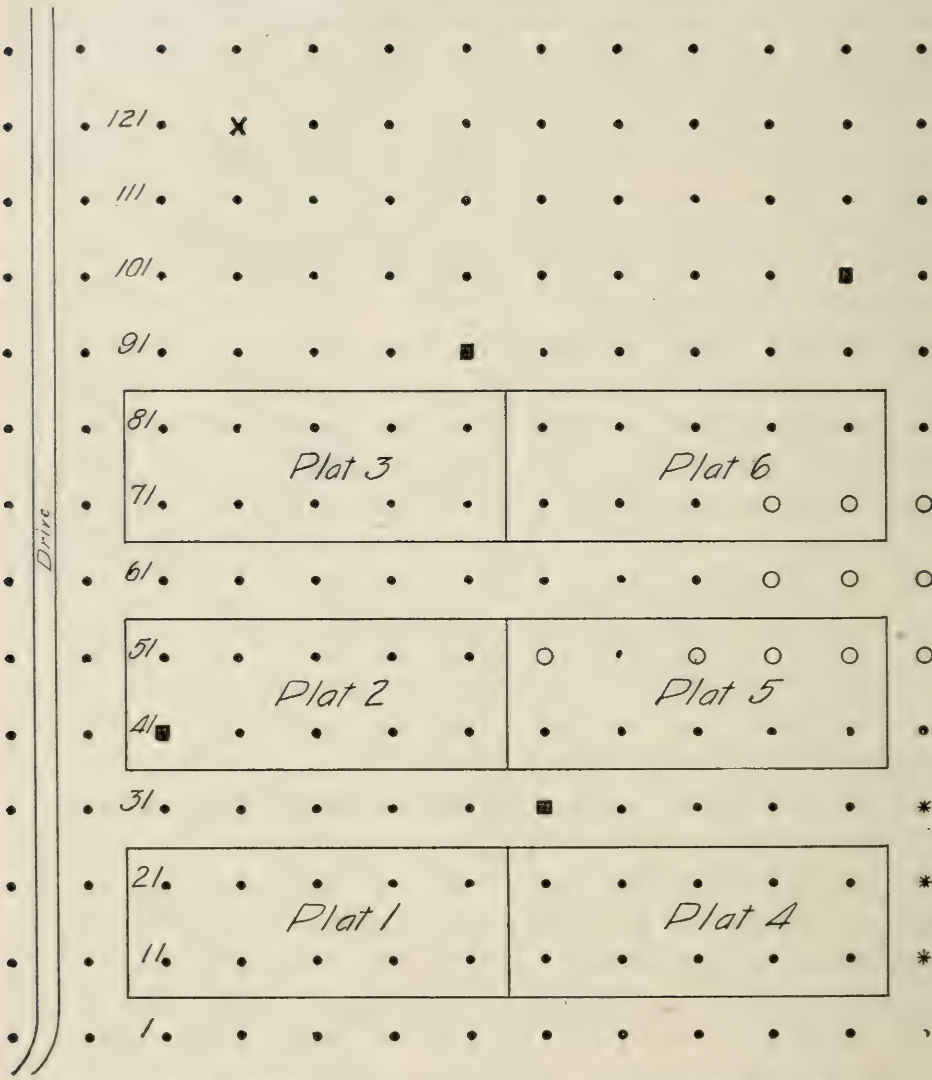
Plat 6—Nitrate of soda 50 lbs.

Without going into details, it may be said that the effect of culture, on the whole block, was most marked, being very distinctly visible from a hill-side half a mile distant. The foliage of the cultivated trees was large, healthy, dark green, and the trees made a good growth, while the adjacent check trees were of a pale, yellowish-green color, made practically no growth, and are in no condition for producing fruit next year. (Owing to previous conditions very few of the trees, either cultivated or otherwise, bore fruit this year.)

As might be expected, the plot receiving a complete fertilizer presented the best appearance at the end of the growing season. The use of nitrogen alone increased the growth to a marked degree (though less than the complete fertilizer) but there was a noticeable lack of color in the fruit. Trees on the plot receiving acid rock alone, in general seemed no better than the check trees which were cultivated but not fertilized. Potash alone, on the other hand, produced a distinct improvement.

The bud-moth and the leaf-roller made such havoc in many cases that trees not growing rapidly were very severely injured and one lesson from an observation of this orchard is obvious, *viz:* To insure against damage from the insects mentioned we must *feed* and *cultivate,* thus forcing growth after the insects have finished their work. The importance of spraying with Paris green as a preventive measure is not, however, to be overlooked. But in order to be effective, the spraying must be done before the buds unfold, for the bud-moth, and just as soon as leaves appear for the leaf roller.

ORCHARD RENOVATION.—DIAGRAM OF THE ORCHARD.



Explanation of Diagram: All of the trees in the orchard are Baldwins except the following: *=pear tree; O=Gravenstein; ×=Sutton Beauty; ■=vacancy.

IV. The Top-Working of Orchards.

Many of the smaller orchards of Maine consist principally of varieties which produce early fruit, or fruit which is of inferior quality or of unknown market value. Such trees, by top-grafting to more valuable sorts, may be made a valuable source of income, instead of an eye-sore and a reflection on the thrift and good judgment of the owner. Every owner of apple trees should know how to perform this simple but important operation, and in no case is it safe to depend upon "professional grafters."

Top-working by cleft-grafting, which is the most common method, may be performed with very little loss of time. In no case, however, should an old tree be cut back to a few large stubs and cions inserted in these with the hope of satisfactory results. The proper method of top-grafting an old tree is not to make a few large limbs the basis of a new top, but to remove a larger number of small limbs ranging from one to two inches in diameter. In all this work, too, the symmetry of the tree should be preserved by cutting the stubs at a nearly uniform distance from the center of the top. In this way the long naked limbs so often seen may be avoided. The cleft in the stub should be in a horizontal position; in other words, the cions should stand so that one is not above the other. After a year or so, when the stub is well healed over, one of the cions should be cut out.

The method of making the cleft graft is very simple. The cions, which are usually from three to six inches long, are made wedge shaped at the lower end and one side of the wedge is a little thinner than the other. A bud is usually left near the upper outer side of the wedge. The stub is split as before suggested, and the cions are inserted as shown in Figure 11, care being taken that the line between wood and bark on the cion just matches that on the stock. Figure 11 shows the graft ready for waxing: Figure 12 is a cross-section just at the end of the stub.

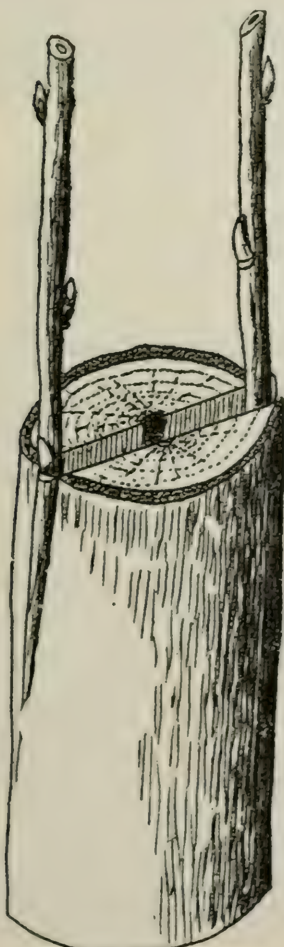


Figure 11.

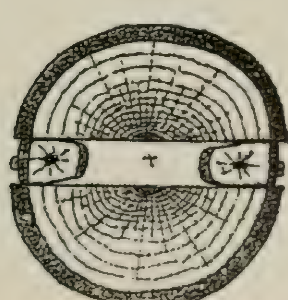


Figure 12.

Figure 13. A young tree before top-grafting.

Figure 14. A young tree after top-grafting.

Waxing is one of the most important factors in successful grafting. The work must be done carefully, that the cions be not disturbed, and completely, that all air and moisture shall be excluded. A very good wax is made by melting together four pounds of resin, two pounds of beeswax and one pound of tallow. When melted, pour into a tub of cold water to cool; then pull, the same as for taffy, until it is of a clear golden color. Of course grafting should be done on warm, bright days; otherwise the wax hardens so quickly it is difficult to do the work well.

Young trees may be re-topped in a single season; a tree eight to ten years old in two years, and one of twenty or more years

Figure 15. A top-worked tree showing a defective seedling stock.

in three seasons. Of the accompanying illustrations, Figure 13 shows a six-year-old tree in the Station orchard before top-grafting. Figure 14 shows the same tree after the operation. Three years later the new top produced one bushel of fruit.

The suggestion to top-graft orchard trees—like most other advice—must be followed intelligently and adapted to specific needs and conditions. At the present time, however, the top-working of certain varieties, like the Baldwin, is highly recommended for general orchard practice by some of the most successful growers. There must be some reason, real or imaginary, for the supposed advantage of this method. For more than a hundred years the mutual influence of stock and cion has been a fertile subject for discussion, but even now there is comparatively little positive and definite information on the subject. There are some facts which go to show that the stock may have a perceptible influence upon the produce of the graft. Aside from a specific recognizable effect upon the fruit, however, there is little doubt of the importance of using some standard hardy variety, such as Spy, Stark, or Pewaukee, as a basis for a top-worked orchard. The Baldwin, in certain sections of the State, is a very unsatisfactory orchard variety because of body blight and sun scald; but when top-worked, as indicated, it often does admirably. Individual seedling apple trees vary just as much in vigor and hardiness as do other seedling plants. Hence the importance of using as stock some variety of known vigor and hardiness rather than a miscellaneous collection of seedlings. Not infrequently the inherent weakness of a seedling stock will manifest itself just as the tree reaches the bearing age; with the result that the orchard is spotted and unsatisfactory. Figure 15 shows such a case on the cultivated plot described on pages 7-10. This tree bore nearly a barrel of fruit this year, but made no growth, dropped its leaves early, and will probably fail to start next spring.

Another advantage of top-working the variety desired is that cions may be selected from particular trees of known value. Cions taken from a tree producing large quantities of highly colored fruit, true to type, will be likely to give satisfactory returns when taken to the new orchard. On the other hand nursery grown stock may have come from buds taken from other nursery trees or from trees which produced fruit of inferior quality and appearance, and these undesirable qualities are just as certain of being perpetuated as are the others,—a fact which doubtless accounts for many unsatisfactory orchards.

THE CHINCH BUG IN MAINE;

With Some Observations and Experiments.

H. W. Britcher.

For nearly a century and a quarter the chinch bug, *Blissus leucopteris,* Say, has been recognized as a pest in the United States. In 1785 so much damage was done in North Carolina that in some districts wheat growing was abandoned. In 1809 another serious visitation occurred in that state and during a third destructive period in 1839 losses were also reported in South Carolina and Virginia. Between 1845 and 1850 injuries were reported from Illinois, Indiana and Wisconsin and during the few following years its destructive presence became known in other states. The loss due to its ravages in 1887 in Kentucky, Ohio, Indiana, Illinois, Minnesota, Iowa, Missouri and Kansas was estimated at $60,000,000, and it is further estimated that the total losses for the period from 1850 to 1898 were $330,000,000, chiefly in the above nine states. Although it occurs in largest numbers and does its chief injury in the states of the Mississippi Valley, its presence is known in every state of the Union except Oregon, Washington, Montana, Idaho, Nevada, Utah and Arizona. The crops, whose partial or total destruction has resulted in such enormous losses, include wheat, barley, rye, corn and several grasses.*

DESCRIPTION.

Fig. 11. CHINCH BUG. The short upright line shows natural length.

The chinch bug, which by its presence in vast hordes is able to cause such immense losses, is a near relative of the group of bugs popularly known as "stink bugs" and has, in common with them, the habit when disturbed of emitting a peculiar odor. When full grown it is about one-sixth of an inch long and one-twentieth of an inch broad. It is black in color, with a flat back upon which rest the wings, which are whitish in color with a black spot at about the middle of the external edge of each. In some individuals

*The first part of this bulletin is largely a compilation from Bulletin No. 15 of the Division of Entomology of the U. S. Department of Agriculture, entitled The Chinch Bug, by F. M. Webster.

the wings cover the whole abdomen while in others they are only long enough to cover from one-third to two-thirds of the back. These latter are known as the short-winged forms, while the former are spoken of as the long-winged forms. Both forms are covered on the body and legs with very fine hairs and are apparently alike in all respects except the size of the wings.

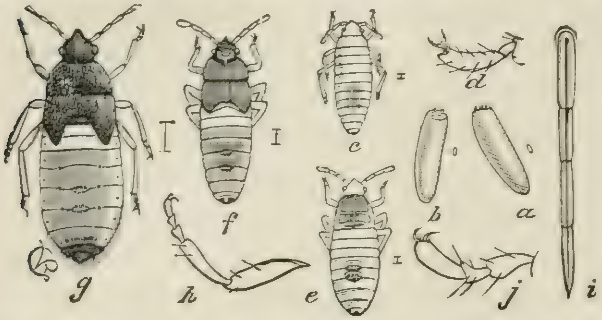


FIG. 12. CHINCH BUG, LARVA, PUPA AND EGG.

a and *b*, eggs; *c*, young larva; *d*, tarsus of same; *e*, larva after first molt; *f*, larva after second molt; *g*, pupa; *h*, leg; *i*, beak or tubular mouth; *j*, tarsus of mature bug. The short line at the right of each figure shows the natural length (after Riley).

The eggs are white in color, about one thirty-third of an inch long, and hatched in about two weeks after laying. The newly hatched larva is yellowish with a red spot on the back. Soon the whole body becomes reddish in color and after the first moult is bright vermillion, except the first two somites of the abdomen, which remain yellow, and the head which is dusky. After the second moult the head becomes still darker and the vermillion changes to duller red. After the third moult the head is brownish black, the abdomen grayish black and the legs blackish as in the adult stage, which is reached after the next moult. After the egg is laid, about sixty days elapse before the adult stage is reached.

HABITS

During the winter the bugs hibernate beneath such convenient material as loose bark and chips, dried leaves, corn shocks, the weeds of fence corners, and similar places, and they may frequently be found, more or less closely crowded, low down among the stems of clumps of wild rushes and grasses, often working their way down between the stems and the soil. During the warm days of May and June they leave these quarters and become active, the long-winged individuals frequently flying some distance to fields favorable for egg laying. The eggs are deposited near or below the surface of the ground on the stems or roots of the food plants. The egg laying season extends over a period of about three weeks and each female may lay from three hundred to five hundred eggs. After hatching the young usually remain below the surface of the ground, sucking the juices from the bases of the stems. When nearly mature they sometimes move higher up and so come to work above ground. If feeding on grain the whole brood, larvæ and adults, crawl off into nearby fields of corn or other food material when the grain is cut. They have been known to thus travel *en masse,* for over a quarter of a mile. There is also usually a migration from the feeding places to suitable places for hibernation during the warm days of early fall.

ENEMIES AND CHECKS.

It is reported that the chinch bug is devoured in considerable numbers by the common quail in some parts of the Central and Western States. Its other bird enemies include the prairie chicken, red-winged blackbird, catbird, brown thrush, meadow lark and house wren.

In Oklahoma Pekin ducks have been found to eat them readily. Frogs are also known to eat them, and a few insects, including lady-birds, one or two beetles, and two or three near relatives of the chinch bug itself also feed upon them to some extent.

Certain fungi have been found to attack chinch bugs normally and with one or two of these field experiments have been carried on rather extensively in some parts of the West, notably in Kansas and Indiana. The fungus has been grown in quantity in the laboratory under conditions favorable for its rapid multiplication and the spores have then been sent to localities in which chinch bugs were abundant and there sown among the bugs. In many instances the healthy bugs, in both larval and adult stages, have rapidly become infected with the fungus and have been speedily killed by its growth within them. However, the fungus requires for its own activity continued wet or damp weather, and appears to be practically worthless except under such conditions.

The weather itself is in all probability the most powerful factor in checking the increase of the chinch bug. The adult bug seems very little affected by moisture, but the larval insect, in all stages, more especially the earlier ones, are very soon killed by wet weather. If, therefore, frequent rains occur during the larval season of early summer, the bugs are considerably reduced in numbers and the amount of injury is much less than during dry seasons.

THE CHINCH BUG IN MAINE.

The chinch bug has been in Maine for some time, its presence being known in the grass lands about Fryeburg as much as thirty-five years ago.* During the past ten years it has been reported from Bridgton, Bethel, Jackman and Orono, at which last named place it has been found in a pasture near the village and also under leaves in woods on the University grounds. The region about Fryeburg is apparently the only locality in the State where the injury has been sufficient to attract general attention. Here it probably does slight damage every year without attracting notice. Occasionally there occurs a year or two especially favorable to the multiplication of the bug and then the damage wrought becomes conspicuous. In 1892 considerable injury was done and on the sixth of September a vial of the insects was sent to the Experiment Station for examination. They all proved to be in the pupa stage.

During the latter part of the summer of 1901 complaints were received at the Experiment Station that the chinch bugs were again causing an unusual amount of injury about Fryeburg. An examination of the conditions existing there during the latter part of September showed that the chief injury had been to timothy and hungarian grass, although corn and oats were in some instances attacked, as were also witch grass and barn grass. Timothy was completely killed over areas varying in size from a few square yards to others of several acres in extent. In some instances clover and witch grass had grown up in these spots. Barn grass growing among corn was completely killed and witch grass was killed to the ground, but grew up again as the bugs passed onward.

Although the damage for the year had ceased the bugs were easily found; in one case clustering in large numbers under the dead leaves, stems and other debris among the clover immediately bordering a spot on which the timothy had been killed; in another case crowding in and about the clumps of beard grass and sedge grass bordering a strip of hungarian grass. In such places as these and under dead grass and weeds about fence corners, under manure spread on the field in the fall and not

* Report Maine Agricultural Experiment Station, 1892.

plowed under, under masses of dead leaves and rubbish of all sorts, the bugs pass the late fall and winter months, lying apparently dead during cold weather, but quickly coming into activity during the warm days of late spring.

REMEDIES.

As the chinch bug works chiefly among grass crops in Maine, many of the remedies employed against it in the West are practically worthless here. As the amount of injury during any year depends partially on the number of bugs which pass the preceding winter in safety, perhaps the best methods to use against them are such as are easily applicable during the winter months. The following methods, if applied before the ground is covered with snow, would probably prove reasonably effective.

1st. *Burning.* When there is considerable clover mixed with the timothy or hungarian grass, the bugs are very likely to winter over beneath the clover which borders for a few feet or yards immediately upon the spot where they have stopped injuring the grass. If such a strip be mowed closely by hand and allowed to dry for a few days it may be burned over and quantities of the bugs will be killed. If this burning be done after the ground is frozen, little, if any, injury will thereby be done to the grass. All rubbish such as dried grass and weeds at the edges of the fields, brush heaps, dead leaves, bark and chops, clumps of wild grasses, sedge grasses, etc., in nearby fields should be burned as completely as possible.

2d. *Spraying.* Chinch bugs are quickly killed by kerosene or kerosene emulsion, but it is essential that it be thoroughly applied. The bugs are so protected by the clover and grass that it is almost impossible to reach them by ordinary spraying. Sprinkling freely over the infested spots will usually be effectual although it may kill the grass also. Clumps of wild grass or sedges in which careful examination shows the bugs to be abundant might be sprinkled thoroughly with kerosene and then burned, thus killing the bugs which had crowded deep down among the bases of the plants, where the flames alone might not reach them.

3rd. *Plowing.* Where bugs are found in considerable numbers at the edges of spots which they have eaten over, they may be destroyed by plowing under the strip in which they are hiding.

Deep plowing, however, is necessary, followed by dragging and rolling in order to completely cover all vegetation and close up all holes or passages through which the bugs might make their way to the surface.

If used promptly and thoroughly, the two latter methods are also applicable when the bugs are found to be working during early summer, and are all the more effective then because the bugs do not scatter over the whole field but stay together in comparatively small areas or strips, and if they are promptly killed over such patches further injury for the season will be very much lessened.

OBSERVATIONS.

The winter of 1901-1902 was unusual in some of its features. Snow fell on the 14th of November and again on the 26th and also on December 4th, the total amount aggregating over two and a half feet. The maximum temperature did not rise much above freezing during this time and the snow lasted. On December 10th began two weeks of rainy weather during which over four inches of rain fell and the fields were washed bare of snow. During the last week of December the maximum day temperature varied from 29° to 50° and the minimum night temperature from 2° to 3°, and during this time eight inches of snow fell, followed a day later by one and a quarter inches of rain. The minimum temperature of 2° occurred the night before the rain, while the snow still remained on the ground. From December 16th to 23rd, while the ground was bare, the maximum day temperature had varied from 13° to 21° and the minimum night temperature from 5° below zero to 12° above.

During the first week of January two inches of snow fell, the minimum night temperature only once rose above 6° and the maximum day temperature only once above 22°, and high winds prevailed. Several snow falls occurred before January 20th, aggregating nearly a foot and a half. During the following week over two inches of rain fell, the temperature was higher and the ground again became bare. During February enough snow fell to keep the fields slightly covered, although it was badly drifted by the high winds which followed each snow fall.

About the 1st of November chinch bugs were found in considerable numbers in a pasture which was separated from a timothy field by the width of the public road. The bugs were found beneath the debris collected in a brush heap by the road side, beneath the dead cedar twigs and leaves under one or two young cedars growing in the fence and in clumps of rushes (*Juncus*) growing in a moist situation in the pasture. In the rushes the bugs were crowded among the bases of the stems, working their way even lower down than the surface of the ground. One clump about six inches in diameter was cut out an inch or so below the surface of the ground and picked to pieces and found to contain one hundred and fifty-six bugs. On December 14th ten bugs were taken from beneath a strip of bark lying on the ground and twenty-two from a *Juncus* clump six inches in diameter.

The melting snow and the rains of the last week in December flooded all except one edge of the *Juncus* patch. The sudden cold of the first days of January froze the water over this area three or four inches thick. The water beneath the ice then settled away, leaving an air space. The rain of January 21st and 22nd, together with the melting snow, filled this space and then overflowed through openings about the *Juncus* clumps. Through these openings chinch bugs were washed out and left stranded on the surface of the ice as the water flowed away. During the afternoon of January 23rd sixty-eight such bugs were picked up off the ice. All were making feeble leg movements, strong enough in some cases to cause very slow progression. Fifty-three of these bugs were short-winged. (See Experiment 6.) On the morning of the same day thirty-two long-winged forms and two short-winged forms were taken from beneath a flat log frozen to the ground. All were thickly covered with frost crystals and made no responsive movements when picked up, but all became active after being in the laboratory a few moments. (See Experiment 5.)

On the 27th of January rain washed more bugs out onto the ice. Many of these were frozen into the ice during the two following days, during which the maximum temperature did not rise above 13°. On January 29th six of the frozen bugs, all short-winged, were chopped out of the ice and slowly thawed out. None of them gave any signs of life. On the same day ten long-winged and one short-winged forms were taken from among leaves beneath a loosely attached board. When thawed out only three long-winged forms failed to show signs of life.

3

Six were able to walk about actively, while two were unable to walk but could move their legs feebly.

On February 14th two clumps of *Juncus* were chopped out. The first was three inches in diameter and contained fifty long-winged bugs and ten short-winged ones. The second clump was six inches in diameter and contained forty-two long-winged forms and eight short-winged ones.

On April 5th, after three weeks of mild and rainy weather, thirty-six long-winged and twenty-nine short-winged forms were taken from the under side of a piece of board two feet long and five inches wide. They were clustered in groups and moved off readily when disturbed. A few bugs were also found in clumps of *Juncus* and these were less active than those beneath the board.

On October 1st, 1902, the chinch bugs were again found in winter quarters in the same locality as during the fall of 1901. Eighteen short-winged and two long-winged forms were shaken out of a piece of *Juncus* clump. On October 15th four hundred and twenty-nine short-winged and forty-four long-winged forms were taken from beneath cedar debris and on October 31st fifty-eight short-winged and fourteen long-winged forms were taken from the same locality.

Thus, of the five hundred and sixty-five bugs collected during October, 1902, only sixty were long-winged.

Of the seven hundred and sixty-three bugs collected during the winter of 1901-1902 two hundred and forty-six were short-winged, three hundred and thirty-nine were long-winged and the remaining one hundred and eighty-eight were not examined as to length of wings.

The odor of the bugs collected and experimented with during October seemed much stronger and more persistent than that of bugs collected and experimented with during the winter.

EXPERIMENTS.

In order to test the powers of the chinch bug to withstand severe and unusual conditions, the following experiments were made:

Experiment 1. Twenty long-winged and five short-winged forms were frozen in an open box from January 17th to 23rd when they were thawed out by a cold rain. None of them showed any signs of life.

Experiment 2. Seven long-winged and five short-winged forms were frozen in a block of ice from January 17th to 23rd. No signs of life were shown after thawing out.

Experiment 3. Fifteen long-winged and eight short-winged forms were packed in snow and frozen from January 18th to 23rd. After thawing out two long-winged and four short-winged forms walked about actively; the rest did not revive.

Experiment 4. Ten long-winged and six short-winged forms were frozen in an open box for fifteen hours. Upon thawing out two gave no signs of life. After being kept for nine hours at a temperature of 65° the fourteen surviving bugs were refrozen for fifteen hours and then thawed out, when five long-winged and three short-winged forms revived. After nine hours at a temperature of 65° they were refrozen for fifteen hours, during which time the minimum temperature sank to 16° below zero. When thawed out all revived, but during the following nine hours at 65° temperature the three short-winged forms and two of the long-winged ones died. The remaining three long-winged forms were then again refrozen for fifteen hours, after which none revived.

Experiment 5. Thirty-two long-winged and two short-winged forms taken from beneath a log on January 23rd were kept at the ordinary temperature of the laboratory in a covered pasteboard box. Several thicknesses of filter paper were laid on the bottom of the box and well moistened twice daily for eight days, when only two bugs remained alive.

Experiment 6. Fifty-three short-winged and fifteen long-winged bugs picked up from the ice on January 23rd were kept at laboratory temperature in a covered box with filter paper moistened twice daily for eight days. Nineteen long-winged and eight short-winged forms were alive at the end of that time. These twenty-seven were continued at the same temperature but without moisture for seven days longer when five short-winged forms still remained alive.

Experiment 7. Three long-winged forms were frozen for twenty hours in a dry glass tube. None revived when thawed out.

Experiment 8. Three long-winged forms were frozen for twenty hours in a block of ice. None revived after being thawed out.

Experiment 9. Five long-winged and three short-winged bugs were frozen between sheets of wet filter paper for seventeen hours. Four long-winged and one-short-winged forms revived when thawed out.

Experiment 10. Seven long-winged and one short-winged forms were frozen in a block of ice for seventeen hours. None revived when thawed out.

Experiment 11. Five long-winged and two short-winged bugs were frozen in a dry glass tube for seventeen hours. Three long-winged forms revived after thawing out.

The minimum temperature for experiments 7 and 8 was 2° and the maximum was 16°. For experiments 9, 10 and 11 the minimum was 4° and the maximum 10°.

Experiment 12. A small clump of *Juncus* was cut from the ground, wrapped in paper and exposed for twenty-five days on the north side of the building where it received no sun rays. It was then picked to pieces and sixteen bugs were found, of which eleven short-winged ones were dead, and three short-winged ones and two long-winged ones were alive. During this exposure the minimum temperature was 15° below zero and the maximum was 45°.

Experiment 13. A clump of *Juncus* was cut out of the ground, wrapped in paper and exposed on the north side of the building for forty days, when it was picked to pieces and found to contain fourteen long-winged and thirty-two short-winged bugs which were dead, and nine long-winged and seven short-winged bugs which were alive. The minimum temperature for the forty days was 15° below zero and the maximum was 52°.

Experiment 14. Five long-winged and four short-winged bugs were completely submerged in water for three hours, after which all revived, the short-winged forms becoming active first. They were kept dry for seven hours and then again completely submerged for eleven hours. All revived, were kept dry for twelve hours and again completely submerged for seventeen hours. All revived, except one short-winged individual. After being dry for twenty-four hours the remaining eight were submerged for twenty-five hours, after which one long-winged and one short-winged form failed to revive. Another short-winged form died during the day. The remaining five were submerged for thirty hours, after which they were kept dry for eighteen hours, at the end of which time only the one short-winged individual was alive.

Experiment 15. Eleven long-winged and three short-winged bugs were completely submerged for twenty-five hours. All revived in from twenty to seventy-five minutes. After being dry for eighteen hours they were again submerged for thirty hours, after which none revived in less than an hour and after being dry for eighteen hours three long-winged and two short-winged forms were dead. The remaining nine were then submerged for fifty hours after which four long-winged forms revived within ninety minutes. Three of these were still able to move about at the end of eighteen hours.

Experiment 16. Four long-winged and four short-winged bugs were submerged for twenty-seven hours. All revived, but at the end of eighteen hours one short-winged individual was dead. At the end of fifty hours longer the remainder were all found to be dead.

Experiment 17. Six long-winged and ten short-winged bugs were submerged for fifty hours, after which all revived except one of each form. After being dry for eighteen hours, all except one long-winged and two short-winged forms were walking about actively.

Experiment 18. Twenty long-winged and five short-winged bugs were submerged for seventy-five hours. There were no signs of reviving at the end of three hours, but at the end of twenty hours twelve long-winged and four short-winged forms were moving their legs, one of each form being able to walk about.

Experiment 19. Thirteen long-winged and two short-winged bugs were kept for seventy-five hours in a tightly corked two-dram vial. At the end of forty-eight hours all were inactive, but all revived within two hours after the end of the test.

Experiment 20. Eight long-winged and three short-winged bugs were frozen in a dry glass tube for sixteen hours. None revived in less than two hours, but at the end of six hours all but one of each form had revived, but none were able to walk about.

Experiment 21. Four long-winged and seventeen short-winged bugs were submerged for twenty-six hours after which all but one revived in from one to four hours.

Experiment 22. Five long-winged and fifteen short-winged bugs were submerged for forty-eight hours after which nine short-winged forms revived in from two and a half to six hours. Only two however were able to walk about.

Experiment 23. Eight long-winged and twenty-two short-winged bugs were submerged for sixty-eight hours. After being dry for eight hours only one long-winged and two short-winged forms had revived and these were unable to make any but very feeble movements.

Experiment 24. Fifteen short-winged bugs were placed in a tightly closed two-dram vial. In six hours they had ceased all movements and lay as if dead. After twenty-four hours five were taken out, but failed to revive at the end of three hours. After forty-eight hours the other ten were taken out. They showed no signs of reviving at the end of eight hours.

Experiment 25. Fourteen long-winged bugs were placed in a tightly closed two-dram vial. At the end of thirty hours all were active. At the end of fifty hours all were still able to move about feebly. At the end of seventy-two hours all but one were still able to move their legs feebly but not able to walk about. They were taken from the vial and after about half an hour all were able to walk about.

Experiments 1-20 were performed during January and February, 1902, and experiments 21-25 during October, 1902.

CONCLUSIONS.

From the foregoing observations and experiments the following conclusions seem reasonable:

The hibernation of the chinch bug is not a period of prolonged or continuous torpidity, but a period during which the torpidity may be broken by warm weather, when the bug becomes capable of active movements.

Complete submersion in water, even for a considerable period is not necessarily fatal.

Freezing while submerged in water is almost surely fatal.

Freezing while exposed to a dry atmosphere is generally fatal.

Freezing in a moisture laden atmosphere is only occasionally fatal.

A FEEDING TEST WITH BILES FOUREX.

CHAS. D. WOODS.

Biles Fourex is dried distillers grains—a new feed for Maine. The Norton-Chapman Company of Portland are the New England agents for these goods. The manufacturers guarantee the goods to carry 33 per cent protein and 11 per cent fat. Twenty samples sent to and collected by the Station have varied from 29 to 36 per cent of protein.

From a car shipped to Bangor one ton was sent to the Station, which was used in a feeding trial with milch cows. This lot carried 34.88 per cent protein.

When the Fourex was received the Station herd was being fed corn silage, mixed hay, and a grain mixture, composed of 200 pounds wheat bran, 200 pounds cotton seed meal, and 100 pounds linseed meal. This grain mixture carried about 30 per cent protein and cost about $25 per ton. A mixture of 300 pounds Fourex and 50 pounds of bran carries 30 per cent of protein and costs about $27 per ton. This mixture was fed in comparison with the oil meal mixture.

From the herd we selected 3 grade Holstein cows, 2 Jersey heifers and 1 Guernsey heifer, all in milk for about 3 months, and who, according to their records, were doing a moderate amount of work. These six animals were gradually changed from the oil meal mixture to the Fourex mixture, and after 22 days on this were gradually changed back to the oil meal ration.

The yield of milk on the oil meal ration for 11 days prior to the change to Fourex, and another 11 days yields after the return to the oil meal ration are compared in the table with 22 days in which the mixture was fed.

The table shows the milk yield of 6 cows for 22 days on oil meal and Fourex rations. The hay and silage fed was the same in all periods. Sufficient wheat bran was used with the oil meals and the Fourex to make a grain ration carrying 30 per cent total protein. The same *weight* of grain mixture was fed in all the periods.

Cows used in test.	Kind of Grain Mixture and Periods of Milk			
	Oil Meal.			Fourex.
	1st period, 11 days.	3d period, 11 days.	Total, 22 days.	2d period, 22 days.
	lbs.	lbs.	lbs.	lbs.
Rothalie, Jersey	198.0	205.5	403.5	427.5
Addie 4, Jersey	209.1	203.1	412.2	428.0
Guernsey	222.0	209.8	431.8	440.3
Abbie B., Holstein	242.9	222.2	465.1	472.3
Roxy, Holstein	304.1	301.6	605.7	627.5
Fan, Holstein	275.2	285.7	560.9	594.2
Total milk in 22 days	....	....	2,879.2	2,989.8

It will be noted that the cows more than maintained their milk yield with the Fourex. The slight increase of 110 pounds with six cows in 22 days or less than a pound of milk per cow per day does not prove that Fourex is better food for milk production than the oil meals, as such small variations constantly arise from causes outside of the feed. For example, Rothalie and Fan gave nearly a pound a day more milk in the third than in the first period, and this on the same ration and when they were a month farther advanced in lactation.

BREEDING FOR EGG PRODUCTION.*

G. M. GOWELL.

On November 1st, 1898, tests were undertaken for the purpose of procuring data relative to the egg production of hens; and also, by selection and breeding, to improve the quality and increase the number of eggs produced. It was decided to study individuals as well as flocks, and to do this with exactness, the everyday performance of every bird should be known.

As a means of securing the needed information 52 trap nests, of our devising and construction, were placed in the 13 pens of the breeding house. The nests were described in the report of this Station for 1898. The pens were 10 by 16 feet in size, and four of these nests were placed in each one: 20 pullets and 2 cockerels were placed in each pen on November 1st, and daily egg records kept with each individual bird during the 12 months following; with some of the largest yielders, the records were continued into succeeding years.

When the data from the first year's testing were secured, the birds that had yielded 200 or more eggs of good shape, size and color, were selected for "foundation stock," upon which, with the additions made to them in succeeding years of birds of similar quality, the breeding operations were to be based. It is known that the laws of inheritance and transmission are as true with birds as with cattle, sheep and horses, and when we consider the wonderful changes that have been made in the form, feather and egg production of hens since their domestication commenced, there is ample room for assuming that a higher average egg production than the present can be secured, by breeding only from those birds that are themselves great producers.

The purpose of this work should not be misunderstood. We are not trying to produce stock that shall average to yield 200 eggs per year. If, by furnishing the male birds which we are raising to poultrymen and farmers, the average egg yields of

* This is a continuation of work begun in 1898, the results of which were reported in Bulletin 64, 1899, and Bulletin 79, 1902.

the hens of the State shall be increased to the extent of one dozen per bird, the value and importance of this work will be many fold its cost. While we are not breeding for fancy or show purposes, the birds are kept within the limits of the requirements of the breeds, so far as markings are concerned. No matter how great the number of eggs yielded, if they are not of good size, shape and color, the bird is rejected as a breeder.

It is yet too early to report what the results of this work are to be. Sufficient time has not elapsed since beginning the tests, to increase egg production, or establish claims of increased productiveness.

During the four years in which we have been selecting breeding stock by use of the trap nests, we have given full year tests to over a thousand hens and have found among them 35 that have yielded from 200 to 251 eggs each in a year. Several have each yielded only from 36 to 60 eggs, and three have never laid at all, to the best of our knowledge.

A study of the monthly record sheets shows not only great differences in the capacities of hens, but marked variations in the regularity of their work; some commencing early in November and continuing to lay heavily and regularly, month after month, while others varied much, laying well one month and poorly or not at all the next. We are not able to account for these vagaries, as the birds in each breed were bred alike and selected for their uniformity. All pens were of the same size and shape and contained the same number of birds. Their feeding and treatment were alike throughout.

With the most careful selections we could make, when estimating the capacities for egg yielding by the types and forms of birds, we found we were still including in our breeding pens hens that were small workers. Many of the light layers gave evidence of much vitality, and in many instances there were no marked differences in form or action, by which we were able to account for the small amount of work performed by them.

Every hen that has laid large numbers of eggs through the first, or the first and second, or more years, has shown much vigor and constitution. Some individuals have laid heavily for a few months and then drooped and died, seemingly because they could not stand the demands made upon them by heavy work.

RECORDS OF PULLETS, 1901-1902.

November 1st, 1901, 55 Barred Rocks, hatched during April, May and June, and 40 White Wyandottes, hatched during the same months, commenced their year's work with the trap nests. These birds were brought in during the last two days of October, from the portable houses, out on the range, where they were raised and had their liberty. Most of those hatched during April had been laying well during October, and some of them commenced the first of September. The eggs laid during September and October were lost, so far as individual records go; so the birds have not got credit for the work they actually performed during their best 12 months. Reference to the table following shows October, 1902, almost bare of eggs. Could the birds that were laying when on the range the previous October, have started their records on the first day of that month, rather than a month later, and have been credited with the eggs they did lay during the 12 months following, more of them would have been placed above the 200 mark, and those now placed there would have their records materially advanced. As it stands now, however, we found seven birds among the 55 Barred Rocks with yields of from 201 to 240 eggs in the year.

The 55 birds laid 7,972 eggs during the year. Four birds were stolen, and if the 24 months they were out is accounted for we have 53 birds for the year averaging a little better than 150 eggs each. Three birds died during the year.

The 40 White Wyandottes laid 4,607 eggs, and if we deduct the time that was lost by those stolen, we have 39 birds for the year, averaging 118 eggs each. None of them reached the 200 mark. Six died during the year.

The yield of the White Wyandottes was lower this year than in previous years. This may in a measure be accounted for by the fact that they were allowed out of doors part of a wet day in April and quite a number of them took colds. A marked reduction in the egg yield was noted, extending over several weeks.

It is believed that one bird, No. 1,069, laid no eggs during the entire year. A very few eggs were found outside the trap nests, but none that could be traced to her. There appeared to be no reason why she should be a drone as she seemed to be in good health and her external form was not unlike that of her laying mates.

RECORD OF BARRED PLYMOUTH ROCK HENS HATCHED IN 1901.

Number of hen.	When hatched.	Monthly Egg Yields.												Yields to November 1st
		1901.		1802.										
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	
1001	April ..	20	23	21	19	23	18	20	18	23	15	13	–	213
1002	April ..	24	24	13	10	22	16	16	21	18	20	16	5	205
1003	April ..	23	24	22	12	16	23	23	20	22	20	19	16	240
1004	April ..	20	6	13	3	18	22	25	23	20	21	2	–	173
1005	April ..	21	24	22	12	16	24	25	23	23	20	12	–	222
1006	April ..	22	20	10	3	9	6	–	16	3	–	–	–	89
1007	April ..	17	16	13	–	13	11	2	13	3	11	–	–	99
1008	April .	–	18	–	19	15	10	*	–	–	–	–	–	62
1009	April ..	18	19	15	10	20	19	15	13	14	13	7	–	163
1010	April ..	19	25	22	15	9	18	14	18	16	11	20	1	188
1011	April .	10	17	17	16	19	22	22	15	16	20	5	–	179
1012	April ..	4	21	12	13	21	22	22	19	14	21	19	12	201
1013	May ...	–	16	10	12	19	25	22	14	21	7	18	6	170
1014	May ...	4	21	23	23	–	†	–	–	–	–	–	–	92
1015	May ...	2	17	21	12	14	23	17	18	21	11	2	–	158
1016	May ...	–	12	17	7	10	11	10	13	11	12	14	1	118
1017	May ...	–	–	18	16	12	25	25	24	21	20	23	9	193
1018	May ...	–	–	15	15	19	21	11	19	9	4	–	–	113
1019	May ...	–	–	15	19	20	17	13	11	9	7	–	–	111
1020	May ...	–	–	3	2	15	18	17	*	–	–	–	–	55
1021	April ..	18	3	16	6	12	19	17	15	16	17	16	–	155
1022	April ..	–	10	17	12	13	12	15	14	13	10	–	–	116
1023	April ..	–	4	10	–	20	10	18	15	20	20	9	–	126
1024	April ..	16	22	21	16	22	24	21	20	20	16	–	–	198
1025	April ..	13	19	12	10	16	21	13	13	17	7	–	–	124
1026	April ..	14	20	17	12	19	15	19	18	16	23	19	3	196
1027	April ..	12	9	12	2	9	2	2	10	–	9	3	–	70
1028	April ..	10	20	21	22	24	24	16	20	15	16	18	–	206
1029	April ..	9	20	20	3	17	†	–	–	–	–	–	–	69
1030	April ..	7	24	25	11	24	10	15	13	10	9	6	1	155
1031	April ..	–	21	4	20	12	19	13	20	14	13	16	7	159
1032	May ...	–	16	22	18	22	19	19	16	18	17	11	–	189
1033	May ...	–	12	4	9	18	18	16	20	16	13	–	–	126
1034	May . .	–	12	9	17	24	11	18	14	14	16	12	6	153
1035	May ...	–	9	4	3	21	21	18	9	5	3	–	–	93
1036	May ...	–	7	22	18	12	15	16	18	20	14	15	17	174
1037	May ...	5	–	18	–	8	4	*	–	–	–	–	–	35
1038	May ...	1	–	20	4	11	23	7	21	19	5	–	–	111
1039	May ...	–	–	20	19	26	26	5	15	13	20	15	9	168
1040	May ...	–	–	8	16	13	14	16	13	11	14	–	–	105
1041	May ...	–	5	21	17	17	20	20	19	1	–	1	–	122
1042	May ...	10	20	22	9	22	23	10	8	21	5	7	–	164
1043	May ...	3	16	3	14	14	22	21	9	14	–	–	–	116
1044	May ...	–	16	16	–	19	23	19	16	16	12	17	9	173
1045	May ...	–	17	7	14	18	24	15	†	–	–	–	–	95
1046	May ...	–	14	16	6	7	18	18	15	16	14	22	21	168
1047	May ...	–	13	7	8	14	18	19	25	24	14	14	–	153
1048	May ...	–	15	20	17	13	19	12	†	–	–	–	–	96
1049	May ...	–	10	16	15	15	17	11	20	21	17	12	1	155
1050	May ...	–	8	21	15	14	20	11	16	17	15	7	18	162
1140	... .	–	3	21	19	20	20	24	21	18	25	20	20	211
1141	....	–	–	17	9	18	20	19	16	15	18	8	–	148
1142	....	–	–	15	5	19	21	23	21	15	20	21	15	175
1143	....	–	–	8	19	25	21	17	22	16	19	7	3	157
1144	....	–	–	7	15	21	19	22	21	–	–	–	–	105

* Died. † Stolen.

EGG RECORDS OF WHITE WYANDOTTE HENS HATCHED IN 1901.

Number of hen.	When hatched.	Monthly Egg Yields During												Yields to November 1st.
		1901.		1902.										
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	
1051	April..	21	14	13	10	13	16	2	10	11	10	–	–	120
1052	April..	17	20	18	12	17	13	9	19	16	12	†	–	153
1053	April..	17	18	18	18	11	13	22	17	18	12	17	10	191
1054	April..	10	21	24	11	1	8	9	21	16	11	7	1	140
1055	April..	5	24	7	15	8	3	–	–	14	19	17	16	128
1056	May..	–	20	11	4	6	12	21	9	15	15	10	5	128
1057	May...	–	15	15	2	13	17	9	18	24	20	16	11	160
1058	May...	–	16	20	17	25	8	12	12	11	16	10	13	160
1059	May...	–	20	10	10	16	17	12	17	3	4	–	–	109
1060	May..	–	21	24	20	13	8	14	5	20	14	18	27	184
1061	May...	–	19	22	11	10	–	7	13	14	16	15	16	143
1062	May...	–	10	20	7	9	16	16	15	12	17	9	12	143
1063	May...	–	1	15	–	3	*5	–	–	–	–	–	–	24
1064	May...	–	1	7	–	*5	–	–	–	–	–	–	–	13
1065	June...	–	–	15	15	4	6	2	15	11	12	18	10	108
1066	May...	5	–	5	–	7	19	11	18	19	19	4	–	107
1067	June...	–	–	15	6	5	13	12	8	9	14	–	–	82
1068	May..	7	–	6	13	14	10	19	11	15	16	21	8	140
1069	May...	–	–	–	–	–	–	–	–	–	–	–	–	–
1070	May...	–	–	–	–	10	–	–	1	*	–	–	–	11
1071	April..	17	16	11	17	11	13	12	16	10	10	13	3	149
1072	April..	19	16	13	18	19	10	14	13	11	12	12	4	161
1073	April..	14	21	12	1	18	16	17	13	9	13	2	1	137
1074	April..	15	24	18	11	7	9	24	11	†	–	–	–	119
1075	May...	–	21	24	20	19	11	4	18	15	15	21	17	185
1076	May...	–	13	19	18	16	16	15	16	17	18	2	–	152
1077	May...	–	18	23	17	16	4	†	–	–	–	–	–	78
1078	May...	–	7	18	13	11	7	9	9	10	9	11	6	110
1079	May...	–	11	13	10	12	11	12	10	9	11	8	13	120
1080	May...	–	9	17	18	13	12	4	14	12	13	11	5	128
1081	May...	–	8	19	3	12	15	11	15	16	9	12	19	139
1082	May...	–	5	19	18	9	3	–	–	–	1	–	–	55
1083	May...	–	6	12	–	8	2	–	2	*	–	–	–	30
1084	May...	–	6	20	19	22	16	12	14	14	12	10	4	149
1085	June...	–	2	24	19	12	9	16	13	21	18	8	20	162
1086	June...	–	1	20	4	12	14	15	13	11	18	17	5	130
1087	June. .	–	–	17	15	5	12	5	5	*	–	–	–	59
1088	June...	–	–	10	17	15	3	14	15	11	17	16	11	129
1089	June...	–	–	13	14	18	17	10	19	18	18	13	15	156
1090	Jnne...	–	–	11	3	1	*	–	–	–	–	–	–	15

* Died. † Stolen,

THE BREEDING STOCK.

The numbers of the foundation stock now secured makes practicable the avoidance of in-breeding, and this is strictly guarded against, as it is doubtful if the in-bred hen has sufficient constitution to enable her to stand the demands of heavy egg yielding.

Males for our breeding operations have been raised from the most desirable of the foundation stock during the last three years.

Aside from the foundation stock in the following table, all of the other breeding females we are now carrying are tested hens that have laid over 180 eggs in a year; pullets whose mothers laid over 200 eggs in a year, and whose fathers' mothers laid over 200 eggs in a year; and pullets out of hens whose sires were out of 200-egg hens, the pullets themselves being sired by cockerels bred for two generations on both dam and sire sides from 200-egg producers.

FOUNDATION STOCK WITH EGG RECORDS TO OCTOBER 31, 1892.

Number of hens.	When hatched.	Breed.	Eggs laid in 1899.	Eggs laid in 1900.	Eggs laid in 1901.	Eggs laid in 1902.
4	April, 1898	W. W.	201	140	130	119
14	April, 1898	W. W.	208	141	28	–
47	April, 1898	W. W.	200	167	–	–
403	April, 1899	W. W.	–	219	162	72
428	April, 1899	W. W.	–	217	138	–
445	April, 1899	W. W.	–	208	139	89
480	April, 1899	W. W.	–	218	172	93
729	April, 1900	W. W.	–	–	203	134
742	April, 1900	W. W.	–	–	208	113
753	April, 1900	W. W.	–	–	217	150
765	April, 1900	W. W.	–	–	226	22
770	April, 1900	W. W.	–	–	207	102
777	April, 1900	W. W.	–	–	233	42
101	June, 1898	B. P. R.	204	30	63	33
286	June, 1898	B. P. R.	206	147	138	–
303	April, 1899	B. P. R.	–	208	127	85
318	April, 1899	B. P. R.	–	237	102	49
326	April, 1899	B. P. R.	–	211	145	104
609	April, 1900	B. P. R.	–	–	200	176
612	April, 1900	B. P. R.	–	–	209	138
617	April, 1900	B. P. R.	–	–	251	133
630	April, 1900	B. P. R.	–	–	213	137
635	April, 1900	B. P. R.	–	–	201	143
672	April, 1900	B. P. R.	–	–	210	185
676	April, 1900	B. P. R.	–	–	209	102
1001	April, 1901	B. P. R.	–	–	–	213
1002	April, 1901	B. P. R.	–	–	–	205
1003	April, 1901	B. P. R.	–	–	–	240
1005	April, 1901	B. P. R.	–	–	–	222
1012	April, 1901	B. P. R.	–	–	–	201
1028	April, 1901	B. P. R.	–	–	–	206
1140		B. P. R.	–	–	–	211

COMPARISONS OF THE YIELDS OF HENS DURING THE FIRST AND SECOND YEARS OF LAYING.

With many poultrymen the idea is prevalent that if a hen lay but few eggs the first year, she is likely to do better the second year, than though she laid well during the first.

The data so far secured, does not show that hens that yield 120 eggs, or less, the first year, yield satisfactorily the second

EGGS YIELDED DURING FIRST, SECOND AND THIRD YEAR OF LAYING

Number of hens.	Breed.	When hatched.	When commenced laying.	Number of eggs laid during first full year.	Number of eggs laid first year Nov. 1 to Nov. 1.	Number of eggs laid second year Nov. 1 to Nov. 1.	Number of eggs laid third year Nov. 1 to Nov. 1.
6	B. P. R..	April	October	161	161	61	
10	B. P. R..	April	October	175	175	8	* March.
26	B. P. R..	April	November	158	155	118	
30	B. P. R..	April	November	165	165	112	
31	B. P. R..	April	November	175	175	94	
36	B. P. R..	April	October	201	181	159	
45	B. P. R..	May	December	166	142	89	
51	B. P. R..	May	December	191	191	94	
74	B. P. R..	May	December	182	165	151	
76	B. P. R..	May	December	169	169	40	
80	B. P. R..	May	January	160	140	103	
93	B. P. R..	April	October	160	160	145	
101	B. P. R..	May	January	204	201	30	63 * April.
114	B. P. R..	May	January	139	136	130	
120	B. P. R..	May	January	188	184	99	* Sept.
126	B. P. R..	May	January	180	152	162	
137	B. P. R..	May	January	155	155	116	
151	B. P. R..	May	January	155	135	161	
159	B. P. R..	May	January	175	137	168	
205	B. P. R..	June	February	191	165	165	
208	B. P. R..	June	January	169	151	82	
209	B. P. R..	June	January	180	154	94	
228	B. P. R..	June	February	153	120	115	
246	B. P. R..	June	February	143	143	46	
281	B. P. R..	June	February	167	129	125	
286	B. P. R..	June	February	206	191	147	138 * Sept.
289	B. P. R..	June	February	181	151	150	
300	B. P. R..	June	February	175	138	148	
303	B. P. R..	May	November	208	208	127	85
318	B. P. R..	April	November	237	237	102	49
324	B. P. R..	April	November	163	163	71	
326	B. P. R	April	November	211	211	145	104 * Sept.
603	B. P. R..	April	November	196	196	16	* June.
607	B. P. R..	May	November	170	170	172	
608	B. P. R..	June	February	195	195	166	
609	B. P. R..	April	November	200	200	176	* June.
611	B. P. R.	May	January	185	185	147	
612	B. P. R.	April	November	209	209	138	
617	B. P. R..	May	November	251	234	150	
618	B. P. R..	April	November	191	191	73	* June.
622	B. P. R..	May	January	99	99	67	
623	B. P. R..	May	November	183	183	124	
626	B. P. R..	May	December	107	107	22	
627	B. P. R..	May	January	61	61	20	* Feb.
630	B. P. R..	April	November	217	213	137	
632	B. P. R..	May	December	217	185	106	
634	B. P. R..	May	January	92	92	35	
635	B. P. R..	May	November	201	190	143	
642	B. P. R..	May	November	169	169	30	
644	B. P. R..	May	January	74	74	12	
648	B. P. R..	April	November	182	182	34	
649	B. P. R..	May	December	190	190	88	
651	B. P. R..	May	December	181	170	103	
654	B. P. R..	May	December	189	189	13	* March.
653	B. P. R..	May	January	95	95	82	* July.
657	B. P. R..	June	January	180	177	58	
664	B. P. P..	May	November	175	175	98	
670	B. P. R..	May	December	167	167	86	
671	B. P. R..	May	November	167	167	51	* May.
672	B. P. R..	May	November	210	200	185	
676	B. P. R..	May	November	209	209	102	
684	B. P. R..	June	January	170	170	107	
686	B. P. R..	June	February	51	51	86	
689	B. P. R..	June	January	181	181	70	
693	B. P. R..	June	February	47	47	44	* July.
698	B. P. R..	June	January	192	192	133	

All except those marked with a star completed the full second or third year. Those marked with a star died in months indicated.

year. Those that yielded in the vicinity of 100 the first year have yielded very lightly the second year.

The left hand column of egg yields, in the table on page 47, shows the numbers of eggs yielded by each hen during the first full year after she commenced laying, and in most cases it is greater than when the year is reckoned forward from November 1st.

We have generally found it necessary to have the pullets of the breeds we have used, hatched by the last of April in order to have them laying regularly by the first of November. They then have a full year for work before they are removed the following fall, to make room for the new pullets that must be in winter quarters early, if they are to do satisfactory work. If the pullet does not commence laying until January, she does not have a full year before she has to give way to the young stock, by the last of October, or the first of November.

This feature of poultry management counts for a great deal and has much to do with determining the incomes of flocks. The column recording the yearly yields of the first and second year's laying are worthy of careful study.

AMOUNT OF FLOOR SPACE AND OTHER CONDITIONS OF HOUSING IN RELATION TO EGG YIELD, AND INCUBATION EXPERIMENTS IN 1902.

G. M. Gowell.

The cost of housing poultry is a very important item to the poultryman, and the amount of floor space required by each hen is a much discussed question which is worthy of the most careful consideration and investigation. One test of this important subject has been undertaken and is here reported. Since it furnishes only limited data, the work will be continued.

A building 12 feet wide and 76 feet long, with walls 6 feet high and a double pitch roof, was divided in the middle, making two rooms, each 12 by 38 feet in size. The entire floor space was available to the use of the birds, as the roost platform or floor of the closet was elevated three feet above the floor. The front of this long closet, or roosting room, had a light frame, covered with white drilling, thoroughly saturated and glazed with boiled linseed oil. This framed curtain was hinged at the top and turned out into the house during the day, but shut down at night, from fall until spring, thus confining the birds in a small space, where it was hoped they would keep themselves warm. From fear that the air would be foul, the closet was not made very close and it froze in there quite hard during the cold nights and the results were that the birds did not commence laying much until March.

The house did not have glass windows, but the front wall had four frame curtains similar to those covering the front of the roosting closet. These cloth covers were 3 by 10 feet in size and came down to within a foot and a half of the floor. This, we think, is too low, as the wind blew in directly on to the birds, when the curtains were up, during the day.

In one half of this building, in Pen No. 1, 90 May hatched Barred Plymouth Rock pullets were put, and daily egg records kept with them for eleven months. In the other half, in Pen No. 2, 60 pullets, mates to those in Pen No. 1, were put, on the same day, and treated in the same manner.

EGG RECORDS OF HENS IN HOUSING EXPERIMENTS.

Months.	Pen No. 1. Size 12x38 feet. 90 birds.		Pen No. 2. Size 12x38 feet. 60 birds.	
	Number of hens each month.	Eggs laid each month.	Number of hens each month.	Eggs laid each month.
November	90	25	60	39
December	90	110	60	154
January	90	427	60	339
February	89	473	59	465
March	89	1214	59	891
April	89	1430	57	889
May	88	1288	57	855
June	85	1216	54	800
July	85	1281	54	808
August	83	997	52	724
September	79	833	48	571
Total yield for eleven months	-	9294	-	6535
Average number of hens in each pen	87	-	56½	-
Average yield per hen for whole period	-	109	-	116

Where the 90 birds were together they averaged 103 eggs each, and where the 60 birds made up the flock, 109 eggs was the average to each one. Where the larger number of birds were together they did not appear to suffer from confinement during winter, as only one bird was lost from November 1st to May 1st.

In the pen where the 90 birds were kept, the floor space was 5.1 square feet per bird, and in the pen where the flock numbered 60 birds the floor space was 7.6 feet per bird.

It is doubtful if there are other lines of investigation where results are likely to be of greater value to practical poultrymen than the study of sizes of flocks and floor spaces for birds. If floor space can be as economically used by leaving it in one large room as by dividing it into several small ones, even though the number of surface feet remains the same per bird, the labor of feeding, cleaning and egg-collecting will be less in the undivided house. Again; the larger room offers greater field for the range of each bird even though it be more densely populated per surface foot than does the smaller one.

CLOSE ROOSTING CLOSETS.

In comparison with the above described curtained-front house with its closet roosting-room, a small cheap building, but with a much warmer roosting closet, was stocked with pullets of the same breed and age as those put in the colder house.

It is not intended to contrast the work done in this second house with the pens noted above so far as floor space, per bird, is considered, for it was made much warmer, but was after the same plan, with curtained closets for sleeping quarters, and oiled cloth, on frame, to cover the large opening in front. The lower edge of the front curtain was three feet above the floor, and this bulkhead kept the wind from blowing directly on to the birds when they were on the floor scratching their food out of the 8-inch deep, dry straw. The roosting closet was made as near air tight as a common carpenter would make it. The outside walls of the building, and up the roof where it came in contact with the roosting closet, were packed with soft, fine hay. Its floor surface was 250 feet and we put 50 of the birds in it and treated them in the same way as those in the colder house. They did not get to laying until well along into November, but yielded 4.14 eggs each that month. In December the birds averaged 14.4 eggs each; January, 14.94; February, 13.4; March, 19.34; April, 18.72; May, 17.20; June, 14.3; July, 15.4; August, 12.3.

They averaged 144.4 eggs each, in ten months, and had still two months in which to work before completing their year, when nearly half of them were stolen and the record keeping interfered with. There appears to be no reason why the birds in this house should do better than those in Pens Nos. 1 and 2 except that they were better protected from the cold both day and night.

The curtained-front house with closet roosting room is inexpensive to construct, but one condition is imperative: the roost room must be as near air tight as it is practicable to make it when the curtain is closed down. There is no need to worry about ventilation. If the closet was filled with water it would quickly leak out. The cracks around the curtain frame, at top and bottom, furnish openings for the entrance of fresh, and escape of foul air.

The main part of this house is cold of course, but the straw on the floor is always dry, and the air clean. While the birds are on the roosts—in bed—they are warm. They come down to their breakfast and spend the day in the open air. Such treatment gives vigor and snap to the human, and it seems to work equally well with the hen.

EXPERIMENTS IN INCUBATION IN 1902.

In many experiments there are disturbing causes which interfere with the work and render unreliable the results, which seem to point in certain directions, and indicate certain truths. This is true with all of the investigations we have made concerning incubation. We have in use several good incubators and have had considerable experience in operating them and others. We think we have no trouble in getting as good results as when the eggs are submitted to the careful treatment given by the mother hen. With eggs from hens that have been laying but a short time we usually get hatches of from 70 to 80 per cent from the entire number of eggs incubated.

During the last three years we have planned and carried to completion a large number of incubation tests. By use of the trap nests we were able to know the source of every egg and it was thought that the eggs from the same hens, all laid within ten days of each other, and divided by selecting the first, third, fifth, etc., for one lot and the second, fourth, sixth, etc., for the other lot, would be nearer alike in freshness, fertility and germ strength, than though they were selected from different hens, however much alike such birds might be.

In this way we could have all the eggs of each hen in a class of her own—in two lots—and it was thought that the comparison of one hen's eggs with each other would yield more reliable data than would the comparison of the eggs from different hens. This assumption is true if the individual bird yields uniformly fertile eggs throughout the test. As investigations progressed we became aware of the great variation in the chick producing capacity of eggs, and that the assumption of uniform fertility in the eggs of each hen for considerable periods of time was not sustained.

In the table on pages 54 and 55 there is given, in addition to the egg yield of 76 hens, an incubation test of the eggs laid during the last 10 days of May, 1902.

The data show plainly the great variability in the fertility of the total egg yield of different hens; some birds yielding eggs that are all highly fertile, and others giving eggs that are all completely infertile, being as clear after 21 days of incubation as at the start. Again some hens are very irregular in the fertility of their eggs; an egg laid one day yielding a chick, while that laid on the next is completely infertile; or they are fertile for a day or two, or more, and then infertile, becoming fertile again after one, two, or more eggs are laid. This seems to be true with some individuals, whether they are laying regularly or irregularly, or whether they have been laying a long or a short time. The eggs from other hens seem to be slightly fertile, the embryo dying before the tenth or twelfth days. This appears to be regular with some hens, and irregular with others; as some give eggs of low fertility one day and high fertility on the days immediately following, or preceding.

The results given in the table plainly show the great variability in fertility. For instance; the egg of the first hen on the list, No. 511, was laid May 21st, and it stopped developing about the tenth day of incubation. The next one was laid May 24th and it yielded a good chick. Both eggs were in the same incubator, on the same shelf, where there is every reason for believing that the conditions were alike. The next egg was laid by the same hen two days later—May 26th—and the germ died on the sixteenth day of incubation. She laid an egg the next day following and development stopped in it on the tenth day of incubation. The next eggs were laid by her on the 29th and 30th insts. and both yielded good chicks.

During this ten days test she laid six eggs, three of which yielded chicks, and in three of which development stopped after having advanced half the period, or more. Had these six eggs been taken promiscuously and divided into two lots which were treated differently, three chicks possibly might have been secured from one lot, and three, half developed dead chicks, from the

THE WORKING HISTORY OF HENS FROM NOVEMBER UNTIL MAY AND THE FERTILITY OF THEIR EGGS DURING THE LAST TEN DAYS OF MAY AS SHOWN BY INCUBATING THEM.

Number of hens.	When hatched.	Eggs laid in previous year.	Number of Eggs Laid During							Dates on which Eggs were Laid and Result of Incubation.									
			November.	December.	January.	February.	March.	April.	May.	May 21.	May 22.	May 23.	May 24.	May 25.	May 26.	May 27.	May 28.	May 29.	May 30.
	1900.																		
511 P. R	June	182			15	18	9	23	21	10			C'k		16	10		C'k	C'k
531 P. R	June	138			19	18	16	21	15	C'k	21	C'k		C'k	C'k		C'k	C'k	
542 P. R	June	133			16	16	11	20	20	Inf		Inf		Inf	Inf	Inf		Inf	Inf
550 P. R	June	160				5	13	21	17	C'k	Inf		16	21		C'k		Inf	C'k
557 W. W	June	82	1	21	12	4	2	18	18	Inf	Inf		Inf	Inf			Inf	Inf	Inf
566 P. R	June	77			15	14	14	12	19	C'k		21	C'k			C'k	C'k	21	
563 W. W	June	97	16		2	4	9	20	18	Inf		Inf	Inf		Inf	C'k		Inf	
568 P. R	October	38				7	8	21	18	21		21		12	C'k		C'k	10	
585 W. W	October	80	17	21	7	2	2	1	14	Inf									
586 P. R	October	60			12	15	10	8	16	21			12	14		18		18	
589 P. R	October	68		7	19	2	10	14	17	Inf		C'k						12	
607 P. R	April	170		6	5	10	21	23	23	C'k		C'k		Inf	C'k		C'k	C'k	
608 P. R	April	195				6		18	25	12	8		14			21	C'k	C'k	8
611 P. R	April	185			10	19	22	12	16	C'k		21	C'k		C'k	C'k		C'k	C'k
626 P. R	April	107					5	8	9	C'k	C'k					C'k		C'k	C'k
634 P. R	April	92					8	8	8							C'k		C'k	
649 P. R	April	190				5	9	14	12						21		8	Inf	12
651 P. R	April	170						19	22	21		16	21		Inf	14	21	12	12
657 P. R	April	177				5	15	12	11	C'k			C'k	C'k		C'k	C'k		12
664 P. R	April	175				7	13	20	18						16			C'k	
670 P. R	April	167				5	6	14	19		17				C'k		21		C'k
684 P. R	April	170				2	13	16	12		21	C'k	Inf	20	C'k		19	19	17
698 P. R	April	192				7	24	17	20		21		18	18	C'k				
709 W. W	April	167			13	8	8	17	15		Inf	Inf		Inf	Inf		Inf	19	
762 W. W	April	186		3	3	3	6	13	18	Inf		Inf		12	Inf			Inf	Inf
780 W. W	April	166				11	7	15	18	20	Inf		Inf	C'k		19	Inf	17	
789 W. W	April	165	2			14	11	20	17	20				18	C'k		Inf		Inf
811 W. W	April	102				3	10	10	11		Inf				Inf				
812 P. R	June	105			5	3	22	11	16			Inf			C'k	17		20	C'k
813 P. R	June	140				2	22	21	16	C'k	Inf	19	20						

	1901.																			
1001 P. R	April		20	23	21	19	23	18	20			Inf		Inf	10	19			
1003 P. R	April		23	24	22	12	16	23	23	C'k	Inf	20		21	C'k	Inf	Inf		21
1004 P. R	April		20	6	13	3	18	22	25		C'k	19	8	C'k		C'k	C'k	8	17
1005 P. R	April		21	24	22	12	16	24	25	18	C'k		18	Inf	Inf		Inf	Inf	Inf
1009 P. R	April		18	19	15	10	20	19	15	C'k	19	19	15	21	C'k				
1011 P. R	April		10	17	17	16	19	22	22		Inf	C'k	Inf			20	19		
1012 P. R	April		4	21	12	13	21	22	22	19		20		C'k	Inf	19		29	20
1013 P. R	May			16	10	12	19	25	22	19	19		21	Inf	C'k	Inf	C'k		Inf
1015 P. R	May		2	17	21	12	14	23	17	Inf	10	Inf							
1016 P. R	May			12	17	7	10	11	10						10	10			
1017 P. R	May				18	16	12	25	25	Inf	Inf		18	Inf		Inf		Inf	Inf
1018 P. R	May				15	15	19	21	11							Inf	C'k	12	
1019 P. R	May				15	19	20	17	13	Inf	Inf	12							
1020 P. R	May				3	2	15	18	17		C'k	C'k	18	C'k		21	C'k	21	
1021 P. R	April		18	3	16	6	12	19	17	C'k		C'k		C'k		21		C'k	Inf
1023 P. R	April			4	10		20	10	18	C'k	Inf	C'k	C'k	12		C'k	20	12	
1024 P. R	April		16	22	21	16	22	24	21	Inf	Inf		Inf	Inf	Inf	Inf	Inf	Inf	Inf
1025 P. R	April		13	19	12	10	16	21	13						12	Inf	Inf		Inf
1026 P. R	April		14	20	17	12	20	15	19	8	Inf		Inf						12
1028 P. R	April		10	20	21	22	24	24	16						Inf	C'k	Inf	Inf	Inf
1032 P. R	May			16	22	18	22	22	19		Inf	C'k	C'k		Inf			Inf	
1033 P. R	May			12	4	9	18	18	16	Inf	C'k		19	21		C'k	Inf	C'k	21
1034 P. R	May			12	9	17	24	11	18	Inf	18	Inf	Inf		Inf	Inf	14	Inf	Inf
1035 P. R	May			9	4	3	21	21	18			Inf		12	16			12	21
1038 P. R	May		1		20	4	11	23	7								Inf	C'k	C'k
1039 P. R	May				20	19	26	26	5							C'k	C'k	C'k	
1040 P. R	May				8	16	13	14	16					Inf			Inf	Inf	Inf
1041 P. R	May			5	21	17	17	20	20	Inf	Inf	Inf	Inf				C'k		Inf
1043 P. R	May		3	16	3	14	14	22	21				21	C'k	C'k	18	21	21	19
1044 P. R	May			16	16		19	23	19	Inf	8		12	Inf	Inf	C'k	Inf	Inf	
1045 P. R	May			17	7	14	18	24	15	8	Inf	Inf			Inf	Inf			
1046 P. R	May			14	16	6	7	18	18								21	C'k	C'k
1047 P. R	May			13	7	8	14	18	19		19			21	C'k	21		Inf	C'k
1049 P. R	May			10	16	15	15	17	11			18	C'k		8	12	12	8	
1050 P. R	May			8	21	15	14	20	11	C'k		C'k	C'k	C'k	C'k	C'k		C'k	
1052 W. W	April		17	20	18	12	17	13	9	Inf			Inf				Inf		
1053 W. W	April		17	18	18	18	11	13	22		Inf		Inf	Inf		Inf	Inf		Inf
1054 W. W	April		10	21	24	11	1	8	9	Inf	Inf	Inf		Inf				Inf	Inf
1056 W. W	May			20	11	4	6	12	21	C'k	12		12	Inf	Inf		Inf	Inf	Inf
1057 W. W	May			15	15	2	13	17	9		Inf		C'k	C'k	Inf				
1059 W. W	May			20	10	10	16	17	12	Inf		8	Inf						
1062 W. W	May			10	20	7	9	16	16		Inf	12			Inf		21	18	
1065 W. W	June				15	15	4	6	3							Inf	Inf	C'k	
1066 W. W	May		5		5		7	19	11					Inf	21		21	Inf	12
1067 W. W	June				15	6	5	13	12				21		21	21		C'k	
1068 W. W	May		7		6	13	14	10	19		19	C'k				C'k	C'k	21	C'k

C'k means that a chick was hatched from the egg. Inf. means that the egg was completely infertile. The numerals in the right-hand side of the table indicate that the development of the egg ceased on or near the day indicated. Thus, 10 means that development ceased about the tenth day of incubation.

other lot, and the conclusion drawn that one lot had right and the other lot wrong conditions. Or, if differently divided, the results might not have been so pronounced, but equally unreliable.

The incubation tests made in 1902 were undertaken in the belief that the knowledge of the source and history of every egg would enable us to avoid disturbing causes and leave only the leading questions for consideration. Had the investigations been made with eggs taken from the flock or pens of hens, as laid, without reference to the individual sources from which they came, and divided into lots, and subjected to the conditions of the test, results could have been secured that, unquestioned, might have seemed to give positive evidence, pro or con, and which might have been published without any suspicion that the results were untrustworthy.

In the twelve incubation tests which we have made this year, but not reported, the eggs from each hen were divided, in the order in which they were laid, by alternation, into two lots in each test. The result of such division, if applied to hen No. 511 would have given one chick hatched from lot 1 and two chicks hatched from lot 2, and yet the results would not have been produced by incubation conditions, but rather by some previous conditions for which we could not account. No. 511 is discussed because she is first on the list; what is true of her holds good in a greater or less degree with many others.

Could eggs of known fertility be secured, incubation tests could be made that would be simple and reliable. In the light of the data given in the table and that obtained in the twelve incubation tests there appears to be no means of securing positive information regarding this point. In the absence of positive information probably the best plan to pursue is to secure birds by test that yield eggs of uniformly high fertility and rely upon the averaging of the results of many incubation tests. In this test the birds were by no means fresh, but had been working several months.

It does not appear that heavy yielding is a hindrance to fertility if the birds have had a period of rest following it, and resumed heavy work.

One of the first birds found to yield over 200 eggs per year in 1899 was No. 4. During the first year she laid 201 eggs; 140 the second, 130 the third, 119 the fourth, and she is now doing her fifth year's work. She was one of the first birds selected for the foundation stock of our breeding operations, consequently the eggs secured from her, each of the last three years, from February to July, have been incubated, and mostly found sufficiently fertile to yield chicks, or developed as far as the 17th day.

No. 286 was a late hatched chick in 1898, and did not commence laying until February 12, 1899. In a year forward from that day she laid 206 eggs; 157 during the second, and 138 in her third year. When nearly three and a half years old she died from an accident, having laid 119 eggs during the last 160 days she lived. Her eggs were remarkable for their fertility, every year, very few of them failing to yield well developed chicks.

No. 318 was hatched in April, 1899. During her first year she laid 237 good brown eggs. After she had laid 200, the next dozen were saved as laid, and found to weigh 1 lb, 11¼ ounces. In her second year she laid 102 eggs, and 49 in her third year. She now looks the picture of perfect health and vigor, and is not over fleshy or "baggy." Vigorous as she has always been, but very few of her eggs have yielded chicks, or been well fertilized, although she has been bred to different males.

Two other birds were remarkable for their small yields. No. 686 laid 67 as her first full year's work, and No. 693 laid 47. In May of their second working year, after their winter vacation, the 15 eggs they both laid during that month were found to be completely infertile. In these cases it certainly was not heavy work that caused infertility. Both birds always appeared to be in good health until about three months after the test when No. 693 failed and died.

Although in a general way we may regard infertility as likely to result after hens have been laying long and heavily, it is by no means true that it is always so.

THE ILLUSTRATIONS.

Illustrations of four of the heaviest laying birds which we have are shown, and also two of the poorest producers.

The White Wyandotte hen No. 1069 was kept until she was four years old and we are very sure she laid no eggs. She was a vigorous, well formed bird, of active habits, and always in apparently good health. She was not masculine in her make up. As may be seen by her picture, she was not sufficiently unlike No. 403—her mate of the same breeding—as to even in a small degree account for their varying functions.

No. 403 is now over four years old. During her first year's work she laid 219 eggs; 162 during the second year; 72 the third year. She is now at her fourth year's work.

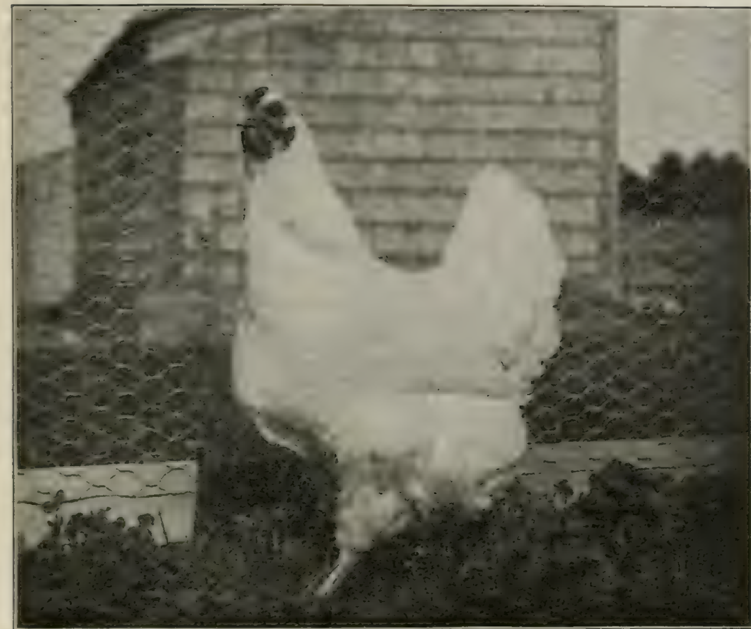
Four illustrations of Plymouth Rocks are shown. No. 588 was a fairly well made bird of medium weight. She was rather fine for a representative of her breed, but she was in no respect effeminate or lacking in vitality. She did not lay until she was nine months old. She then laid eight eggs in one month, and laid no more during the remaining six months she was kept.

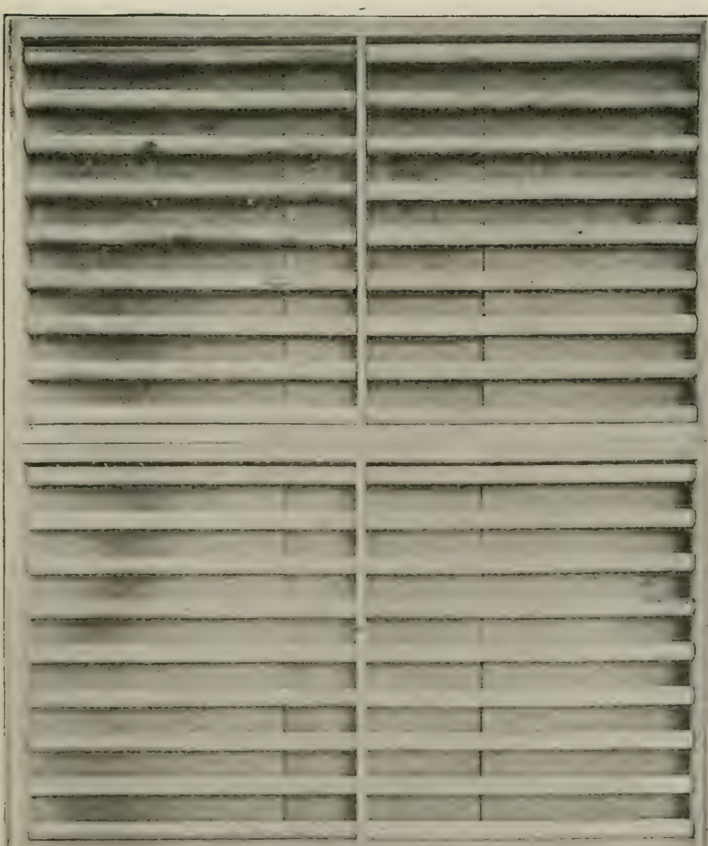
No 318 is now four years old. She is a strong, muscular bird, of large size, always fleshy but never over much so. She is very energetic and active. The 236 eggs she laid the first year and their extra size and color easily make her one of the best birds we have bred.

No. 617 yielded 251 eggs in her first year, the most of any bird we have bred. They were of good size and shape, but hardly of sufficiently high color. In size, form, and feature she is in marked contrast with No. 318, being lighter in weight, narrower in body, both front and rear, with lighter neck and fine head and comb. She would be regarded as of the egg type, by those people who profess to tell the egg yielding capacities of hens by their forms and markings, while No. 318 would be regarded as rather of the beefy type.

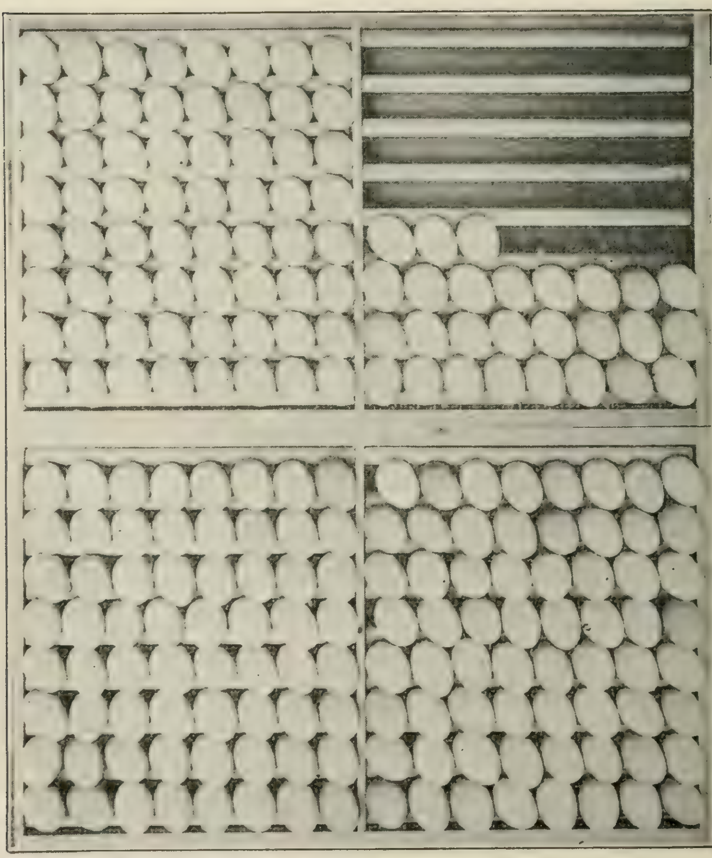
No. 1003 is somewhat like No. 318 in form, being large and more compact and fleshy than No. 617. Her yield was 240 large brown eggs the first year she laid.

A study of the illustrations, while not as satisfactory as an examination of the living birds, is worthy the attention of investigators and breeders.

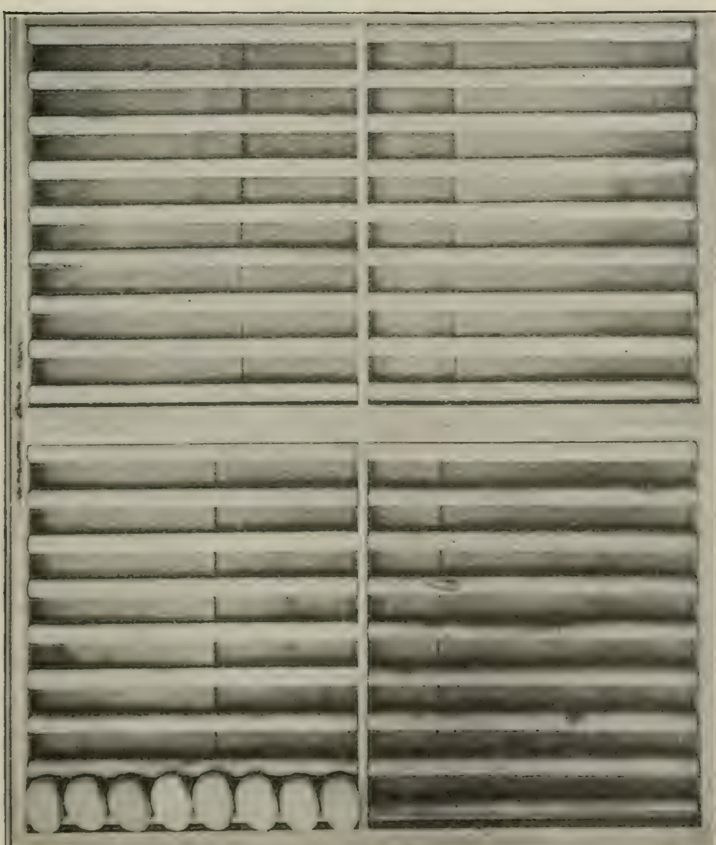




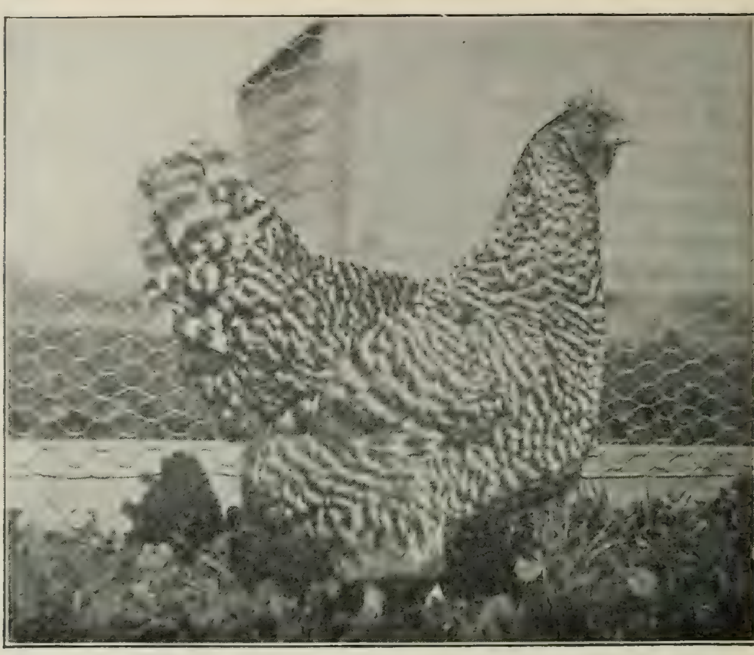
Figs. 18 and 19, White Wyandotte hen, 1069. Laid no eggs.

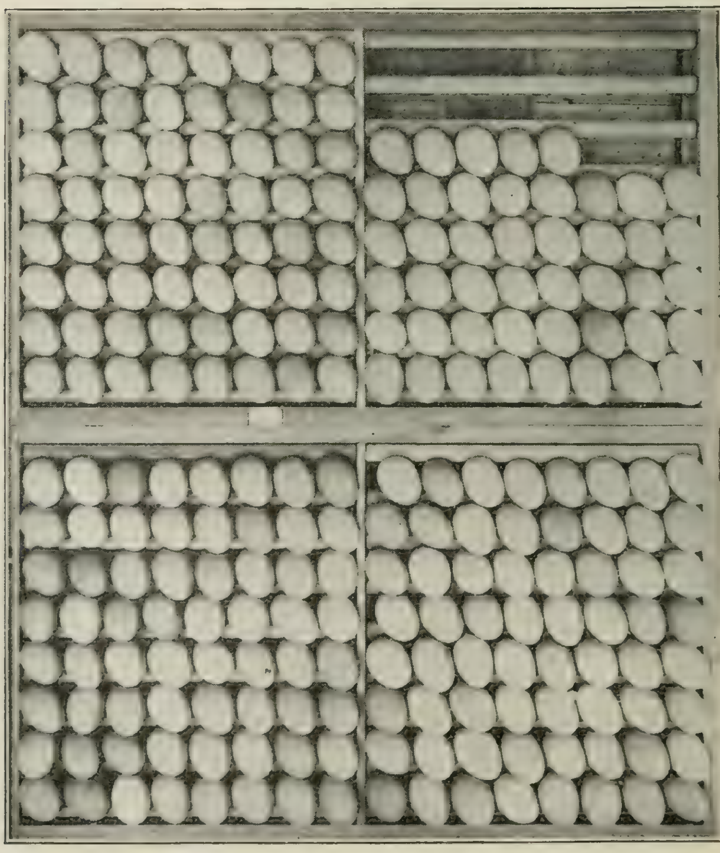


Figs. 20 and 21, White Wyandotte hen, No. 403. Laid 219 eggs in first year.

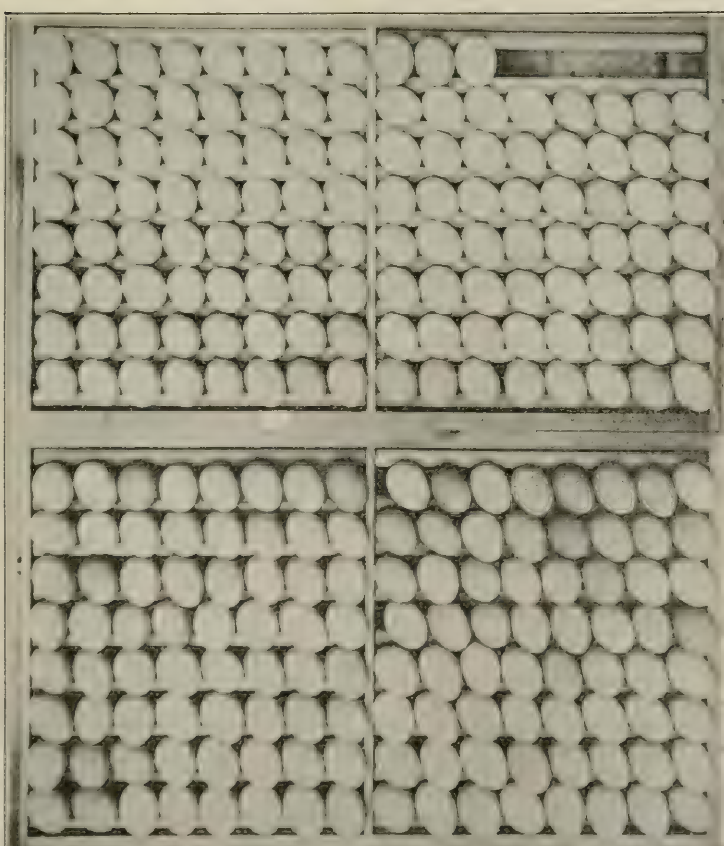


Figs. 22 and 23, Barred Plymouth Rock hen, No. 588. Laid 8 eggs in first year.

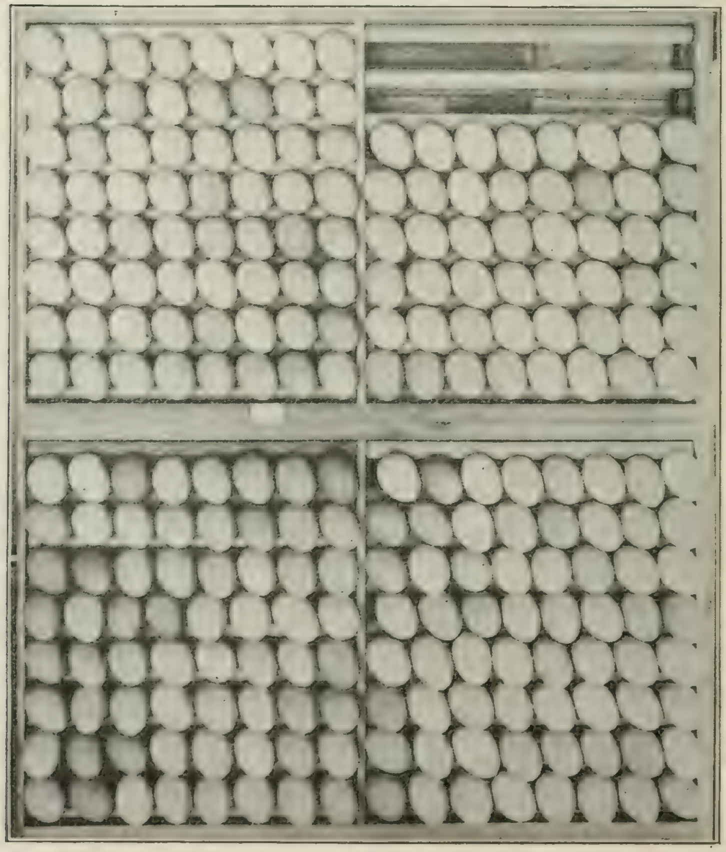




Figs. 24 and 25, Barred Plymouth Rock hen, No. 318. Laid 237 eggs in first year.



Figs. 26 and 27. Barred Plymouth Rock hen, No. 617. Laid 251 eggs in first year.



Figs. 28 and 29, Barred Plymouth Rock hen, No. 1003. Laid 240 eggs in first year.

NITRATE OF SODA AND MURIATE OF POTASH AS TOP DRESSING FOR GRASS LAND.

Chas. D. Woods.

Four half acre plots were laid off in a field that had been in grass for four years. The field was well and apparently evenly stocked with mixed grasses, chiefly timothy. The chemicals were applied as a fine spray by the use of a four-rowed automatic spray pump such as is used for spraying potatoes. In this way an even distribution of the fertilizer was insured. The chemicals were applied May 9, 1903. This was a bright sunny day with no wind of any amount, the spraying apparatus worked well and the chemicals were evenly applied.

The season was unfavorable for this class of an experiment because of the small rainfall in May and June which was probably insufficient to redissolve the chemicals and carry them to the roots of the plants. May 19 there was a rainfall of .25 inch. The next appreciable rainfall was of .34 inch on June 9. On June 12 and 13, 1.28 inches of rain fell. Probably not until these rains or five weeks after the application of the fertilizer did they become available to the grass. Because of the rain it was impracticable to harvest the crop until August 2. The copious rains in July kept the grass growing so that at cutting the timothy was not seriously over ripe. The soil being a clay loam, well stocked with humus, is not "leachy" and probably none of the nitrate or muriate was carried to such a depth as to be beyond the reach of the grass roots.

Unfavorable as the season was, the application of the nitrate of soda was probably profitable, for it cost practically no more to harvest the increased yield and the 700 to 1,000 pounds of hay per acre is worth about double the cost of the ninety pounds of nitrate and its application. In this year, on this soil and with timothy, the potash seems to have been of no benefit. The details are given below, but in interpreting the results the nature of the season must be kept in mind.

Plot.	Fertilizer.	Yield of hay per plot. Lbs.	Value at $12 per ton.
O	None	1825	$10 95
N	45 lbs. nitrate of soda	2310	13 86
N-P	45 lbs. nitrate of soda 45 lbs. muriate of potash	2175	13 05
P	45 lbs. muriate of potash	1880	11 28
O and P		3705	22 23
N and N-P		4485	26 91
	Increase from use of 90 lbs. nitrate of soda	790	4 68
	Cost of 90 lbs. nitrate of soda, applied		2 40

DANDELIONS.

W. M. Munson.

It is a common practice in most places to permit perfect freedom to the hordes of women and children which every spring invade the roadsides and sunny slopes of parks and private grounds in search of "greens;" in other words, of the common dandelion. Contrary to the usual notion, however, this is the worst possible thing for the lawn thus sought out; for in addition to the injury caused by the knives and trowels used in digging the roots, every top or crown cut off will in a short time send up in its place from one to six new crowns and the lawn is frequently ruined.

A hardly less common pest in the lawns of the state is the Fall Dandelion, *Leontodon autumnale*. This plant, often wrongly called "arnica," manifests itself in late summer and early fall, as its name imples, and often takes complete possession of fields and lawns; its flat, spreading, radical leaves choking out all grass and other competing plants in its neighborhood. This, as well as the first mentioned species, grows readily from root cuttings and ordinary digging of the plants has the effect of multiplying them, although not to so great an extent as with the spring dandelion.

The common dandelion is too well known to need description, but the other species is frequently overlooked. In brief, it is characterized by a branched, rather fleshy root; very numerous, long, rather slender and very deeply cut leaves in a thick mass at the surface of the ground; slender branching flower scrape, 8 to 12 inches high; peduncles thickish and scaly bracted next to the small (½-¾ inch) deep yellow head.

With a view to ascertaining precisely the behavior of mutilated plants and of young seedlings of both species, seeds were sown and root cuttings were made in the fall. These

Figure 28—Seedling of common dandelion.

Figure 29—Root cutting of common dandelion

Figure 30—Mature dandelion plant.

Figure 31—Dandelion plant which has been cut for "greens."

were grown in the green house where they could be under constant observation. Some of them are shown in the accompanying figures.

Figure 28 represents a seedling plant of the common dandelion (*Taraxacum officinale*) in its normal condition. Figure 29 shows a small root cutting which is forming a new plant. Figure 30 shows a normal branching root of a mature plant and figure 31 a plant which at some time has been cut off about two inches beneath the surface. It is evident that by severing the numerous side roots of such plants as that shown in figure 30, the crop of dandelions on the lawn will be materially increased by cutting the existing plants. Figure 32 represents the condition many lawns exhibit after having been dug freely for greens for a few years.

Figure 32—Effect of continued digging for "greens."

The fall dandelion, shown in figures 33 and 34, also grows readily from root cutting; but as this plant is not used for greens it is seldom spread by promiscuous digging. It seeds very freely, however, and spreads rapidly in this way.

Since digging the roots in the ordinary manner will not exterminate the dandelion and since both species spread rapidly by seed, it is evident that great care must be used in order to exclude this pest from the lawn. The first preventive measure is thick seeding in the first formation of the lawn. Nature abhors bare ground, and if young grass plants do not occupy a given space, weeds will be sure to come in. The best authorities on making lawns recommend from 3 to 5 bushels of seed per acre; and in every case it is the part of economy to purchase the best fancy cleaned seed. If, for any reason, a

Figure 33—Fall dandelion seedling, 60 days old.

Figure 34—Root cutting of fall dandelion.

lawn has become badly infested with dandelions, as in figure 32, absolute renewal by seeding or by sodding is advised. If but few plants are present, they may be removed (care being taken to dig deep) and a little grass seed sprinkled on the place where the plants stood. Like witch grass, or any other weed, both of the dandelions are readily controlled by frequent cultivation; so that they seldom become serious pests except in grass plots.

CULTIVATED DANDELIONS.

As a cultivated plant the dandelion is assuming an important place in the garden of New England, and in the large market gardens it is grown by the acre, yielding a handsome profit. Like celery it is best when grown rapidly on rich sandy loam.

Sow the seed in early spring in drills 12 to 15 inches apart and cover 1-4 to 1-2 inch deep. As the young plants are small and dark colored, it is well to mix a few radish or lettuce seeds with the dandelion seed. Give the same culture as for carrots during the summer, except that the plants require thinning to 8-10 inches apart, and the following spring the leaves will be fit to cut. They are best when partially blanched by placing a covering of boards or boughs over the rows, thus modifying the bitter taste and rendering them tender and superior to those growing wild or in grass land. The plants are prepared and marketed the same as spinach, and may be grown profitably at 50 cents per bushel, though the price is frequently much higher.

In beds for forcing the seed may be sown in rows 6 inches apart, or plants may be removed from the field. Seedlings are usually best. Except in a limited way, the forcing of the plants could never be recommended, as other plants mature so much more quickly.

There are but few varieties of dandelions listed. The most important are the French Garden and the Improved Thick Leaved.

THE HAWKWEEDS.

W. M. MUNSON.

The wide distribution of the Orange Hawkweed (*Hieracium aurantiacum*) throughout the State has been the subject of frequent comment in previous reports of the Experiment Station.* As yet, however, no effective legislative measures have been adopted for the check of this or other noxious weeds, and its importance demands continued attention. A man is, to a large extent, at the mercy of his neighbors in the matter of spreading weeds. While we have laws looking toward the control of the seed offered for sale, little attention is given to the weedy roadsides and waste lands in proximity to our best cultivated fields. The character of the seed sown is of as much importance as the character and composition of the fertilizer used; but it is not enough that the field be free from weeds at the time of sowing or that the grain or grass seed used show a high per cent of purity. This freedom from noxious weeds must be maintained by destroying the sources of infection found, as already noted, in neighboring fields and roadsides.

Orange Hawkweed is a native of Europe and has been recorded in this state as a weed, only about fifteen years. It is advertised by some seedsmen as a desirable ornamental plant, and as such it was introduced into this region, and probably to many others. Only a few weeks ago the writer found it on sale in a large store at one of the leading summer resorts of the State. From the fact that the plant is a perennial, developing runners and root stocks, and that it produces seed very freely, it is a very difficult weed to control. As illustrating its tenacity of life, flower heads which were scarcely in full bloom were picked by the writer and left upon the office table to dry. After a time the seeds from these heads were sown in pots in

*Cf. Rept. Me. Exp. Sta. 1892, 106; 1893, 146; 1897, 13.

the greenhouse and a considerable number of young hawkweed plants at once sprang up.

The plant is now, unfortunately, so well known as to need little description. The concise account given by Professor Harvey in a previous bulletin is, however, repeated: 'Stem simple, erect, nearly leafless, one to two feet high, clothed with hairs, those at the top of the stem black at the base. Leaves mostly at the roots, oblong-lanceolate, toothed, hairy on both sides and without a petiole. The conspicuous heads of orange colored flowers in a flat-topped cluster at the end of the stem. Heads composed of numerous small orange colored flowers, each one of which produces at its base a small dark brown, ten-ribbed seed-like fruit, with dirty white hairlike bristles at the top.'*

TREATMENT.

This plant is one of our worst weeds and is without one redeeming feature. It kills all of the grass in its vicinity with its dense mat of leaves and it is of itself no use as hay. The only certain remedy for it is clean culture in some hoed crop. By this means, however, it may readily be held in check; as it has been in several instances on the Station farm. The early and frequent cutting of infested patches of grass may prevent the formation of seed, but has no effect upon the formation of runners.

Numerous attempts have been made to destroy this weed by applications of salt,† kerosene, etc. All experience at this Station, however, but emphasizes the statement before made, viz., that clean culture is a certain method, and the only certain method of extermination. Every intelligent and progressive farmer will on the first appearance of this pest take active means of checking its spread.

THE KING-DEVIL WEED.

Sometimes associated with the hawkweed is a closely related species known as the King-Devil Weed (*Hieracium prealtum*).

This plant has proved very troublesome in northern New York where it is regarded as even worse than the hawkweed. It has been reported from several sections in Maine, especially in Ken-

* Harvey, Bul. 32, Maine Exp. Sta. Jan. 1897.
† Jones, Bul. 56—Vermont Exp. Sta.

nebec and Penobscot counties. The King-Devil weed is of more vigorous habit than its relative, producing stems two feet or more high, and from one to four or five from the same root. The leaves are lanceolate with winged petioles, slightly wavy margins, pale green both sides, and covered with scattering long, white hairs. The radical leaves form a dense mat on the ground, killing out other vegetation. There are two to four smaller, narrower leaves on the lower half of the stem. The flower clusters are terminal and consist of four to twenty-four yellow heads about one-half inch long. The difference in color of flowers as compared with the orange hawkweed, is a most noticeable character. The heads, also, are smaller and more numerous than in the common hawkweed. The blossoms usually appear about the same time as the fall buttercup, and, as the flowers are of nearly the same color, the King-Devil weed may escape notice when growing in grass land. A full discussion of this weed was given by Professor Harvey in a previous report of this Station.*

TREATMENT.

Remarks as to the treatment of the orange hawkweed will apply with equal force to this plant. Treatment must begin earlier in the season, however, and greater vigilance is necessary to detect the presence of this species.

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* Report Maine Exp. Sta. 1897, 184.

GINSENG.

W. M. Munson.

In response to numerous requests for information from the Experiment Station upon the cultivation of ginseng as a business venture, the following brief suggestions have been prepared:

Ginseng is a native perennial plant having a thick, fleshy, irregular root, and leaves somewhat resembling the common sarsaparilla, to which it is quite closely related. Not infrequently specimens of sarsaparilla are sent for identification with the hope that they will prove to be ginseng. Both species are found in Maine, but sarsaparilla is the more common. The mature plant of ginseng has a single stem 8 to 15 inches high and about as thick as a lead pencil. At the top are five compound leaves in a whorl, each resembling a leaf of the horse-chestnut. The leaves usually have five leaflets, but on young or weak plants, there may be but three. The *single flower stalk,* rising above the leaves and bearing a small cluster of greenish-white flowers followed by dark, purple berries, will help in distinguishing this plant from other similar ones.

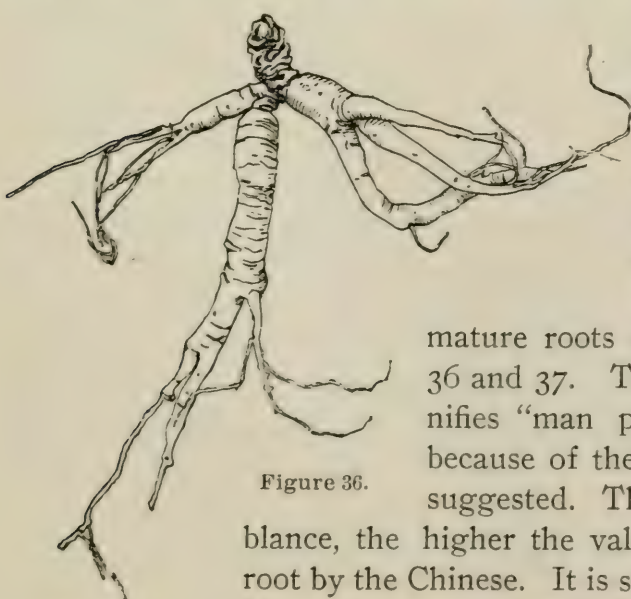

Figure 36.

The seedling roots resemble small parsnips, but the older roots are usually peculiarly branched and in shape often resemble the human form. Two of the mature roots are shown in figures 36 and 37. The name ginseng signifies "man plant" and is applied because of the fancied resemblance suggested. The greater this resemblance, the higher the value placed upon the root by the Chinese. It is seldom that the resemblance is so marked as in figure 37.

American ginseng, the use of which has to a large extent superseded that of the native plant in China, was first discovered near Montreal in 1716. It is now found in the United States from Maine and Minnesota southward to the mountainous regions of Georgia and Alabama. At present the chief sources of supply are Ohio, West Virginia and Minnesota, though small quantities are collected in many other states. The usual price per pound for the dried root is $2.50 to $3.00.

Figure 37.

Numerous attempts have been made to cultivate ginseng and, where careful attention has been given, the returns have been very satisfactory. But the plant is a native of cool, moist, shady situations, and is soon killed if exposed to the glaring sunlight. It usually thrives best in moist loamy soils such as are found in oak or maple forests at the north.

Mr. George Stanton, Summit Station, Onondaga County, New York, is the pioneer in ginseng culture in America. He has made the business profitable and has demonstrated the practicability of garden culture. His method of procedure is essentially as follows: Seed is sown as soon as it is ripe, in September, in a carefully prepared seed bed in well drained sandy loam. The bed is covered with leaf mould and with brush to prevent drying and cracking of soil. Eighteen months are usually required for germination. When the seedlings are two or three years old, they are transferred to permanent beds as carefully prepared as the first. The plants are set four to six inches apart each way and are not again disturbed, except to keep the weeds down, until the harvest time; which will be in four or five years from transplanting, or six or eight years from seed. Transplanting is best done in the fall and the roots are set so that the bud for the next year's growth is about two or

Figure 38—Lattice-work shed for ginseng garden.

three inches below the surface of the ground. The roots should not be cut or trimmed. After the roots are set, an open lattice-work or lath shed should be built over the whole area covered, as indicated in figure 38. The lath roof may be made in sections and removed for storage during the winter.

The roots of cultivated plants are usually larger and more uniform than those from the wild and will bring from 50 cents to $1.00 more per pound. The long time required for returns will, however, deter most people from undertaking the work of cultivation. In general, if an experimental bed is decided upon, it is probably wise to purchase seedling plants rather than to attempt to start seedlings. But no one should be deceived by the glowing accounts of possible fabulous returns from the enterprise. The present high prices are said to be maintained by a syndicate of Korean merchants who control the native product. On the other hand, the demand for the article is apparently limited only by the exorbitant price, and with an increased supply and consequent reduction of price will come an increased demand for the roots.

The Experiment Station would not encourage ginseng culture in Maine, but those intending to attempt this industry would do well to procure the little book "Ginseng," by M. G. Kains (published by Orange Judd Company, New York) ; also Bulletin 16, Div. of Botany, U. S. Dept. of Agriculture.

The Station is indebted to Hon. N. B. Critchfield, Secretary of Agriculture, of Pennsylvania, for permission to copy figures 36, 37 and 38.

CANKER WORMS.

W. M. Munson.

Every year come complaints of the defoliation of orchard and shade trees in May and early June. This trouble is usually caused by small slender inch worms or measuring worms which from their effect upon the foliage are commonly called "canker worms." These larvæ appear in immense numbers just as the leaves put forth in the spring. They are so small in the beginning, however, that they are often overlooked and the cause of the backward appearance of the trees is not recognized. When they first appear, and while not more than one-eighth to one-fourth of an inch long, the larvæ gnaw small holes in the young leaves. As they increase in size the entire leaf, except some of the larger veins, is destroyed and the trees if badly attacked look as if swept by fire.

Two distinct species of insects are concerned in this destructive work, viz., the fall canker-worm and the spring canker-worm. The habits of the two insects are much alike and to the casual observer there are no distinguishing marks. The striping of the larvæ is slightly different, however, and the spring canker-worm has three pairs of legs under the rear portion of its body while the other has but two. Both species are natives of this country and are about equally destructive where they occur. The spring canker-worm is, however, the more widely distributed, ranging from Maine to Iowa and southward to Texas.

THE SPRING CANKER-WORM (*Paleacrita vernata.*)

The male moths of this species have rather large, thin, silky wings, about one inch across when spread. The general color is bluish gray. A well defined row or band of light markings near the outer margin of the front wings, and three darker, irregular bands, across the same wings, together with the slightly lighter color and absence of markings on the hind wings, are characteristic features. The inconspicuous female moths are wingless and, because of this fact, the spread of the species is very slow, occurring mainly by the transportation of nursery stock infested with eggs.

The moths usually emerge from the ground early in the spring —about April, or farther south, in March—and the females climb up the trunks of trees to deposit eggs. The eggs, which are shaped something like hens eggs and are about the size of "fly specks," are deposited in irregular masses, usually partially concealed by loose pieces of bark. They hatch about the time the leaves unfold; the time varying with the locality and the season. The young larvæ are voracious feeders and they grow rapidly, usually attaining full size in from three to four weeks from the time of hatching. Upon reaching full size they drop to the ground, burrowing beneath the surface to a depth of two to five inches. Here each one forms a cell, lined with silk which it spins, and soon transforms to the chrysalis stage, where it remains until the following spring, when the adult moth emerges as before.

THE FALL CANKER-WORM.—(*Alsophila pometaria.*)

The fall canker-worm so closely resembles the other species as to be frequently mistaken for it. For all practical purposes they may be considered together, but the fall canker-worm is more distinctively a northern insect. As in the other species the female moth (see figure 39 *b*) is wingless, but in this species she lacks the hairiness which characterizes the other. The male moth (figure 39 *a*) has two light bands across the front wings instead of the single one of the preceding, and the rear wings are slightly shaded. The larvæ of this species also, besides having three pairs of legs under the hind end of the body, as shown in figure 40 *f*, have a broad, dark stripe along the back, as opposed to the narrow markings of the other species. The eggs, which are slightly larger than in the previous species, somewhat resemble small flower

Figure 39—Fall canker worm; *a*, male moth; *b*, female moth; *d*, egg cluster.

pots and are attached to the bark, in exposed situations, in masses of from 60 to 200, placed side by side as seen in figure 40, *e*. The eggs highly magnified, are shown in figure 40 *a* and 40 *b*.

The eggs are deposited in fall or early winter (sometimes in mild winters as late as March). They hatch about the same time as those of the other species and the larvæ act in a similar manner, entering the ground about the same time. Instead of forming a cell lined with silk, however, this species spins a tough cocoon, and the moths come forth and begin laying eggs in October and November.

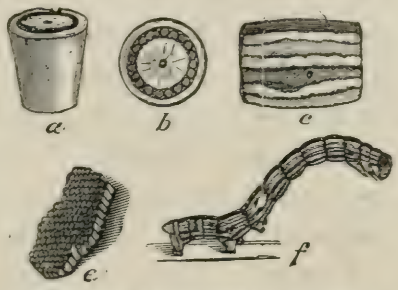

Figure 40—Fall canker worm; *a*. and *b*. eggs, enlarged; *c*. segment of larva enlarged; *e*. egg cluster; *f*. full grown larva.

HOW TO FIGHT CANKER-WORMS.

The natural enemies of the canker-worms, including Ichneumon, Tachina and Chalcid flies, certain wasps and beetles, and various kinds of birds, are so numerous as to prevent serious damage save in exceptional years. In the absence of these natural enemies, however, or when the weather conditions are specially favorable to the increase of the worms, active measures must be taken to save the trees.

One of the surest preventive measures is to place a band of tarred paper about the tree in March and smear it with printers' ink, thus preventing the ascent of the female moths and the deposit of eggs. In case the bark is very rough, it should be scraped smooth to prevent the insects from crawling up behind the paper. The ink must be renewed often enough to prevent hardening, or it will be of no use. If the fall canker-worm is present, of course the treatment must begin in October. If the trees are already attacked, jarring the limbs will cause many of the worms to spin a thread and drop to the ground. If the band of printers' ink is in place they will be unable to return to the attack and may be destroyed.

The surest way of fighting this pest, however, is by spraying with Paris green or arsenate of lead (Disparene). For this purpose the pump should be powerful enough to develop a pressure of at least 60 pounds to the square inch, and all parts should be made of brass and carefully adjusted. The formulas for use on ornamental trees are the same as those which have heretofore been recommended for use in the orchard, *viz.:* (1) Paris green, 1 pound; lime, 6 pounds; water, 100 gallons; or (2) arsenate of lead or Disparene, 6 pounds; water, 100 gallons. The lime is added to the first formula to prevent injury of the foliage by the Paris green, and should in no case be omitted. The lead arsenate acts slower as a poison than does Paris green, but it adheres to the foliage better. It is important that spraying be done *at once* when the attack of canker-worms is discovered, as the insects are much more difficult to kill as they increase in size.

If more explicit directions for spraying are desired, send to the Experiment Station for directions "How to Fight Apple Enemies."

PLANT-HOUSE ALEYRODES.

Aleyrodes vaporariorum Westw.

LEWIS R. CARY.

During the summer this species of Aleyrodes lives chiefly out of doors on garden plants, and in the fall larvæ and pupæ are brought into the greenhouse with the plants, and some of the adults fly in. Here they begin to breed freely as soon as crops are started, multiplying fast enough to keep pace with the growth of the plants. The eggs are very abundant on the under surface of the leaves of various greenhouse plants, frequently occurring in numbers so great that they give the under side of the leaves a decided brown cast.

The curious manner in which the eggs are deposited has been already observed. Mr. W. E. Britton describes the process * with reference to Reaumur's observation of the habit in *Aleyrodes chelidonii.* The female inserts her beak into the leaf and with this point as a center she swings about, describing a circle with her ovipositor. The number of eggs in such circles varied in the different instances noted here from six to ten. Much of the time eggs were deposited promiscuously over the leaf. On rough hairy leaves, like those of the Abutilons, the eggs were found without definite arrangement, which agrees with Mr. Davis's observation that on plants like Ageratum the eggs are deposited singly.

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* Report of the Connecticut Agricultural Experiment Station, 1902, p. 153.

Note. These studies were made by Mr. Cary in 1902-3 in the biological laboratory of the University of Maine, under the direction of Dr. G. A. Drew, professor of biology in the University and at that time zoologist to this station. The station greenhouses have been infested with this species of Aleyrodes for several years and thus afforded ample material for the study. They were most abundant on the leaves of tomatoes and cucumbers, but other kinds of plants were more or less infested.

TECHNIQUE.

The material was fixed with hot water, alcoholic-picro-sulphuric, and alcoholic picro-corrosive acetic. The two latter solutions when used hot gave the best histological results. Some eggs in the earlier stages which were fixed in absolute alcohol gave very satisfactory results. In all cases the material was washed immediately after killing in 70 per cent alcohol.

In studying the different stages as entire transparent objects the best results were obtained by pricking each specimen with a very fine needle, and staining either in Grenacher's borax-carmine or alcoholic cochineal for twenty-four to forty-eight hours. Then the material was washed with 70 per cent alcohol acidulated with a few drops of hydrochloric acid for two or three days or until it was bleached sufficiently. Xylol was used for the clearing medium as it gave whiter and more transparent mounts than either clove or cedar oil.

In sectioning the younger stages, Dr. Drew's method for orienting small objects was very helpful.* The eggs to be sectioned were stained as for whole mounts, but were not washed out as thoroughly. They were then cleared in clove oil, mounted on the tracing cloth and finally cleared in xylol before transferring them to the paraffin bath. By this method good series of sections were obtained of all the stages. The sections were finally stained on the slide with Mayer's haemalum or iron haematoxylin.

EMBRYOLOGY.

The surface of the egg is smooth and without any markings. When newly laid they are creamy white or very light green, but in two or three days they become darker, growing almost black before the time of hatching. The color change starts from the pointed end of the egg and extends over the surface. As will be seen from Figs. 41, 44 and 48, the eggs are elongated oval, one side being a little concave. The body of the egg is from .2 to .25 millimeters in length, and from .085 to .1 millimeter in diameter through the thickest part. A short narrow stalk at the

* Drew, Gilman A. A modification of Patten's method of imbedding small objects for sectioning in definite planes. Zoologischen Anzeiger, Bd. XXIII, No. 611, 1900.

broad end of the egg attaches it to the leaf and serves also as the external part of the micropylar apparatus. The lumen of the stalk is filled with protoplasm, which is in direct communication with a space in the end of the egg containing a mass of granular protoplasm in which the nucleus and polar bodies are situated. This space is separated from the yolk by a distinct membrane. See Fig. 44.

The yolk (Fig. 44) is composed of a great number of small, nearly spherical bodies, each consisting of a vesicle containing a viscid coagulable substance which stains deeply with haematoxylin or carmine. The yolk granules are arranged so that there are many comparatively large spaces which are filled with oily fluid left between them. The oil globules are scattered evenly through the substance of the yolk. Over the whole surface of the yolk the peripheral protoplasmic layer is thin and inconspicuous.

Maturation of the egg takes place within the ovarian tubes of the female. In the mature egg the polar bodies lie in the chamber at the posterior end of the egg which contains the nucleus and undifferentiated protoplasm. The eggs are fertilized in the vagina of the female. The spermatozoon moves up through the protoplasm contained in the stalk of the egg, while the female pronucleus moves down and comes to lie at the entrance of the stalk. Immediately after the act of fertilization, the protoplasmic contents of the stalk shrivel and dry up. When the two pronuclei have fused, the resulting nucleus migrates back to the center of the mass of protoplasm and at once begins active division. The nuclei resulting from the first few divisions begin to migrate toward the periphery of the egg, keeping an arrangement conforming very nearly with the shape of the original protoplasmic vesicle. The wall of the vesicle disappears as the nuclei approach it.

Each of the nuclei resulting from the frequent divisions is surrounded by some of the protoplasm present in the vesicle. As the nuclei migrate farther and farther from their point of origin, it necessarily happens, on account of the location of the parent nucleus, that they first reach the surface of the yolk in the posterior part of the egg. When the nuclei reach the surface of the yolk they begin to arrange themselves regularly in the thin layer of protoplasm there present. The protoplasmic layer increases in thickness at the time of the arrival of the nuclei. This thickening seems to be due to the taking up of the protoplasm which accompanies the nuclei in their migration through the yolk. As the nuclei increase in number they become crowded and press outward, forming little protuberances on the surface of the egg. Gradually, due to the increase of nuclei within, the outside walls of the protuberances approach each other and finally fuse to form the cell walls of the blastoderm. The inner wall of the cells appears later and seems to be formed by the hardening of protoplasm at that point.

The blastoderm extends rapidly over the surface of the yolk from the point where the nuclei first came to the surface. Before the blastoderm has come to cover the whole surface of the yolk, it has commenced to thicken over a small area on the ventral (concave) surface of the egg, a little in front of the posterior end. This thickening increases in size and forms the embryonic disc. In a short time a slight invagination appears at the center of the disc. The invagination deepens rapidly and becomes directed toward the anterior end of the egg. The cells of the anterior limb of the invagination increase in length and thickness, while those of the posterior limb become very much flattened. The invagination deepens by the addition of cells at its inner end, and the space between the two limbs of the invagination, the amnionic cavity, becomes reduced to a narrow lumen open to the surface at the point where invagination began. This opening continues to grow smaller as the blastoderm folds approach each other over the point of invagination. See Fig. 47.

During the early part of the first day the folds of the blastoderm now marking the amnion and serosa come together over the mouth of the invagination. The two folds fuse at the point of contact, but the inner and outer layers soon separate from each other. The amnion however continues to remain almost in contact with the serosa so that there are only a few yolk granules between them at any time. The embryo, therefore, is of the superficial type, such as had been described by Metschnikoff* for Corixa.

Sometimes before the closure of the invagination has taken place there begins to be formed on the dorsal side of the germ

* Metschnikoff E. Untersuchungen über die Embryologie der Hemipteren. Zeits. für Wiss. Zool., Bd. XVI, 1866.

bands a shallow median groove. Certain cells in the vicinity of this groove seem to lose their epithelial nature and pass downward until they come to be below the surface layer of cells. The cells which go to make up the region of the groove pass down and out to form a complete layer below the ectoderm. There is no distinct separation of a median plate or tube in the formation of the lower layer. The anterior end of the germ band becomes widened out to form the cephalic lobes (Fig. 49). The germ band is strongly flexed just posterior to the cephalic region, so that the cephalic and thoracic regions are nearly in apposition. On the dorsal side of the expanded germ there is formed quite early a slight invagination which marks the beginning of the stomodæum. The proctodæum is usually formed a little later than the stomodæum.

Even before the formation of the lower layer is entirely completed the germ band begins to show traces of segmentation in the thoracic and anterior abdominal region. Very soon after the segmentation of the germ band becomes apparent, the first rudiments of the appendages begin to make their appearance. The rudiments of the antennae arise first, being situated on the cephalic lobes just posterior to the region of the stomodæum. The rudiments of the mouth parts and of the thoracic limbs appear simultaneously, and those of the abdomen appear successively, from before backward, at a little later stage. The abdominal rudiments have the form of little conical projections on the ventral surface of the abdomen. They persist for a short time only and, with the exception of perhaps the two posterior pairs, leave no traces of themselves when they are absorbed.

Tracheal invaginations begin to appear at about the same time as the limb rudiments. Eleven pairs of invaginations are formed ;—a pair on each thoracic segment and a pair on each of the first eight abdominal segments. These invaginations, with the exception of those on the thorax and on the eighth abdominal segment, disappear during embryonic life. The four that persist form the external openings of the tracheal system of the larva.

The nervous system begins to appear simultaneously with the tracheal system and the abdominal limb rudiments. The brain is formed in the cephalic lobes as paired thickenings of the ectoderm just anterior to the stomodæum. The ventral chain of ganglia are formed as ectodermal thickenings, a pair to each segment. Those of the four posterior abdominal segments are very small and do not continue to develop.

In the later life of the embryo there is a marked concentration of the ventral nervous system. The ganglia in the abdominal region are reduced to a nerve cord and the ganglionic part of the chain is confined to the thorax. When the lower layer was formed, two masses of cells, one anterior and the other posterior, developed in a manner distinct from that of the great mass of the lower layer. These two cell masses become the rudiments of the developing enteron. As the growth of the embryo goes on they spread farther and farther toward the center of the body forming two u-shaped bands of tissue. Finally the two bands come together and fuse on the ventral side, the dorsal side remaining open until after rotation takes place. While the changes leading to the establishment of these sets of organs are going on, the germ band is increasing rapidly in size, both longitudinally and laterally. The posterior end of the embryo becomes strongly flexed, so that it extends toward the posterior end of the egg and lies along the ventral side of the abdomen. The appendages have increased in length and the mandibles and maxillæ have become lobed.

On the fourth or fifth day after the egg is laid, rotation of the embryo takes place. The amnion and serosa fuse at the point where they previously separated. The fused envelopes are ruptured and the embryo begins to be drawn out through the opening in the membranes. The head of the embryo passes anteriorly along the ventral surface of the egg until it comes to occupy the anterior end of the egg, the posterior part of the embryo taking up its position in the posterior end. By this rotation the embryo has come to a position so that its ventral surface is next to the ventral surface of the egg. The embryonic envelopes, during the process of rotation, are carried around so that they lie as a shrunken mass on the dorsal side of the embryo, making a provisional body wall. The serosal part of the envelope soon becomes a thick mass of cells, with prominent nuclei, situated just posterior to the head, making the dorsal organ. The yolk mass of the egg, which by this time has been much diminished in bulk, is brought so that it lies inside of the body in the region of the growing enteron. The dorsal walls of the enteron now grow rapidly and soon inclose the yolk substance within the lumen of the gut. The dorsal organ begins to break up, its cells disintegrate, their substance being used for the nourishment of the embryo. The body walls of the embryo grow out laterally and take the place of the amnion as the covering of the dorsal surface. After the dorsal wall of the enteron has closed, a pair of diverticula are given off from it near the anterior end. These increase rapidly in size until they are larger than the original part of the enteron.

Quite late in the embryonic life of the insect there are formed in the thoracic region of the embryo five pairs of imaginal discs, three pairs on the ventral and two pairs on the dorsal side. These discs arise as ingrowths of the hypodermis which soon lose their connection with the outer layer and remain just below the surface as closed pouches of ectoderm. The internal layer of the pouches increases in thickness by the multiplication of the cells, but the outer part remains a single celled layer.

In the latter part of the embryonic development the changes which take place are mostly confined to the readjustment of the organs already present, which gives to the fully formed embryo the proportions seen in the newly hatched larva. These changes are particularly noticeable in the appendages. The larval integument is secreted by the hypodermis. There is an increase in the size of the embryo so great that the egg is distended until it is markedly larger than at the time it was deposited.

On the thirteenth or fourteenth day after the egg is laid the shell splits on the anterior end and the larva appears. The larva when it first comes from the egg is rounded and compressed on account of its having had to conform to the shape of the egg shell. After it is free it soon flattens out and assumes the typical larval form. The larva moves about for a short time after hatching and then settles down to its scale-like immovable existence. After its period of moving is over the legs begin to atrophy and by the time the pupal stage is reached have almost completely disappeared. The mouth parts of the larva consist of a number of piercing setæ which are thrust into the tissues of the leaf, where they remain during the larval stage. The tracheal system shows peculiar adaptation to the mode of life which the larva assumes. The body of the larva is in close contact with the surface of the leaf, so that no air could reach it from that direction. Two special channels for conveying the air to the spiracles, which are situated on the ventral surface of the body, have been developed. These breathing folds are grooves in the integument of the ventral side, one in the thoracic region, the other on the posterior part of the abdomen. The cavity of the breathing folds is supplied with fine chitinous hairs and there are a number of stiffer hairs at the aperture of the fold which serve to prevent the entrance of solid particles. There are four pairs of spiracles, one abdominal and three thoracic, one pair of the latter being situated just posterior to each pair of legs. These spiracles open into a series of projections of the first breathing folds, each fold being divided into three branches at the internal end.

The tracheal system consists of a ventral trunk on either side connecting the spiracles, two dorsal girdles connecting the two anterior pairs of spiracles, and a dorsal trunk on either side extending from the anal spiracles to a point half way between the second and third thoracic spiracles, where it joins the ventral trunks. Branches are given off from the first spiracle as follows. Two main branches, one of which soon divides into a large number of long twigs which spread out to the sides of the body. The other main branch gives off the dorsal girdle, and soon after divides into two about equal branches one of which is the ventral trunk, while the other goes anteriorly. This last trunk divides into two branches, the dorsal branch breaking up into long convoluted tubes which supply the sides of the head, the other goes almost to the mouth opening, where it curves around and breaks up into a number of branches which continue anteriorly to the edge of the body. The trunks from the second pair of spiracles divide into two main branches each of which gives off smaller branches, the upper posteriorly and the lower anteriorly, to supply the surrounding viscera. The main ventral branch goes to the ventral trunk, the dorsal branch forming the dorsal girdle. The third spiracle opens into a trunk which gives rise to an external and an internal branch. The external branch soon separates into an anterior and a posterior division and each of these breaks up into a number of fine branches supplying the body in the metathoracic and anterior abdominal region. The internal branch goes to the ventral trunk. The anal spiracle gives rise to a dorsal and a ventral branch and a smaller branch laterally. From the lateral branch there arises successively a number of twigs going to the sides of the abdomen. The ventral branch goes to the ventral longitudinal trunk and the dorsal branch to the dorsal longitudinal trunk.

In the abdominal region of the larva the rudiments of the reproductive organs appear as a pair of prominent yellowish organs made up of large cells. The imaginal discs of the external genital organs appear during the larval period as two pairs of invaginations of the hypodermis at the posterior part of the abdomen. The imaginal discs of the hypodermis appear in the abdomen at about the same time as those of the genital organs.

There are three moults during the larval stage. The first one occurs at from five to six days after hatching. The second occurs four or five days later, and the third five to six days after the second. At each of the moults there is a very appreciable increase in the size of the larva, but there is no apparent change other than the growth of the organs and the formation of the imaginal discs already mentioned, although it is probable that the imaginal discs of the digestive and other organs are formed during larval life. With the occurrence of each moult there is an increase in the number of the wax rods secreted around the margin of the body.

In the pupal stage (Fig. 43) which lasts from twelve to sixteen days, there are many important changes taking place on the interior. The whole external form of the insect is changed, from that of a wingless, motionless larva, to an active, flying form. The greater part of the organs of the larva, with the exception of the nervous and reproductive systems, are entirely made over to meet the requirements of the new mode of life. All of the muscles are reduced to an almost structureless condition. The greater part of the muscles of the body undergo histolysis at the same time. The imaginal discs of the thoracic region become everted so that they lie outside of the body. The developing legs take on their normal appearance, the wings are folded up in the form of pads on the thoracic tergites. The external genital organs are developed from the two pairs of imaginal discs in the posterior parts of the abdomen. The central part of the nervous system passes directly over from the larva to the imago, but it undergoes farther concentration during the pupal period. The reproductive organs pass over from the undifferentiated state, and begin to show the characteristics of the male or female organs. The genital ducts, connecting the reproductive organs with the exterior, develop. The larval hypodermis is broken up and the body wall of the adult is formed from the imaginal discs present. The imaginal integument is apparently formed as a secretion from the hypodermis. The escape of the imago from the pupa case is accomplished by the splitting of the case in the mid dorsal line from the anterior end to the region of the thorax.

THE ADULT INSECT.

The adult insect (Fig. 46 and 51) measures 1 to 1.5 millimeters from the head to the end of the folded wings. The males are as a rule smaller than the females, and have more slender bodies. The body is yellowish in color. The wings are pure white and each has a single median vein, which in the fore wings has a branch near the base. The legs are long and slender, and are terminated by a two-jointed tarsus which is furnished with three claws. The eyes are four in number, those on each side of the head situated one above the other with a triangular piece of integument extending between them from the posterior side of the head. Above each eye is an ocellus.

The mouth part consists of a three-jointed rostrum which arises from the back side of the head, and contains on its anterior side a groove in which are situated four piercing setæ. The setæ have a different point of origin from the rostrum, arising farther forward on the head. The antennæ are seven jointed. The first two segments are short and stout, the remaining five rather long and slender and covered with ring-like markings. The thorax is very deep and its segments short. The thorax and abdomen are connected by a narrow prolongation of the metathorax.

Digestive System. See Fig. 51. The pharynx, situated at the base of the rostrum, is a narrow tube hardly to be distinguished from the œsophagus, into which it passes with very little change in size. The œsophagus is a long narrow tube extending from the pharynx to the metathorax where it joins the mid-intestine. The mid-intestine runs back to the anterior part of the abdomen where the pair of large diverticula are given off.

From this point it passes posteriorly to the sixth abdominal segment where it turns and runs anteriorly again to the first abdominal segment; here it turns about again and joins the hind-intestine which runs posteriorly to open on the dorsal surface of the eighth abdominal segment at the vasiform orifice. The salivary glands are small, nearly spherical organs, located in the dorsal part of the prothorax. They are made up of a small number of large secreting cells. Coming from each gland is a small duct which unites with its fellows just posterior to the brain in the median line.

Muscular System. See Fig. 51. The muscles of the body are arranged in three chief systems. First: the intersegmental muscles running between the segments for the whole length of the body. These muscles are attached to the folds of the integument at the joints between the segments. Second: the muscles of the wings, which are arranged in two sets, the elevators and the depressors. The elevators are attached at their ventral ends to ridges on the integument of the ventral wall of the two posterior thoracic segments, and at their dorsal ends to the wings. The depressors of the wings are two large muscles situated in the dorsal part of the thorax, attached to the lateral and dorsal walls of the thorax, and to a deep median ventral prolongation of the dorsal integument of the thorax. Third: the muscles of the legs. These muscles are in part attached at the dorsal ends to the dorsal wall of their respective segments, and in part to the ventral median ridge. The ventral ends of both sets of muscles are inserted in the walls of the femur of the leg to which they are attached. There is a small set of muscles for moving the mouth parts, which are attached dorsally to the dorsal and lateral walls of the head and prothorax. In the posterior end of the abdomen there is a set of small muscles which move the ovipositor.

Nervous System. See Fig. 51. The nervous system is very much concentrated. It consists of the brain and a ventral ganglionic mass. The brain is quite complicated although of rather small size. The *cerebral hemispheres* are very prominent, standing above the other positions of the brain. The optic lobes are small, hidden beneath the cerebral portion of the brain. The optic tracts are well developed. They appear as a pair of rounded bodies just posterior to the cerebral hemispheres. The ventral nerve chain consists of a ganglionic mass separated into two parts by a narrow constriction. The anterior mass is small and closely united with the brain, the circum-œsophageal commissures being very broad and the aperture through which the œsophagus passes far back. The second ventral ganglion is large and lies entirely within the mesothorax. It gives off the nerves to all the legs, and smaller branches to the organs of the thorax. Structurally it is for the most part made up of nerve cells, the amount of fibres being comparatively small. From the posterior end of the second ventral ganglion a large nerve cord passes posteriorly to the abdomen, giving off nerves to the organs in each of the segments through which it passes. It breaks up into a number of fibres in the seventh abdominal segment, the resulting fibres supplying the two posterior segments of the abdomen.

Reproductive System. The reproductive system of the female insect (Fig. 51) consists of two ovaries, each made up of five chambered ovarian tubes. The ovaries are large, extending from the eighth abdominal segment to the anterior part of the abdomen, filling the greater part of the abdominal cavity. The vagina occupies the posterior part of the seventh and the whole of the eighth abdominal segments. The seminal receptacle is situated on the ventral side of the vagina in the eighth segment. The oviduct opens to the exterior at the posterior end of the abdomen between the valves of the ovipositor. The ovipositor, is short, made up of two valves which are deeply concave on the inner side.

The male reproductive organs (Fig. 50) consist of the testes, two rounded bodies situated dorsally in the fifth abdominal segment, one on either side. Coming from the testes the vasa deferentia make a complete turn and are then enlarged to form the seminal vesicles. The two vasa deferentia unite in the seventh segment to form a single tube which extends to the end of the abdomen. At the point where the two vasa deferentia are united they are joined by the ducts from the two large accessory glands. The external genitals of the male consists of the penis and a pair of well developed claspers.

Respiratory System. The respiratory system of the adult insect corresponds in arrangement very closely to that of the larva. There are four pairs of stigmata, three on the thoracic region and one on the eighth abdominal segment. The stigmata of each side are connected by a ventral trunk, but the dorsal girdles are not complete. The dorsal longitudinal trunk is not complete in the imago, but long branches extend anteriorly from the anal spiracles, and posteriorly from the thoracic spiracles, on the dorsal side of the body.

REMEDIES.

The experience at this Station in destroying the plant-house Aleyrodes is similar to that at the Connecticut Station and the following from their report* will serve to express the situation here.

"Spraying.—In 1895 the writer (Mr. W. E. Britton) used whale-oil soap solution (1 pound of soap to 5 gallons of water) in the form of a spray on the under surface of the leaves to kill the nymphs. The result was successful, but on account of the disagreeable odor of whale-oil soap, it was discarded. Fir-tree oil (one-half pint in 2 gallons of water) gave excellent results when the plants were thoroughly sprayed with the solution. The adults and nymphs which were moistened by the spray were killed. The cost of the material, however, makes the treatment an expensive one and precludes its use on a large scale. Fir-tree oil has a pleasant odor and is not objectionable to use in a green-house of ornamental plants or even in a dwelling.

"A fine spray of kerosene and water (15 per cent, kerosene) was then applied to the tomato plants on sunny days, by means of a 'kerowater' pump, with good results in killing the insects. But kerosene, like whale-oil soap, has an unpleasant odor, and occasionally causes a slight injury to the foliage. Even when not at first apparent, the leaves in some instances took on later a brown or reddish color not indicative of health, and some of these finally dropped.

"Early in 1901, we began spraying the tomato plants with common soap and water, dissolving one pound of soap in eight gallons of water. This seemed to be best, all things considered, of any of the sprays. Not only was it effectual in killing all adults and nymphs with which it came in contact, but it was

* Report of the Connecticut Agricultural Experiment Station for 1902.

both inexpensive and inodorous, and at first did not appear to cause the slightest injury to the plants. The soap was cut in thin slices, then dissolved in hot water, and cold water added to make the right proportions. The plants received one application each week for about three months, when some of the leaves finally exhibited signs of injury.

"As the plants had never been sprinkled with water from the hose and had received frequent applications of soap, the leaves finally became coated over with soap to such an extent as to interfere seriously with the normal processes of respiration. The lower leaves in some cases shriveled and dropped. A few sprayings cause no injury, and probably none would be done in any case if the plants are sprinkled freely with water to remove the excess of soap.

"The chief difficulty with sprays of any kind is that it is impossible to reach all places where the insects are located. Many leaves are curled so that the spray cannot reach the under side, and there are always portons of the plants which do not, on account of location perhaps, receive a thorough treatment; this permits the escape of a sufficient number of adults, or of nymphs which soon change to adults, to keep the house infected.

"Fumigating.—Fumigating with tobacco is the remedy that has been oftenest recommended for this insect, but the fumes from the burning of ordinary stems or dust do not kill any considerable number of the insects. Many are stupefied by the fumes and fall from the plants, but revive later and soon become as active as ever. During the past two or three years tobacco used in this way seems to have been less effective in destroying the adults than when the writer first employed it eight years ago. Where the adults are stupefied and fall to the ground a copious watering of the surface of the soil will kill them in great numbers."

At this Station fumigation with hyrocyanic acid gas is the most successful remedy tried. The gas was made with a half more strong sulphuric acid (liquid measure) than the weight of cyanide, and a half more water than acid. The jar containing the dilute acid was placed on the floor of the house, and the cyanide of potassium which had been put into a paper bag, weighed, and suspended over the jar, was dropped into the acid. This treatment is in accordance with the suggestions by Johnson.* The house was then closed and left, in various experiments, from forty-five minutes to fourteen hours. When the fumigation was given early in the afternoon of a bright day, the tomato plants were injured by the use of one ounce cynanide to 1000 cu. ft. of space. The same amount caused no trouble, however, when the fumigation was postponed until evening, a fact which verifies Johnson's statement†. With 1 oz. cyanide to 1500 cu. ft. of space the plants were not injured. In no case, however, is it considered advisable to fumigate when the sun is shining brightly, or when the temperature is above sixty degrees.

*Johnson, fumigation methods, pages 9 and 118.
†Ibid. 145.

EXPLANATION OF FIGURES.

Fig. 41. Egg. x130.

Fig. 42. Newly hatched larva from the ventral side. x130.

Fig. 43. Pupa from the dorsal side. x130.

Fig. 44. Longitudinal section of a mature egg in the ovary of the female. x530.

Fig. 45. Longitudinal section of an egg when the invagination of the germ band has begun. x530.

Fig. 46. Adult female from the left side. x130.

Fig. 47. Side view of egg with embryo, just before closure of amnionic cavity.

Fig. 48. Reconstruction of a fully developed embryo just before hatching.

Fig. 49. Ventral view of the germ band after segmentation has begun. x530.

Fig. 50. Male reproductive organs seen from above. x130.

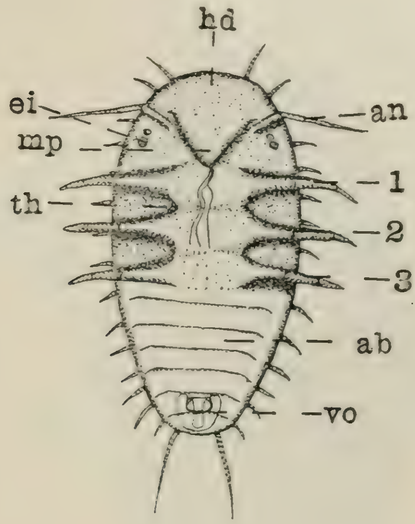
Fig. 51. Reconstruction of an adult female shown with the dorsal part of the body wall removed. x130.

REFERENCE LETTERS AND NUMBERS.

a	anterior.
ab	abdomen.
abp	abdominal portion of germ band.
acg	accessory glands.
am	amnion.
amc	amnionic cavity.
an	antenna.
bl	blastoderm.
br	brain.
c	cephalic end of germ band.
cl	cephalic lobes.
cae	diverticulæ of mid intestine.
d	dorsal.
ei	eye.
fw	fore wing.
hd	head.
hi	hind intestine.
hw	hind wings.
idro	rudiments of reproductive organs.
idw1	imaginal disc of fore wing.
idw2	imaginal disc of hind wing.
ism	intersegmental muscles.
lm	muscles of the legs.
mc	male claspers.
mi	mid intestine.
mp	mouth parts.
msth	mesothorax.
mtth	metathorax.
myc	micropyle.
nl	nerves of the legs.
nu	nucleus.
oes	œsophagus.
ov	ovary.
ovd	oviduct.
ovp	ovipositor.
p	posterior.
pas	posterior abdominal segment.
pb	polar bodies.
pe	penis.
prth	prothorax.
sd	duct of salivary gland.
se	serosa.
sg	salivary glands.
stk	stalk of egg.
te	testis.
th	thorax.
v	ventral.
vd	vas deferens.
vg	ventral ganglia.
vg 1	first ventral ganglion.
vg 2	second ventral ganglion.
vg 3	third ventral ganglion.
vnc	ventral nerve cord.
vo	vasiform orifice.
wm	wing muscles.
yk	yolk.
1	fore leg.
2	middle leg.
3	hind leg.

Figure 41.

Figure 42.



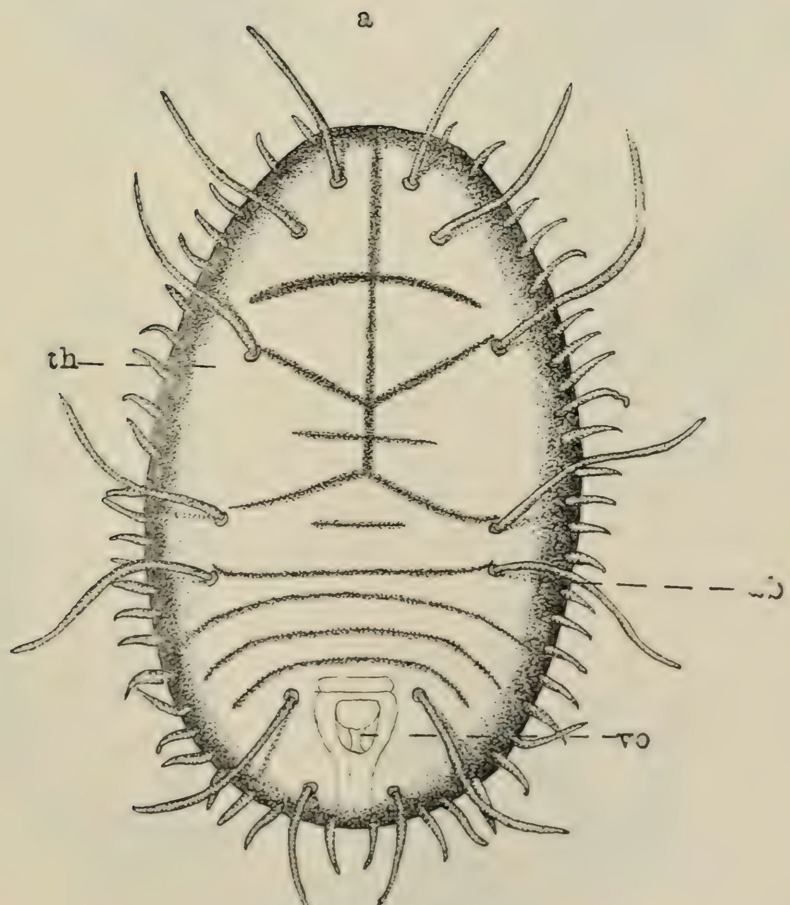


Figure 43.

Figure 44.

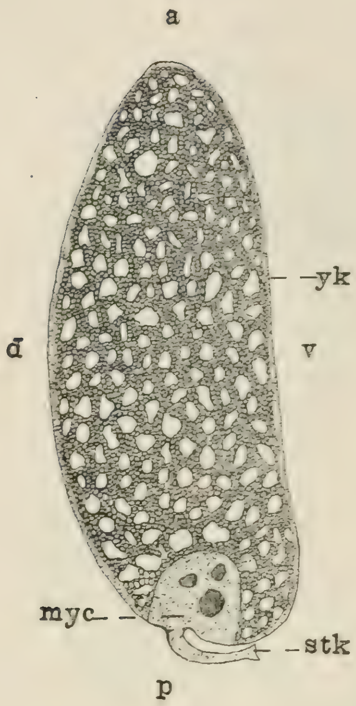
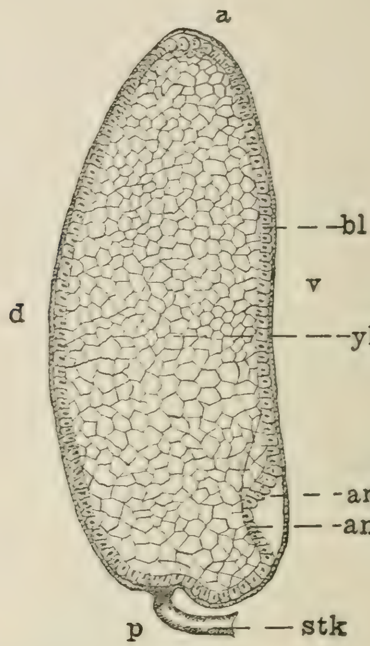


Figure 45.



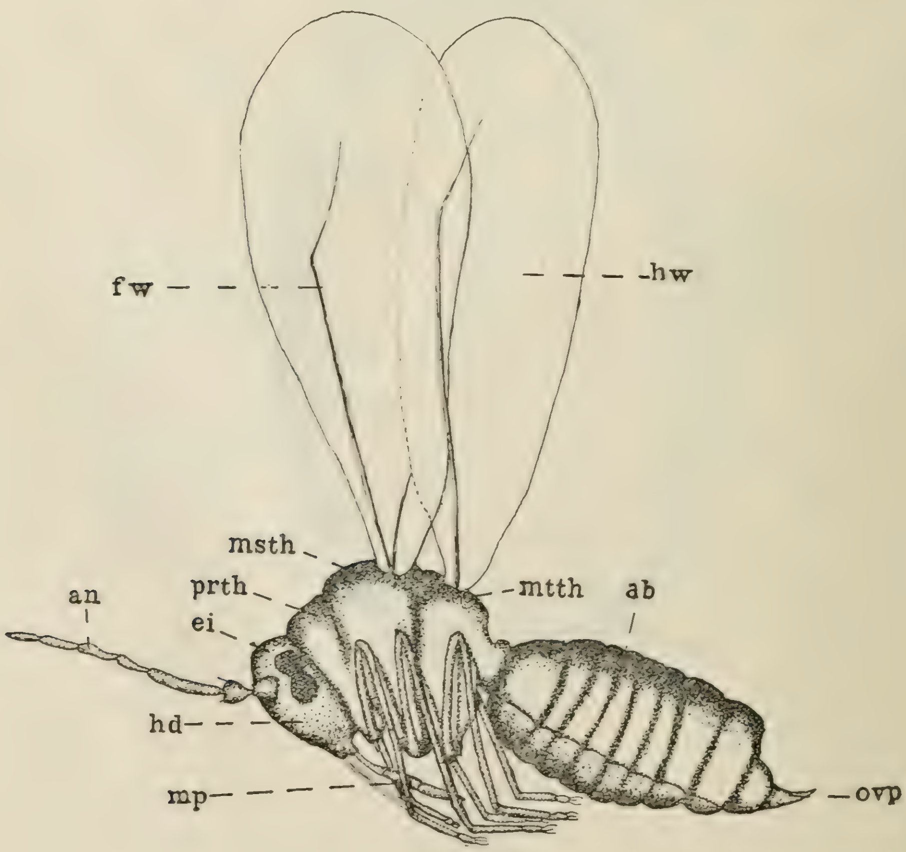


Figure 46.

Figure 47.

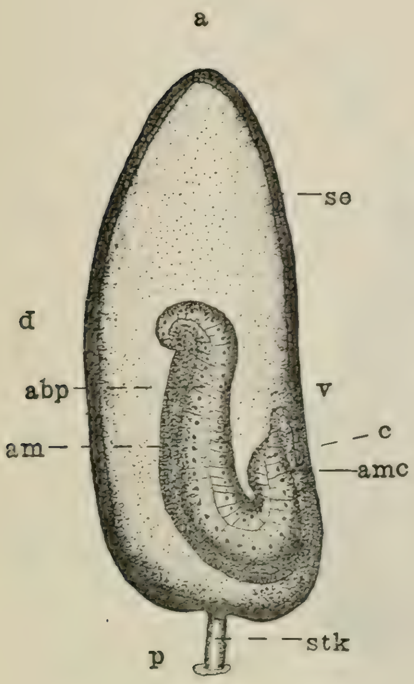
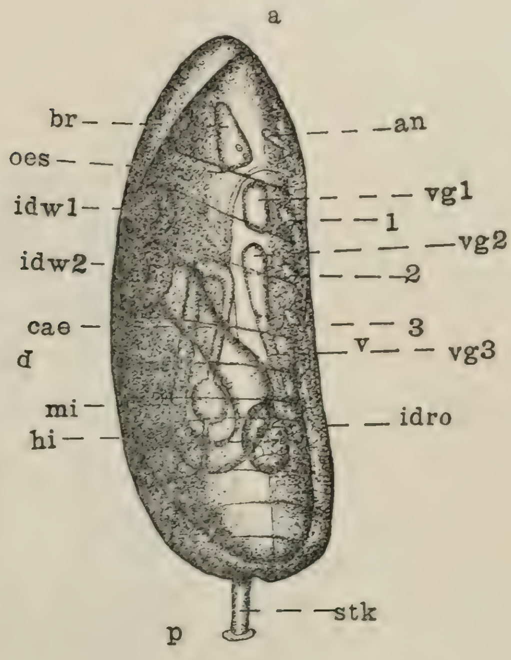


Figure 48.



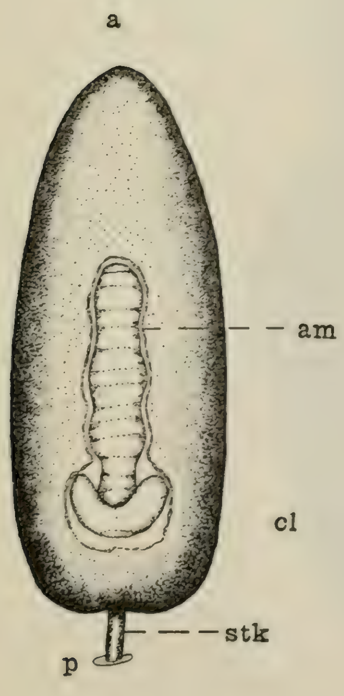


Figure 49.

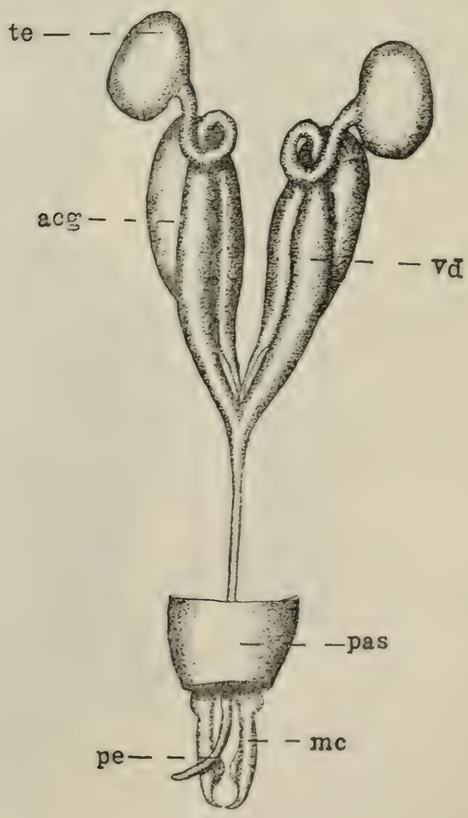


Figure 50.

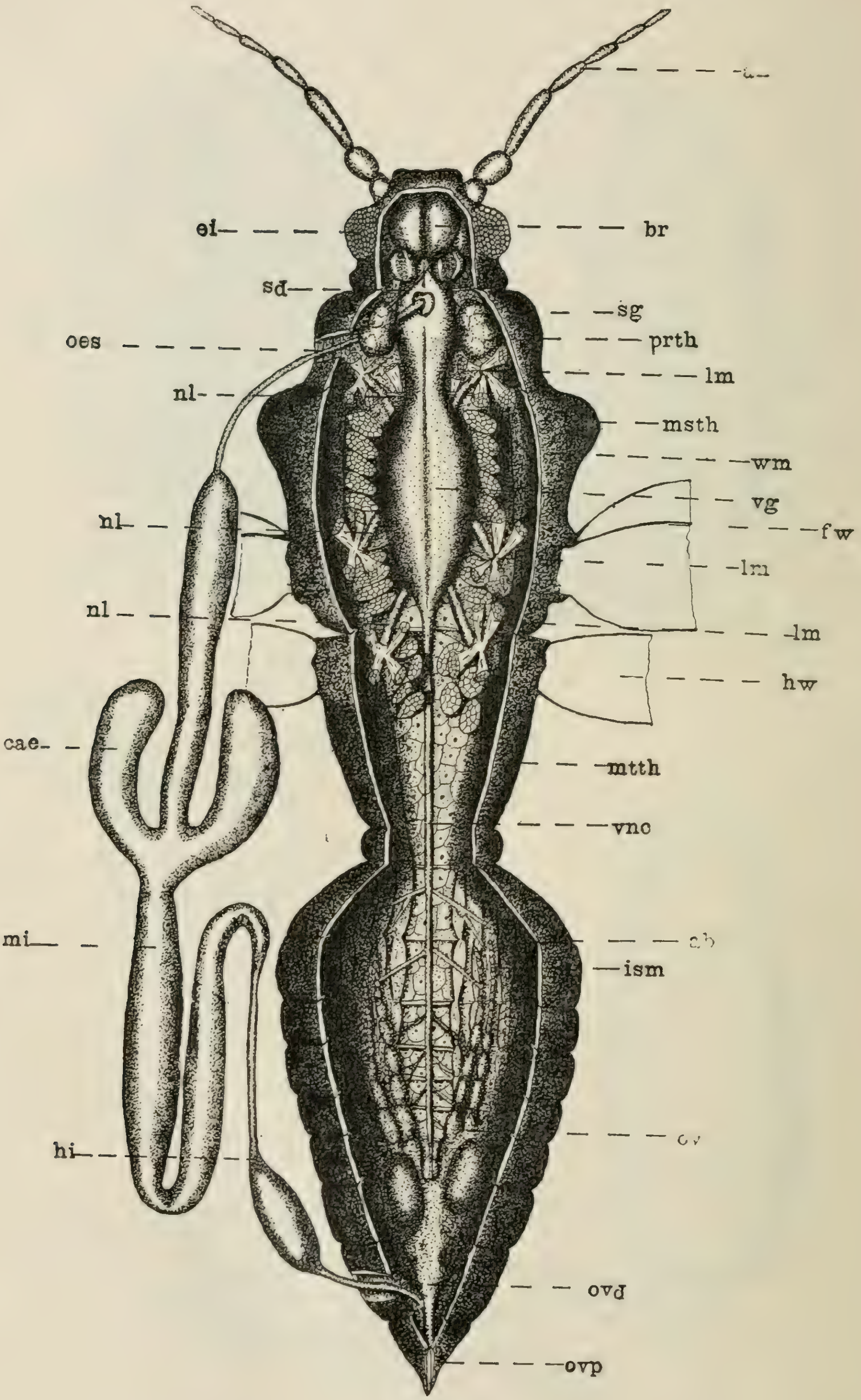

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Figure 51.

NOTES AND EXPERIMENTS UPON THE WHEATS AND FLOURS OF AROOSTOOK COUNTY.

Chas. D. Woods and L. H. Merrill.

Since the introduction of roller mills into this State, wheat growing in Aroostook county has received a marked impetus. Several years ago the attention of the Station was drawn to the subject and a brief study of the wheats and flours produced in the county was undertaken. Although it was found necessary to discontinue this work before many definite conclusions could be reached, considerable data have been accumulated that are given here as a report of progress. The work accomplished has been made possible through the effective co-operation of growers and millers. We are especially indebted to Mr. T. H. Phair of Presque Isle, and his miller, Mr. Carter, and also to E. Merritt and Sons of Houlton, and their miller, Mr. H. P. Gray.

The first roller flour mill in Aroostook county was built in 1897 by D. E. Edwards of Fort Kent. Although this was not a large mill, having a daily capacity of only fifty barrels, its establishment may be considered as marking an era of considerable importance in the industrial and agricultural development of the State. Since the date mentioned five other roller mills have been built in the county, so that at present there are six mills, as follows:

D. E. Edwards, Fort Kent, capacity	50 barrels.
H. D. Collins, Caribou, capacity	50 barrels.
H. A. Edwards, Caribou, capacity	30 barrels.
Alexander Cox, Presque Isle, capacity	50 barrels.
T. H. Phair, Washburn, capacity	20 barrels.
E. Merritt & Sons, Houlton, capacity	50 barrels.

The combined capacity of these mills is 250 barrels per day, or about 75,000 barrels per year.

It is estimated that the American people consume annually 357 pounds of bread per capita.* This is equivalent to about 260 pounds of flour, or one and one-third barrels. In dietary studies of the inmates of the hospitals of the insane of New York state † it was found that 10 hospitals with nearly 25,000 patients and attendants, used a total of 6,000,000 pounds of flour. This is equivalent to 240 pounds, or one and one-fourth barrels of flour for each person.

Assuming the accuracy of these figures from two distinct sources, the 60,000 people of Aroostook county could use all the flour which the mills now established there could produce. These mills, however, are not run at anything like their full capacity. The wheat crop of 1901 was probably as large as any that Aroostook county has harvested, yet even this crop was not sufficient to employ these mills to more than one-third their capacity.

The essential difference between these mills and the larger establishments of the Northwest is in the number and size of the stands, the consequent number of breaks, and the closeness with which the final products are graded. With a good quality of wheat and expert milling these mills should turn out as good product as larger plants.

Aroostook Flour Compared with Western Flour.

In 1900 the Station collected and analyzed samples of flour from three of the mills in Aroostook county. The tables which follow give the results of the analyses of these flours together with those of the samples since received from the mills of E. Merritt and Sons of Houlton, and of six samples of three brands of flours milled at Minneapolis. In the first table the results are calculated to the water content of the flours as received at the laboratory. As the flours vary somewhat in the amount of water which they contain, the results are calculated in the second table to a water-free basis.

* American Miller, March 1, 1901.

† W. O. Atwater, Report of Dietaries for Hospitals for the Insane, 10th Annua Report of the New York State Commission in Lunacy.

COMPOSITION AND HEAT OF COMBUSTION OF AROOSTOOK FLOURS COMPARED WITH WESTERN FLOURS. RESULTS CALCULATED TO WATER CONTENT OF FRESH FLOURS.

Laboratory number.	Manufacturers and Brands.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	Aroostook County.								
6302	S. W. Collins & Sons, Straight..	11.57	1.49	8.49	1.50	.23	77.70	.51	3.839
6306	S. W. Collins & Sons, Aroostook Patent..	12.75	1.55	8.83	1.12	.17	76.96	.38	3 805
6296	T. H. Phair, Straight	14.38	1.55	8.83	1.49	.16	74.55	.59	3.768
6349	T. H. Phair, First Grade	12.91	1.84	10.49	.96	.36	74.85	.43	3.864
6356	T. H. Phair, First Grade	13.57	1.64	9.35	1.09	.27	75.28	.44	3.805
6413	E. Merritt & Sons...	10.73	1.63	9.29	1.20	.26	78 08	.45	3.865
6414	E. Merritt & Sons............ ...	13.83	1.73	9.86	1.23	.22	74.38	.48	3.821
6415	E. Merritt & Sons....	14.68	1.52	8.66	1.07	.27	74.86	.46	3.783
6608	E. Merritt & Sons, Patent.......	13.62	1.53	8.72	1.09	.16	75.97	.44	3.723
6609	Second Grade	12.70	1.83	10.43	2.15	.37	73.30	1.05	3.824
6613	Patent....	14.84	1.51	8.61	.79	.24	75.20	.32	3.660
6614	Second Grade	15.20	1.77	10.09	.63	.39	72.98	.71	3.639
6618	Patent....	13.57	1.75	9.97	1.21	.25	74.47	.53	3.734
6619	Second Grade	13.68	1.95	11.11	.51	.42	73.39	.89	3.706
6623	Patent.................	12.19	2.27	12.94	1.04	.19	73.12	.52	3.831
6624	Second Grade........	12 44	2.53	14.42	2.03	.45	69.66	1.00	3.886
6628	Patent...	12.13	2.05	11.69	1.12	.18	74.52	.36	3.812
6629	Second Grade	12.14	2.35	13.40	2.30	.48	70.48	1.20	3 831
	Average of Aroostook County flours........	13.16	1.80	10.29	1.25	.25	74.45	.60	3.789
	Average of 8 flours from Maine grown wheats*	13.50	1.60	9.12	1.13	.24	75.52	.49	3.773
	Western.								
6129	Pillsbury's Best.............. ..	13.78	1 97	11.23	1.40	.....	73.01	.58	......
6130	Pillsbury's Best..	11.84	2.21	12.60	1.25	......	73.81	.50	......
6133	N. W. Consolidated Milling Co., Straight	11.55	2.04	11.63	1.43	......	74.79	.60	3.889
6273	N. W. Consolidated Milling Co., Straight................ .. .	11.30	2.04	11.63	1.28	.33	75.02	.44	3.942
6443	N. W. Consolidated Milling Co., Straight	10 90	2.27	12.94	1.40	.35	73.92	.49	3.963
6382	Washburn-Crosby Co., First Grade..........................	12.41	2.01	11.46	1.74	.27	73.70	.42	3 876
	Average of Western flours.. ...	11.96	2.09	11.92	1 42	.32	73.88	.50	3.917

*See discussion on page 148.

COMPOSITION AND HEAT OF COMBUSTION OF AROOSTOOK COUNTY FLOURS COMPARED WITH WESTERN FLOURS. RESULTS CALCULATED TO A WATER-FREE BASIS.

Laboratory number.	Manufacturers and Brands.	Nitrogen.	Protein (Nx5.7)*	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion, per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	Aroostook County.							
6302	S. W. Collins & Son, Caribou, straight	1.68	9.58	1.70	.26	81.89	.57	4.293
6306	S. W. Collins & Son, Aroostook Patent	1.78	10.15	1.28	.20	87.94	.43	4.361
6296	T. H. Phair, Washburn, Straight. ...	1.81	10.32	1.74	.19	87.07	.68	4.401
6349	T. H. Phair, First Grade	2.11	12.03	1.10	.41	85.97	.49	4.437
6356	T. H. Phair, First Grade	1.90	10.83	1.26	.31	87.09	.51	4.402
6413	E. Merritt & Sons, Houlton	1.83	10.43	1.34	.29	87.44	.50	4.330
6414	E. Merritt & Sons	2.01	11.46	1.43	.25	86.30	.56	4.434
6415	E. Merritt & Sons	1.78	10.15	1.25	.32	87.76	.54	4.434
6608	E. Merritt & Sons, Patent	1.77	10.09	1.26	.18	87.96	.51	4.312
6609	Second Grade	2.10	11.97	2.46	.42	83.95	1.20	4.380
6613	Patent	1.77	10.09	.93	.28	88.32	.32	4.298
6614	Second Grade	2.09	11.91	.74	.46	86.05	.84	4.292
6618	Patent	2 03	11.57	1.40	.29	86.13	.61	4.321
6619	Second Grade	2.26	12.88	.59	.49	85.01	1.03	4.294
6623	Patent	2.59	14.76	1.18	.22	83.25	.59	4.363
6624	Second Grade	2.89	16.47	2.32	.51	79.56	1.14	4.338
6628	Patent	2.33	13.28	1.27	.21	84.83	.41	4.338
6629	Second Grade	2.68	15.28	2.62	.55	80.18	1.37	4.360
	Average of Aroostook County flours.	2.08	11.86	1.44	.32	85.69	.69	4.355
	Average of 8 flours†	1.84	10.49	1.30	.28	87.37	.56	4.355
	Western.							
6129	Pillsbury's Best	2.29	13.05	1.62	.....	‡84.65	.68	
6130	Pillsbury's Best	2.51	14.31	1.42	.....	‡83.70	.57	
6133	N. W. Consol. Milling Co., Straight	2.31	13.17	1.61	.....	‡84.54	.68	4.397
6273	N. W. Consol. Milling Co., Straight	2.30	13.11	1.44	.37	84.58	.50	4.444
6443	N. W. Consol. Milling Co., Straight	2.55	14.54	1.57	.39	82.95	.55	4.448
6382	Washburn Crosby Co., First Grade	2.30	13.11	1.98	.31	84.12	.48	4.426
	Average of Western flours	2.37	13.51	1.61	.36	83.94	.58	4.429

*The factor 5.7 is used throughout this bulletin in calculating the percentage of protein as this more nearly represents the relation of nitrogen to protein in wheat than the usual factor, 6.25.

†See discussion which follows the table.

‡Total carbohydrates.

In the second of the preceding tables, the average amount of protein in the Maine flours is shown to be 1.65 per cent below that of the western flours. The comparison is not a fair one, however, since four of the Aroostook flours, 6349, 6356, 6628, and 6629, were from western grown wheat. Six of the others, 6608, 6609, 6618, 6619, 6623 and 6624, were from wheats of western parentage which had been grown but one year in this State. If we exclude these ten flours from our averages, we find that the remaining eight Maine flours, water-free, contain three per cent less protein than the western. In other words, the western flours contain one-fourth more protein than those ground in Aroostook county from home grown wheats.

If we continue the comparison, we note also that the dry matter of the western flour contains one-fourth more fat and crude fibre, and three and one-half per cent less starch and other carbohydrates than the Maine flour. The heat of combustion is practically the same in both.

These differences may be summed up by saying that the dry matter of these Maine flours contained three per cent less protein, three per cent more carbohydrates (mostly in the form of starch), and slightly less fat and woody matter than the hard wheat flours of the Northwest.

BAKING TESTS OF AROOSTOOK MILLED FLOURS.

Six of the samples of flour, analyses of which are given in the preceding tables, were sent to Mr. C. E. Foster, the milling expert of the Northwestern Consolidated Milling Company of Minneapolis. This is one of the largest flour milling companies of the world, and twice daily makes baking tests on all its output. Mr. Foster kindly examined these flours and his report is summarized in the following table. As the terms in which the results are given are somewhat unfamiliar, they are explained in detail in the discussion which follows the table.

RESULTS OF BAKING TESTS OF AROOSTOOK FLOURS.

Number of sample.	Appearance of Flour.	Dough.		Bread.				Moist gluten.
		Viscosity.	Color.	Largest circumference of loaf.	Least circumference of loaf.	Weight.	Color.	
				Inches.	Inches.	Ounces.		Per cent.
630	....	....	1	27.00	22.60	18 00	.....	27.50
6349	Coarse.	Very short .	1xw	27.75	24.00	18.50	....	32.29
6350	Coarse..........	Very short .	1w	27.50	24.00	18.25	....	28 12
6413	Very soft	Short	1w	25.25	21.00	17.75	1 –	29.58
6414	Granular, coarse ...	Fair, Elastic	1	26.50	23.00	18.50	1	29.58
6415	Mixed	Soft	1.5	26.00	22.25	17.75	1.5	26.04
	Minn. Standard	Standard ...	1	29.25	26.25	18.25	1	38.75

The Northwestern Milling Company has adopted a standard flour as an ideal toward which it works. In appearance of the flour, viscosity and color of the dough, and color of the resulting bread, the standard is taken as unity. The standard carries 38.75 per cent of wet gluten. In the narrow pans in which the bread is baked, 12 ounces of flour should produce a loaf weighing 18.25 ounces and measuring in its greatest circumference 29.25 inches, and over the center of the loaf at right angles to this, 26.25 inches.

The standard flour is of a degree of fineness which has been found by experience to produce the best loaf. It is not granular, nor is it impalpable. The standard is thoroughly uniform in appearance. Its degree of fineness is so definite, and the sense of touch of the expert so delicate that he is at once able to properly class a flour. "Soft" means ground too fine for bread purposes. Sample 6414, while too granular, was "nearest Minneapolis first patent in granulation." Sample 6415 was reported as "mixed." This means that the flour from the different breaks was not of uniform fineness, so that the resultant flour from the breaks was of uneven fineness.

When the standard flour is wet up so as to make a dough, it has a definite viscosity. If a dough has not as great resistance to the touch as the standard it is "soft." If it has less tenacity than the standard, it is "short." A soft or short dough will also have less elasticity than the standard. Sample No. 6414 was nearer to the standard Minneapolis patent than any of the other flours in viscosity and color of the dough.

The scale used in marking the color of the dough is as follows: 1 x w indicates dead white rather than the creamy white of the Minneapolis Standard patent. 1 w means that the dough is white but not such a dead white as 1 x w.

In the color of the bread, 1- means that the bread is just a little off color for a patent, while 1.5 means that it has the color of a straight grade and not that of a patent flour.

The wet or moist gluten is determined by taking a definite weight of flour, wetting it to a dough and with the necessary precautions washing out the starch and soluble constituents by kneading and working the materials under a stream of water. Crude as this separation is, in the hands of an expert it gives results which, when made by the same person, are closely comparable. It is noted that all of these Maine milled flours were very deficient in the content of wet gluten as compared with the standard Minneapolis first patent. While the defect may be due to a low gluten content in Maine grown wheats, it would seem that a large part of it is due to milling. Samples 6349 and 6356 were made from carefully bred Minnesota wheat. There is little doubt that if these same wheats had been milled by the expert millers of the Consolidated Milling Company in their large plant that the resultant flours would have been equal to the Minneapolis standard. In other words, the Maine miller did not work as close to the outer layers of the wheat berry as the western miller would have done.

By referring to the percentage of protein given in the tables on pages 105 and 106 it will be seen that there is in general a fair conformity between the amount of protein and that of wet gluten.

The standard flour produces a loaf of maximum weight and size from a given weight of flour. Both of these factors are largely dependent upon the amount of gluten which the flour carries. While experiments by Snyder* indicate that in a flour of the highest bread making properties there is a definite ratio of gliadin to glutenin (the two substances which together constitute gluten), these particular flours were not examined for these constituents.

It will be noted that while most of these Maine milled flours gave a loaf nearly equal to or greater in weight than the standard flour, that the loaf as shown by its measurements was considerably smaller. This means that the bread was heavy as compared with the Minneapolis standard described on page 108. The bread from 6415 while giving a loaf of low weight, a drawback from the baker's standpoint, was large in proportion to its weight, and so far as texture and appearance were concerned, the expert had no criticism to offer. It is interesting to note that this flour, which from the standpoint of the consumer was the best of any of the Maine flours, was made from wheat which had been grown for many years in Aroostook county. The report of the expert shows that the flours depart from the Minneapolis standard in appearance, in working and in baking.

The imperfect and uneven granulation are due to faulty milling and can, of course, be corrected, at least, in part, although it

* Bul. 101, Office of Experiment Stations, U. S. Dept. Agr., p. 61.

may not be possible in small mills to adopt all the refinements practiced in large establishments, partly for lack of machinery, and partly because expert millers cannot be profitably employed where the business is small. The report shows that, in addition to the ordinary defects in milling, the flours were somewhat deficient in gluten; in other words, the flours were weak.

The two lots of Minneapolis grown wheat milled at Washburn were lower in protein than the flours from this wheat should have been, but they carried considerably more protein than the flours made from Maine grown wheat. While the amount of gluten in the flour is to a certain extent determined by the process of milling, in which matter may be excluded that should have been retained in the flour, the deficiency in the cases examined is so large that it can only to a limited extent be referred to this source and must rather be attribued to a lack of gluten in the grain itself.

Composition of Maine Grown Wheat.

The low protein content of the Maine flours naturally led to the examination of several wheats grown in Aroostook county. Numerous studies have been made elsewhere upon the general effect of climate upon the size and composition of the wheat berry. The present studies can be better interpreted in the light of these other investigations. The summaries of such studies by a few authorities follow.

EFFECTS OF CLIMATE UPON WHEAT.

Schindler* has shown that the size and weight of the berry of wheats of different localities depends upon the length of the vegetation period, and more especially upon the length of the interval between blossoming and ripening. This, as he explains, is in accordance with the development of the grain as it matures, which is as follows: The glumes or chaff of the berry are first in order of growth; following these, the outer fruit coating and then the inner true seed coats develop, then follows the endosperm which is the richest in gluten, and later still the storage tissues in the interior of the berry are formed. In regions with a moist warm climate the fruiting period is prolonged and abundant quantities of starch are formed in the large leaf sur-

* Der Weizen in seinen Beziehungen zum Klima, u. s. w., Berlin, 1893.

faces which such a climate produces on the wheats. The starch thus formed is all transferred to the berry, which is thus filled up as is shown externally by the broadly expanded form. Such a wheat is relatively rich in carbohydrates and poor in protein.

On the other hand, a hot dry climate shortens the time for starch transference, and the native wheats of such a climate are in general richer in protein and lower in carbohydrates. As illustrations of this, he shows that the climate, and especially proximity to the sea, closely affects the amount of gluten in the wheat. The insular climate of England produces a robust wheat having large ears with numerous kernels but with less gluten than the wheats of eastern Europe. According to this author, the wheats of England and other countries having a similar climate seldom contain more than ten per cent of gluten; while in the warm temperate zone, in eastern Europe, as well as in the Western United States, in Southern Russia, Roumania, and Turkey, and in the subtropical zone, the gluten content may even exceed twenty per cent.

The wheats from different sections of our own country show a great variation in the protein content.*

PROTEIN IN AMERICAN WHEATS.

Section.	Number of analyses.	Average per cent.	Highest per cent.	Lowest per cent.
Atlantic and Gulf States	117	11.35	15.58	9.43
Middle States	91	12.50	16.63	10.15
Western States	177	12.74	18.03	8.93
Pacific States	20	9.73	12.78	7.70
Canada	6	10.87	14.70	9.45

These figures show an extreme range of over 10 per cent, from 18.03 per cent in the western states to 7.70 per cent in the Pacific states. It is not to be understood that these variations are due to difference in climate alone. On the contrary, the varieties grown, nature of the soil, and the kind of fertilizers used, have

* Report of Chemist, U. S. Dept. Agr., Rept. 1884, p. 77.

all been proved to have their influence. Since, however, the figures of Richardson represent a large number of analyses it must be admitted that the predominating influences are climatic. These conclusions are not in thorough accord with those of Wiley* who asserts that "the broad principle has been established that, other things being equal, wheats from a high northern latitude contain more gluten than those grown farther south and the wheats that are grown in the spring a larger quantity of gluten than those which are planted in the autumn." Brewer† states that the quality of wheat is largely determined by climate, the grain of a sunny climate, like that of California, Egypt, northern Africa, and similar countries always ranking high for quality. He finds no proof, however, for the frequent assertion that such wheats are richer in gluten and consequently make stronger flours. Chemical composition depends more upon the variety cultivated than upon soil or climate, although the influence of the two latter is by no means to be overlooked. "Many years ago Davy found the wheat of Sicily richer in gluten than that of England, and this appears to have led to a hasty generalization that the wheat of warm climates was stronger than that of cooler ones. It has been claimed that the wheat of northern Africa was stronger, that is, contained more gluten, than that of northern Europe. So far as our analyses of American wheat show, this has not proved to be the case here. Undoubtedly climate as well as soil affect the amount of albuminoids, but we have no evidence that California wheats are, as a class, richer than those of the other regions, or the wheats of the southern states richer than those of the northern." ‡

We find, then, quite a marked difference of opinion regarding the relations between quality of wheat and climate. This confusion is not so surprising when we consider how many factors enter into the problem. It is manifestly unfair to compare wheat from different localities when the varieties grown are not the same. Thus, wheats of the varieties, French Imperial and New York Spring wheat, grown upon the farm of the Oregon Agricultural College in the same season, 1889, were found to contain respectively 1.35 and 2.21 per cent nitrogen; that is one con-

* U. S. Department of Agriculture, Yearbook 1899, p. 244.
† Tenth Census U. S., 1880, Vol. III, Cereal Production of the U. S., p. 64.
‡ Brewer. Tenth Census of the U. S., 1880, Vol. III, Cereal Production U. S., p. 68.

tained over 60 per cent more nitrogen than the other.* The table which follows contains the results of the analyses of 16 samples of spring wheat grown in northern Maine (Aroostook county). Twelve samples of hard spring wheat grown in the northwest have recently been analyzed at the Station. These results are given in the table for purposes of comparison. In this table is also given the average of 25 analyses of Minneapolis wheats reported by the Minnesota Experiment Station. As there reported, the protein was calculated by using the factor 6.25. It is here recalculated, using 5.7 as a factor.

THE COMPOSITION AND HEAT OF COMBUSTION OF SPRING WHEAT GROWN IN MAINE COMPARED WITH WHEAT GROWN IN THE NORTHWEST. CALCULATED TO WATER CONTENT OF FRESH WHEAT.

Laboratory number.	Variety of Wheat.	Wt. 100 kernels.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	Grown in Aroostook County.	Grms	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Calories.
6294	Unknown	3.245	11.67	1.74	9.92	2.65	2.32	71.43	2.01	3.924
6361	Unknown	3.333	11.82	1.93	11.00	2.68	2.00	70.69	1.81	3.918
6317	Lost Nation	3.218	11.70	1.66	9.46	1.97	2.21	72.97	1.69	3.884
6410	White Fife	3.675	9.62	2.04	11.63	2.22	2.47	72.27	1.79	3.989
6411	Common Aroostook	2.825	9.35	1.86	10.60	2.22	2.50	73.48	1.85	4.005
6412	Blue Stem	3.228	9.28	1.96	11.17	2.28	2.52	72.96	1.79	3.994
6431	Hard Fife	3.379	11.12	1.93	11.00	2.25	2.28	71.62	1.73	3.966
6432	White Russian	3.262	12.22	1.85	10.54	2.17	2.41	70.99	1.67	3.909
6433	Blue Stem	2.977	11.41	1.88	10.72	2.25	2.42	71.31	1.89	3.932
6434	Fife	3.178	9.42	2.07	11.80	2.32	2.65	71.94	1.87	3.998
6435	Blue Stem	2.970	9.14	1.86	10.60	2.25	2.40	73.82	1.79	3.988
6436	Unknown	3.032	10.16	1.78	10.15	2.26	2.56	73.12	1.75	3.997
6437	Unknown	3.969	9.74	2.15	12.25	2.23	2.52	71.24	2.02	3.990
6438	Unknown	3.084	9.82	1.83	10.43	2.31	2.55	72.93	1.96	3.977
6439	Unknown	3.578	11.33	1.87	10.66	2.24	2.42	71.65	1.70	3.926
6440	Blue Stem	3.251	11.15	2.21	12.60	2.29	2.31	69.96	1.69	3.922
	Average of 16 wheats	3.225	10.56	1.91	10.91	2.29	2.41	72.02	1.81	3.957
	Grown in the Northwest.									
6270	Hard Spring	2.371	11.19	2.20	12.54	2.43	1.96	70.23	1.65	3.987
6310	Wellman's Fife	2.129	11.84	2.16	12.31	2.22	2.66	69.11	1.86	3.954
6314	Fife	2.203	10.93	2.15	12.26	1.98	2.52	70.11	2.10	3.919
6315	Blue Stem	2.213	11.72	1.78	10.15	2.07	2.67	71.41	1.98	3.891
6316	Blue Stem	2.253	9.59	2.21	12.60	2.05	2.65	70.93	2.18	3.995
6348	Wellman's Fife	2.271	12.80	2.06	11.74	2.53	2.46	68.35	2.12	3.956
6355	Blue Stem	2.199	12.48	1.86	10.60	2.30	2.42	70.36	1.84	3.909
6516	Hard Spring	2.604	12.08	2.39	13.62	2.70	2.40	67.21	1.99	3.969
6622	Blue Stem	3.087	10.89	2.55	14.54	2.11	2.17	68.42	1.87	3.936
6627	Unknown	2.474	11.39	2.32	13.22	2.32	2.35	68.74	1.98	3.823
6714	Minn. No. 181	2.527	10.80	2.97	16.93	1.99	2.30	66.02	1.96	3.890
6715	Minn. No. 851	2.440	10.03	2.47	14.08	2.23	2.50	69.17	1.99	3.996
	Average of 12 wheats	2.398	11.31	2.26	12.88	2.24	2.45	69.16	1.96	3.935
	Average of 25 analyses of Minnesota wheats †	...	11.00	2.20	12.54	2.05	2.25	70.24	1.92	

† Bulletin 36 Minnesota Experiment Station.

* Oregon Exnt. Sta., Bul. 4, p. 31.

Because of the hot, dry summer, the growing season of the northwest is much shorter than in Aroostook county. Wheat harvest is from a month to six weeks earlier in Minnesota than in Maine. For this reason we should expect a difference in the size and composition of the berry. In the sixteen samples of Aroostook wheats the weight of 100 kernels varied from 2.825 to 3.969 grams, averaging 3.225 grams. The eight northwestern wheats showed a greater uniformity in size, 100 kernels ranging from 2.129 to 3.087 grams, with an average of 2.398. Omitting sample 6622, the range was from 2.129 to 2.604 grams. This difference in weight was accompanied by a difference in composition, the difference being chiefly in the lower protein and higher nitrogen-free extract of the Maine wheats. This difference is more clearly brought out in the following table, where the analyses of the different wheats are calculated to a water-free basis.

AVERAGE COMPOSITION AND HEAT OF COMBUSTION OF MAINE AND WESTERN GROWN WHEATS, CALCULATED TO A WATER-FREE BASIS.

		Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
16	Maine wheats	2.14	12.20	2.56	2.70	80.52	2.02	4.424
12	Western wheats	2.55	14.52	2.53	2.76	77.98	2.21	4.437
25	Minnesota wheats	2.47	14.09	2.30	2.53	78.92	2.16	*4.328

*Calculated.

Experiments upon Growing Northwestern Wheats in Maine.

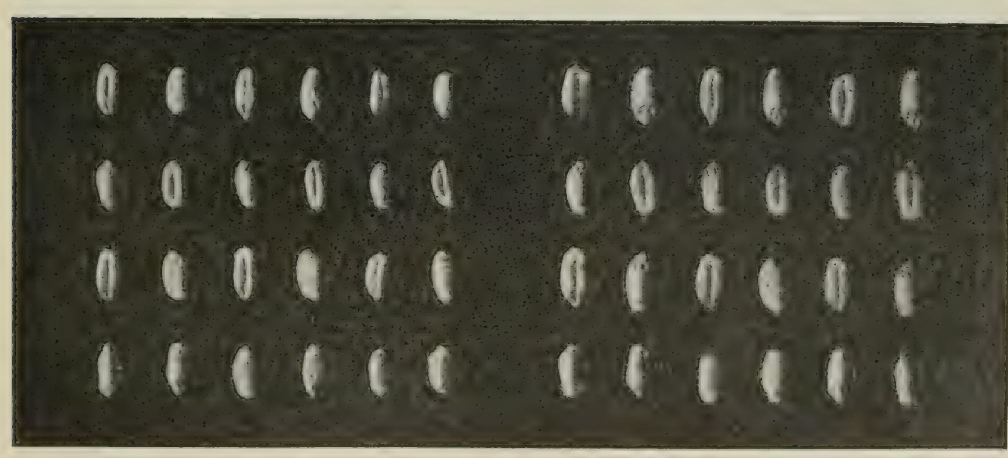
Marked as are the differences in composition of wheats that have been grown many years in Aroostook county, the immediate effect of change of climate upon carefully bred wheat is not so clear. It is important for the Maine grower to produce a wheat with as high a protein content as possible. Practical men in Aroostook county are unanimous in the opinion that wheats grown from western seed change in size and appearance of the kernel. How soon this change takes place, whether in one or two seasons, or whether more gradually is not clear.

FIRST EXPERIMENT.

As a preliminary study, three experiments in growing wheat in Aroostook county from western seed were made in 1900. While three trials in one season are not sufficient to give conclusive results, they were undertaken with the hope that they might prove to be instructive as indications of what might be expected from more extended trials. The description of the seed and details of the experiment follow.

6309. Lamona wheat, obtained from the U. S. Department of Agriculture. This wheat was grown in Lincoln county, Washington, and it is said to be the best drouth-resistant variety ever grown there, yielding from 20 to 30 bushels per acre of fine plump kernels. A portion of this wheat was reserved for analysis, and the remainder forwarded to the Hon. T. H. Phair of Presque Isle, to be used as seed. Samples were obtained from the crop thus grown (6515).

FIG. 52. FIFE WHEAT, SHOWING CHANGES IN SIZE AND SHAPE OF KERNEL BY CHANGE OF CLIMATE.



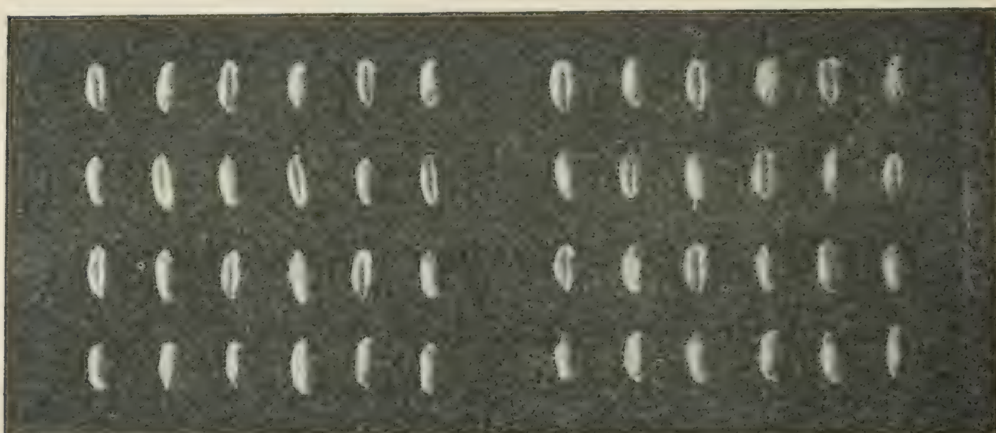
6314. Parent, Minnesota grown. 6434. Progeny, Maine grown.

6314. Wellman's Fife. This wheat was obtained from Professor W. M. Hays of the Minnesota Experiment Station. It was grown at Perham, Minn., from seed introduced 20 years previously from the Saskatchawan Valley. It is thought to have come originally from northern Russia. From this seed crops were grown at several points in Aroostook county. Sample 6434 was grown at Washburn by Alex Duncan.

6315. Blue Stem Wheat. This was also obtained from Professor Hays. It was grown in Minnesota from seed introduced over 20 years before from North Dakota. This is one of the superior hard wheats of Minnesota. A crop from this seed was grown by John H. Wark of Washburn, from which sample 6435 was selected.

A considerable amount of grain of the two varieties last named which had been purchased by Mr. Phair for seed remained unsold and was ground at Mr. Phair's mill at Washburn. At the same time samples of grain grown in Aroostook county from this seed were also ground. Opportunity was thus furnished for comparing not only the wheats themselves but the resulting flours.

FIG. 53. BLUE STEM WHEAT, SHOWING CHANGES IN SIZE AND SHAPE OF KERNEL BY CHANGE OF CLIMATE.



6315. Parent, Minnesota grown. 6435. Progeny, Maine grown.

The tables on page 117 contain the results of the analyses of these grains. An examination of the first column of the table on the top of the following page shows an increase in the weight of the kernel in each case. With the Fife and Blue Stem the increase was very large (see accompanying illustrations), amounting to nearly 50 per cent of the seed, while the weight of the Lamona kernel (already very heavy) remained practically unchanged. The latter, however, showed a very marked decrease in protein, amounting to 21 per cent of the original. The Fife also suffered a small loss of protein, while the Blue Stem made a slight gain, too small to be of any significance. All the wheats exhibited a remarkable agreement in the heats of combustion.

A COMPARISON OF MAINE GROWN WHEATS WITH THE WESTERN GROWN SEED. CALCULATED TO A WATER-FREE BASIS.

Laboratory number.		Weight 100 kernels.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	Lamona.	Grms	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
6309	Western	3.143	2.78	15.87	1.98	2.31	77.85	1.99	4.491
6515	Aroostook	3.225	2.17	12.37	3.28	2.77	79.60	1.98	4.402
	Fife.								
6314	Western	1.962	2.41	13.75	2.23	2.94	78.72	2.36	4.400
6434	Aroostook	2.879	2.29	13.03	2.56	2.93	79.41	2.06	4.415
	Blue Stem.								
6315	Western	1.954	2.02	11.51	2.35	3.02	80.88	2.24	4.406
6435	Aroostook	2.699	2.05	11.69	2.48	2.64	81.22	1.97	4.388

PERCENTAGE AMOUNTS OF PROTEIN AND WET AND DRY GLUTEN IN WESTERN WHEATS AND THEIR MAINE GROWN PROGENY.

Laboratory number.		Protein.	Wet gluten.	Dry gluten.	Ratio wet to dry gluten.
	Lamona.	Per cent.	Per cent.	Per cent.	
6309	Western	15.87	40.92	15.38	2.66:1
6515	Aroostook	12.37	26.83	11.42	2.35:1
	Fife.				
6314	Western	13.75	26.66	10.95	2.43:1
6434	Aroostook	13.03	28.65	11.31	2.53:1
	Blue Stem.				
6315	Western	11.51	24.07	9.92	2.42:1
6435	Aroostook	11.69	27.60	11.32	2.44:1
					2.47:1

The Lamona suffered a large falling off in protein and a still larger loss in the gluten content. On he other hand, both the other varieties gained in gluten, the Maine wheats being stronger than the western seed. Even the Fife, which lost .73 per cent protein, gained .36 per cent dry gluten, showing that the usual relations between protein and gluten are reversed. These results are somewhat surprising and fail to confirm the conclusions reached from the comparison of flours previously made. It should be remarked, however, that the loss of gluten in the Lamona is much larger than the combined gains of the other varieties.

SECOND EXPERIMENT IN GROWING NORTHWESTERN WHEAT IN MAINE.

The results of the first trial were so contradictory that a second series was planned under other and more favorable conditions.

Through the courtesy of Mr. John Watson the Station grew in 1902 five one-fourth acre plots of wheat on his farm in Houlton. In 1901 E. Merritt & Sons imported a car of Blue Stem wheat from the Northwest, part of which they sold for seed. A milling test (described beyond) was made with this original wheat and with its Maine grown progeny, and both this original wheat and the Maine grown were selected for the experiment. Professor W. M. Hays of the Minnesota Experiment Station kindly furnished us with two strains of Blue Stem wheat bred by them and also grew plots of the same on the Minnesota Station farm for comparison. The relation between the parent wheats and their progeny is shown in the table at the top of page 119.

The composition of these wheats, both parent and progeny, is given in the tables on pages 119 and 120, where the wheats are classified according to the locality in which they were grown. Beyond these tables of composition are given the more characteristic figures arranged in order of growth.

TABLE SHOWING THE RELATIONS BETWEEN THE SEED WHEAT AND THE PROGENY.

Parent Wheats.	Progeny. 1901.	Progeny. 1902.
No. 6622. Blue Stem 1900. Northwestern.	No. 6617. From No. 6622. Aroostook County........	No. 6770. From No. 6617. Aroostook County.
	....	No. 6772. From No. 6622. Aroostook County.
No. 6714. Minn. 181. Northwestern 1901.	....	No. 6774. Northwestern.
	....	No. 6769. Aroostook County.
No. 6715. Minn. 851. Northwestern 1901.	....	No. 6775. Northwestern.
	....	No. 6768. Aroostook County.

COMPOSITION AND HEAT OF COMBUSTION OF SPRING WHEATS GROWN IN THE NORTHWEST COMPARED WITH THE SAME VARIETIES GROWN IN AROOSTOOK COUNTY.

Laboratory number.	Variety of Wheat.	Wt. 100 kernels.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	Northwestern.	Grms	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
6622	Blue Stem	3.087	10.89	2.55	14.54	2.11	2.17	68.42	1.87	3.936
6714	Minn. 181	2.527	10.80	2.97	16.93	1.99	2.30	66.02	1.96	3.890
6774	Minn. 181	2.230	12.07	2.26	12.88	2.52	2.69	67.77	2.05	3.862
6715	Minn. 851	2.440	10.03	2.47	14.08	2.23	2.50	69.17	1.99	3.996
6775	Minn. 851	2.312	11.93	2.39	13.62	2.52	2.95	66.76	2.22	3.886
	Average of 5	2.519	11.14	2.53	14.41	2.27	2.52	67.63	2.02	3.914
	Aroostook County.									
6617	Blue Stem	3.329	13.58	1.89	11.01	2.14	2.14	69.53	1.60	3.823
6770	Blue Stem	3.435	11.77	2.41	13.74	2.10	1.85	68.44	2.10	3.965
6772	Blue Stem	3.751	11.65	2.41	13.74	2.10	2.11	68.47	1.93	3.898
6769	Minn. 181	3.784	12.27	2.41	13.74	2.33	2.03	67.77	1.86	3.917
6768	Minn. 851	3.860	12.53	2.47	14.08	2.14	2.19	67.02	2.04	3.902
	Average of 5	3.625	14.36	2.32	13.21	2.16	2.06	66.29	1.91	3.901

COMPOSITION AND HEAT OF COMBUSTION OF SPRING WHEATS GROWN IN THE NORTHWEST COMPARED WITH THE SAME VARIETIES GROWN IN AROOSTOOK COUNTY. CALCULATED TO A WATER-FREE BASIS.

Laboratory number.	Variety of Wheat.	Wt. 100 kernels.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	Northwestern.	Grms	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Calories.
6622	Blue Stem	2.751	2.86	16.32	2.37	2.44	76.78	2.09	4.417
6714	Minn. 181	2.254	3.33	18.98	2.23	2.58	74.02	2.19	4.361
6774	Minn. 181	1.960	2.57	14.65	2.87	3.06	77.08	2.33	4.392
6715	Minn. 851	2.196	2.75	15.65	2.48	2.78	76.89	2.21	4.442
6775	Minn. 851	2.036	2.71	15.46	2.86	3.35	75.81	2.52	4.409
	Average of 5	2.239	2.85	16.22	2.55	2.84	76.12	2.27	4.405
	Aroostook County.								
6617	Blue Stem	2.877	2.18	12.76	2.48	2.48	80.43	1.85	4.425
6770	Blue Stem	3.031	2.73	15.57	2.38	2.10	77.57	2.38	4.494
6772	Blue Stem	3.314	2.73	15.55	2.38	2.39	77.50	2.18	4.412
6769	Minn. 181	3.287	2.75	15.66	2.65	2.31	77.26	2.12	4.465
6768	Minn. 851	3.372	2.82	16.10	2.45	2.50	76.62	2.33	4.461
	Average of 5	3.109	2.71	15.43	2.52	2.41	77.41	2.23	4.451

The results obtained in Aroostook county with the Blue Stem and the Minn. 181 wheats would, if taken by themselves and for a single season, seem to confirm the belief that the northwestern wheats quickly deteriorate when grown in Maine. If, however, these results are studied in connection with those obtained by a second planting and also by the check trials in Minnesota, it will be found that the results first obtained have lost much of their apparent significance.

The most important differences in these wheats is in the amount of protein which they contain and in the weights of the kernels. These differences are brought out more clearly in the table on the following page.

WEIGHTS OF KERNELS AND PERCENTAGES OF PROTEIN IN MINNESOTA PARENT WHEATS AND THEIR MAINE AND MINNESOTA GROWN PROGENY.

Laboratory number.		Water.	Weight of 100 Kernels.		Protein.	
			Air dry.	Water free.	Air dry.	Water free.
		Per cent.	Grams	Grams	Per cent.	Per cent.
6622	Parent grown in Northwest 1900	10.89	3.087	2.751	14.54	16.32
6617	From 6622 grown in Houlton 1901.........	13.58	3.329	2.877	11.01	12.76
6772	From 6622 grown in Houlton 1902........	11.65	3.751	3.314	13.74	15.55
6770	From 6617 grown in Houlton 1902..	11.77	3.435	3.031	13.74	15.57
6714	Parent grown in Minn. 1901...............	10.80	2.527	2.254	16.93	18.98
6774	Progeny grown in Minn. 1902.............	12.07	2.230	1.960	12.88	14.65
6769	Progeny grown in Maine 1902.	12.27	3.748	3.287	13.74	15.66
6715	Parent grown in Minn. 1901...............	10.03	2.440	2.196	14.08	15.65
6775	Progeny grown in Minn. 1902.....	11.93	2.312	2.036	13.62	15.46
6768	Progeny grown in Maine 1902	12.53	3.860	3.372	14.08	16.10

The first of these trials with Blue Stem in Aroostook resulted in a loss of protein of nearly 4 per cent; yet on the following year a planting from the same seed and another from the original Minnesota wheat brought the protein back to within one per cent of the parent wheat. What the result from another planting might be, it is impossible to predict.

Equally inconclusive are the results obtained with the Minn. 181 wheat. This variety planted in Maine lost over 3 per cent in a single season; planted in Minnesota, it lost over 4 per cent. The Minn. 851 lost no protein when grown in Aroostook, although the western grown crop experienced a slight reduction.

These curiously varying results seem to admit but one safe conclusion, viz.: That merely temporary or extremely local conditions of season and soil may obscure or counterbalance a tendency the existence of which can be fully established only by years of careful experimentation. It is evident that no collection of data like that given on page 113, in which wheats of one variety are compared with those of another, can cast any certain light upon the subject, and the only fair comparisons now available are those given on pp. 117 and 119. The general trend of these results, contradictory though they are, is in favor of the northwestern grown wheats. These have been found to contain on the average, in the water-free grain, 15.28 per cent of protein; while the Aroostook county wheats, grown from the same seed, contain 14.27 per cent of protein; a difference in favor of the former of 1.01 per cent.

Milling Experiments.

In conversation with the millers while obtaining the samples of flour described earlier in this bulletin, it was learned that they had very little notion as to the amount of wheat they used to make a barrel of flour. In order to study the losses in Maine milling, two milling experiments were made at the Washburn mill. This mill and the services of the miller were kindly placed at our disposal by its owner, Mr. T. H. Phair of Presque Isle. The mill is a small one (20 barrels capacity), and at the time of the experiment newly erected, the miller had had very limited experience, and the wheats milled were hard wheats grown in the Northwest. For these reasons the test was not a fair measure of the work the mill can do, but it probably fairly represents the quality of flour and closeness of milling that was in practice there in the fall of 1900. With the erection of the new mill at Houlton and the employment of a skilled practical miller, the owners, E. Merritt & Sons, were sure they were doing work which would compare favorably with that of small mills in any part of the country. They kindly placed their mill and their miller at the service of the Station and five additional tests with native grown and northwestern grown wheat of several varieties were made. The "runs" were quite short and the milling was not as close as doubtless would have been the case if the time of the "runs" had been days instead of one or two hours. The baking tests were made for us by Mr. Foster, the expert of the Consolidated Milling Company of Minneapolis. The detailed statements of the milling experiments and the baking tests follow, together with a discussion of the results.

MILLING EXPERIMENT NO. I.

At Washburn. Wellman's Fife wheat from the Minnesota Experiment Station. The wheat used in the experiment weighed 1699 pounds. The results of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT WASHBURN, MAINE, FROM MILLING ONE HUNDRED POUNDS OF MINNESOTA GROWN WELLMAN'S FIFE WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6348	Wheat	100.0	2.06	100.0
6349	First grade flour	48.0	.88	42.3
6350	Second grade flour	8.6	.17	8.2
	Total flour	56.6	1.05	50.5
6351	Middlings	22.9	.52	25.0
6352	Bran	20.5	.51	24.5
	Total offals	43.4	1.03	49.5
	Total products	100.0	2.08	100.0

COMPOSITION OF MINNESOTA GROWN WELLMAN'S FIFE WHEAT AND MILLING PRODUCTS OBTAINED AT WASHBURN, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO THE WATER FREE BASIS.

Laboratory number.	Wheat and Its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	In Fresh Substance.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
6348	Wheat	12.80	2.06	11.74	2.53	2.46	68.35	2.12	3.956
6349	First grade flour	12.91	1.84	10.49	.96	.36	74.85	.43	3.864
6350	Second grade flour	12.65	1.92	10.94	1.22	.35	74.29	.55	3.875
6351	Middlings	11.98	2.29	13.05	3.42	2.54	66.71	2.30	4.003
6352	Bran	10.40	2.44	13.91	4.92	8.05	56.77	5.95	4.081
	In Dry Matter.								
6348	Wheat	......	2.36	13.46	2.92	2.82	78.37	2.43	4.535
6349	First grade flour	......	2.11	12.05	1.10	.41	85.95	.49	4.435
6350	Second grade flour	......	2.20	12.53	1.40	.40	85.04	.63	4.436
6351	Middlings	......	2.60	14.82	3.89	2.89	75.79	2.61	4.547
6352	Bran	......	2.72	15.55	5.47	2.98	69.36	6.64	4.535

MILLING EXPERIMENT NO. 2.

At Washburn. Haynes Blue Stem wheat from the Minnesota Experiment Station. The wheat used in this experiment weighed 1699 pounds. The results of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT WASHBURN, MAINE, FROM MILLING ONE HUNDRED POUNDS OF MINNESOTA GROWN HAYNES BLUE STEM WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6355	Wheat	100.0	1.86	100.0
6356	First grade flour	49.5	.81	43.3
6357	Second grade flour	8.7	.15	80.0
	Total flour	58.2	.96	51.3
6358	Middlings	20.6	.43	23.0
6359	Bran	21.2	.48	25.7
	Total offal	41.8	.91	48.7
	Total products	100.0	1.87	100.0

COMPOSITION OF MINNESOTA GROWN HAYNES BLUE STEM WHEAT AND MILLING PRODUCTS OBTAINED AT WASHBURN, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO THE WATER-FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	In fresh substance.								
6355	Wheat	12.48	1.86	10.60	2.30	2.42	70.36	1.84	3.909
6356	First grade flour	13.57	1.64	9.35	1.09	.27	75.28	.44	3.806
6357	Second grade flour	13.37	1.74	9.92	1.38	.24	74.64	.45	3.845
6358	Middlings	13.18	2.11	12.03	3.62	2.56	66.56	2.05	3.967
6359	Bran	9.96	2.28	13.00	5.07	8.69	58.34	4.94	4.135
	In dry matter.								
6355	Wheat	.....	2.13	12.11	2.63	2.76	80.40	2.10	4.462
5356	First grade flour	.....	1.90	10.83	1.26	.31	87.09	.51	4.402
6357	Second grade flour	.....	2.01	11.45	1.59	.28	86.16	.52	4.438
6358	Middlings	.....	2.43	13.85	4.15	2.95	76.69	2.36	4.569
6359	Bran	...	2.53	14.43	5.63	9.64	64.80	5.50	4.592

MILLING EXPERIMENT NO. 3.

At Houlton. Fife wheat grown in Maine in 1901, the progeny of seed brought from the Northwest in 1896. The wheat used in the experiment weighed 1619 pounds. The results of the milling test, calculated for 100 pounds of wheat, and the analysis of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT HOULTON, MAINE, FROM MILLING ONE HUNDRED POUNDS OF MAINE GROWN FIFE WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and Its Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6607	Wheat	100.0	1.87	100.0
6608	Patent flour	55.8	.86	47.2
6609	Second grade flour	15.0	.28	15.4
	Total flour	70.8	1.14	62.6
6610	Middlings	15.4	.39	21.4
6611	Bran	13.8	.29	16.0
	Total offals	29.2	.68	37.4
	Total products	100.0	1.82	100.0

COMPOSITION OF MAINE GROWN FIFE WHEAT AND MILLING PRODUCTS OBTAINED AT HOULTON, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO THE WATER-FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	In Fresh Substance.								
6607	Wheat	11.48	1.87	10.66	2.34	1.96	71.64	1.92	3.886
6608	Patent flour	13.62	1.53	8.72	1.09	.16	75.97	.44	3.723
6609	Second grade flour	12.70	1.83	10.43	2.15	.37	73.30	1.05	3.824
6610	Shorts	10.10	2.49	14.20	5.71	4.86	61.19	3.94	4.118
6611	Bran	10.27	2.11	12.03	4.72	9.37	57.64	5.97	4.041
	In Dry Matter.								
6607	Wheat	....	2.11	12.04	2.64	2.21	80.94	2.17	4.390
6608	Patent flour	......	1.77	10.10	1.26	.19	87.94	.51	4.310
6609	Second grade flour	....	2.10	11.95	2.46	.42	83.97	1.20	4.380
6610	Shorts	.....	2.77	15.80	6.35	5.41	68.06	4.38	4.581
6611	Bran	.....	2.35	13.41	5.26	10.44	64.24	6.65	4.504

MILLING EXPERIMENT NO. 4.

At Houlton. White Russian wheat that has been grown in Aroostook county for many years. The wheat used in this experiment weighed 840 pounds. The result of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT HOULTON, MAINE, FROM MILLING ONE HUNDRED POUNDS OF MAINE GROWN WHITE RUSSIAN WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6612	Wheat	100.0	1.85	100.0
6613	Patent flour	54.0	.82	44.3
6614	Second grade flour	16.2	.29	15.7
	Total flour	70.2	1.11	60.0
6615	Middlings	12.6	.34	18.4
6616	Bran	17.2	.40	21.6
	Total offals	29.8	.74	40.0
	Total products	100.0	1.85	100.0

COMPOSITION OF MAINE GROWN WHITE RUSSIAN WHEAT AND MILLING PRODUCTS OBTAINED AT HOULTON, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO WATER-FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	In fresh substance.								
6612	Wheat	11.82	1.85	10.54	2.18	1.92	71.90	1.64	3.852
6613	Patent flour	14.84	1.51	8.61	.79	.24	75.20	.32	3.660
6614	Second grade flour	15.20	1.77	10.09	.63	.39	72.98	.71	3.639
6615	Shorts	10.79	2.65	15.10	5.59	5.00	60.07	3.45	4.149
6616	Bran	11.38	2.31	13.17	3.92	8.23	58.22	5.08	4.015
	In dry matter.								
6612	Wheat	......	2.10	11.95	2.47	2.18	81.54	1.86	4.368
6613	Patent flour	.....	1.77	10.11	.93	.28	88.30	.38	4.298
6614	Second grade flour	......	2.09	11.96	.74	.46	86.06	.84	4.291
6615	Shorts	....	2.97	16.93	6.27	5.60	67.33	3.87	4.651
6616	Bran	.....	2.61	14.86	4.42	9.29	65.70	5.73	4.531

MILLING EXPERIMENT NO. 5.

At Houlton. Maine grown Blue Stem wheat, the progeny of the wheat (No. 6622) used in milling experiment No. 6. The wheat used in the experiment weighed 837 pounds. The results of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT HOULTON, MAINE, FROM MILLING ONE HUNDRED POUNDS OF MAINE GROWN BLUE STEM WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratoty number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6617	Wheat	100.0	1.93	100.0
6618	Patent flour	56.3	.98	50.5
6619	Second grade flour	16.1	.31	16.0
	Total flour	72.4	1.29	66.5
6620	Middlings	14.4	.35	18.0
6621	Bran	13.2	.30	15.5
	Total offals	27.6	.65	33.5
	Total products	100.0	1.94	100.0

COMPOSITION OF MAINE GROWN BLUE STEM WHEAT AND MILLING PRODUCTS OBTAINED AT HOULTON, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO THE WATER-FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
	In fresh substance.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
6617	Wheat	13.58	1.89	11.01	2.14	2.14	69.53	1.60	3.823
6618	Patent flour	13.57	1.75	9.97	1.21	.25	74.47	.53	3.743
6619	Second grade flour	13.68	1.95	11.11	.51	.42	73.39	.89	3.706
6620	Shorts	13.45	2.47	14.08	1.28	5.09	62.55	3.55	3.664
6621	Bran	13.23	2.27	12.94	1.79	10.56	55.88	5.60	3.815
	In dry matter.								
6617	Wheat	....	2.18	12.76	2.48	2.48	80.43	1.85	5.003
6618	Patent flour	......	2.02	11.53	1.40	.29	86.17	.61	4.321
6619	Second grade flour	......	2.26	12.90	.58	.49	85.01	1.02	4.298
6620	Shorts	.... .	2.85	16.27	1.48	5.88	72.27	4.10	4.234
6621	Bran	.....	2.62	14.92	2.06	12.17	64.40	6.45	4.397

MILLING EXPERIMENT NO. 6.

At Houlton. Blue Stem wheat grown in the Northwest and imported by E. Merritt & Sons in 1901. This wheat is the parent of that (No. 6617) used in milling experiment No. 5. The wheat used in the experiment weighed 898 pounds. The result of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT HOULTON, MAINE, FROM MILLING ONE HUNDRED POUNDS OF NORTHWESTERN GROWN BLUE STEM WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6622	Wheat	100.0	2.55	100.0
6623	Patent flour	57.5	1.31	52.4
6624	Second grade flour	15.3	.39	15.6
	Total flour	72.8	1.70	68.0
6625	Middlings	13.1	.38	15.2
6626	Bran	14.1	.42	16.8
	Total offals	27.2	.80	32.0
	Total products	100.0	2.50	100.0

COMPOSITION OF NORTHWESTERN GROWN BLUE STEM WHEAT AND MILLING PRODUCTS OBTAINED AT HOULTON, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO THE WATER FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	Calories.
	In fresh substance.								
6622	Wheat	10.89	2.55	14.53	2.11	2.17	68.43	1.87	3.936
6623	Patent flour	12.19	2.27	12.94	1.04	.19	73.12	.52	3.831
6624	Second grade flour	12.44	2.53	14.43	2.03	.45	69.65	1.00	3.886
6625	Shorts	10.34	2.91	16.59	5.17	5.04	58.79	4.07	4.083
6626	Bran	8.51	2.93	16.70	4.00	9.29	55.51	5.99	4.075
	In dry matter.								
6622	Wheat	.....	2.86	16.30	2.37	2.43	76.80	2.10	4.417
6623	Patent flour	......	2.59	14.74	1.18	.22	83.27	.59	4.363
6624	Second grade flour	......	2.89	16.48	2.32	.51	79.55	1.14	4.438
6625	Shorts	......	3.24	18.49	5.77	5.62	65.58	4.54	4.554
6626	Bran	.....	3.20	18.25	4.37	10.15	60.68	6.55	4.454

MILLING EXPERIMENT NO. 7.

At Houlton. Northwestern grown No. 2 wheat imported by E. Merritt & Sons in 1902. The wheat used in the experiment weighed 804 pounds. The results of the milling test, calculated for 100 pounds of wheat, and the analyses of the wheat and the milling products, are given in the tables which follow.

PRODUCTS OBTAINED AT HOULTON, MAINE, FROM MILLING ONE HUNDRED POUNDS OF NORTHWESTERN GROWN NUMBER TWO WHEAT AND THE DISTRIBUTION OF NITROGEN THEREIN.

Laboratory number.	Wheat and its Milling Products.		Distribution of Nitrogen.	
	Kind.	Amount.	By weight.	By per cent.
		Pounds.	Pounds.	Per cent.
6627	Wheat	100.0	2.29	100.0
6628	Patent flour	54.1	1.10	47.6
6629	Second grade flour	14.3	.33	14.3
	Total flour	68.4	1.43	61.9
6630	Middlings	11.2	.34	14.7
6631	Bran	20.4	.54	23.4
	Total offals	31.6	.88	38.1
	Total products	100.00	2.31	100.0

COMPOSITION OF NORTHWESTERN GROWN NUMBER TWO WHEAT AND MILLING PRODUCTS OBTAINED AT HOULTON, MAINE, CALCULATED TO WATER CONTENT AT TIME OF MILLING AND TO WATER-FREE BASIS.

Laboratory number.	Wheat and its Milling Products.	Water.	Nitrogen.	Protein (Nx5.7).	Fat.	Crude fiber.	N-free extract.	Ash.	Heat of combustion per gram.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories.
	In fresh substance.								
6627	Wheat	11.39	2.29	13.05	2.32	2.35	68.91	1.98	3.823
6628	Patent flour	12.13	2.05	11.69	1.12	.18	74.52	.36	3.812
6629	Second grade flour	12.14	2.35	13.40	2.30	.48	70.48	1.20	3.831
6630	Shorts	10.22	3.05	17.39	5.72	4.79	57.72	4.16	4.112
6631	Bran	8.31	2.67	15.22	4.48	8.48	58.00	5.51	4.109
	In dry matter.								
6627	Wheat	......	2.58	14.73	2.62	2.65	77.77	2.23	4.315
6628	Patent flour	......	2.33	13.30	1.27	.20	84.82	.41	4.339
6629	Second grade flour	......	2.68	15.25	2.62	.55	80.22	1.36	4.360
6630	Shorts	....	3.40	19.37	6.37	5.34	64.29	4.63	4.580
6631	Bran	......	2.91	16.60	4.89	9.25	63.25	6.01	4.482

In the summary table which follows there are shown the average amounts of flour and offals obtained in these tests from 100 pounds of wheat, together with the distribution of the nitrogen in the same.

To these tests has been added one made by Professor Snyder of the Minnesota Experiment Station, and reported in Bul. 101, Office of Experiment Stations, U. S. Dept. of Agriculture, p. 7. As originally given the distribution of nitrogen by per cent was obtained by using the nitrogen of the wheat as the base. The figures are here changed so as to use the total nitrogen of the products as the base. The wheat employed in this test was a hard spring variety, very similar to those used in the trials at Washburn and the two last experiments at Houlton. The results given in the second column are calculated from the amount and nitrogen content of the products in question.

SUMMARY OF MILLING EXPERIMENTS—AVERAGE WEIGHT OF FLOUR AND OFFALS OBTAINED AT WASHBURN AND HOULTON AND IN ONE MILLING EXPERIMENT IN MINNEAPOLIS AND THE DISTRIBUTION OF NITROGEN THEREIN.

Flour and Offals.		Distribution of Nitrogen.	
Kind.	Amount.	By weight.	By per cent.
Average of two experiments at Washburn with Minnesota grown wheat.	Pounds.	Pounds.	Per cent.
Flour	57.4	1.01	51.0
Middlings and bran	42.6	.97	49.0
Total	100.0	1.98	100.0
Average of three experiments at Houlton with Maine grown wheat.			
Flour	71.1	1.18	63.0
Middlings and bran	28.9	.69	37.0
Total	100.0	1.87	100.0
Average of two experiments at Houlton with northwestern grown wheat.			
Flour	70.6	1.57	65.0
Middlings and bran	29.4	.84	35.0
Total	100.0	2.41	100.0
One experiment at Minneapolis with Minnesota wheat.			
Flour	73.1	1.56	69.6
Middlings and bran	26.9	.68	30.4
Total	100.0	2.24	100.0

The weight of flour produced for 100 pounds of wheat would naturally vary within quite wide limits because of differences in different varieties of wheat, the character of the season and numerous other causes. As the result of one milling test, given in the table, a Minnesota miller obtained 73.1 pounds of flour from 100 pounds of wheat. According to Wiley* a large milling firm in the Northwest obtained 75.87 pounds total flour from 100 pounds of good quality spring wheat. Wiley also says: "From one of the largest mills in Minnesota I have received the following; When an exceptionally high grade of flour is formed, the quantity produced is usually from 12 to 20 per cent of the total weight of the wheat. Of the medium or straight flours, which form the greatest part of the product, the quantity is about 50 per cent. Very low grade flours form from 2 to 10 per cent. In general about 75 per cent of the weight of the wheat is obtained as merchantable flour of some kind, of which from 60 to 70 per cent is high grade or straight flour. About 24 per cent of the weight of the wheat is obtained as feeding stuffs, and about 1 per cent. of the weight disappears as waste during the process of manufacture. The miller above referred to states that in producing a certain grade of straight flour he has obtained as high as 72.2 per cent of straight flour and 8 per cent of low grade."

It appears from the above that with careful milling it is possible to obtain from 72 to 75 per cent of the wheat in the form of flour.

In the milling test at Washburn, in which prime Minnesota grown wheat was used, about 57 per cent of the wheat was recovered as flour; in other words, the yield of flour should have been at least one-fourth higher. It is true that the by-products cannot be considered as wholly waste, since they are used as food for stock. But since herbivorous animals can utilize coarser and cheaper foods than those required by man, the practice of leaving so large a proportion of flour in the feeds is to be deprecated.

There is also another fact that should not be overlooked. It is probable that this loss is due chiefly to the large amount of the endosperm that adheres to the seed coating and is lost in the bran and middlings. The outer portion of the endosperm is richer in

* U. S. Dept. Agr., Bul. 13, Part 9, p. 1232.

protein than the softer inner parts, which are the first to be reduced. The distribution of nitrogen clearly indicates this. In the two experiments at Washburn, the flour which made up 57 per cent of the wheat carried only 51 per cent of the nitrogen, while in the wheat milled at Minneapolis the 73 per cent of flour carried nearly 70 per cent of the total nitrogen. That is to say an increase of 28 per cent in the yield of flour added 37 per cent to the nitrogen (protein) in the flour. For this reason the flour which is lost is worth much more than an equal weight of the average product, and its recovery would not only increase the amount of flour by so much, but would at the same time materially improve its quality. The loss is not only in the weight of flour produced but also in the protein content. Close milling is imperative from the standpoint of economy for both these reasons.

The milling experiments at Houlton gave much better yields of flour, ranging from 70.2 per cent to 72.4 per cent in the native wheats, 72.8 per cent in the No. 1 northwestern wheat and 68.4 per cent in the No. 2 northwestern wheat. The middlings from these five tests were submitted to the expert miller of the Consolidated Milling Company who found them to contain the following percentages that could be converted into flour.

PERCENTAGE AND WEIGHTS OF FLOUR LEFT IN MIDDLINGS IN MILLING EXPERIMENT AT HOULTON.

Experiment Number.	Flour contained in Middlings.	
	Per cent.	Pounds lost in milling 100 pounds of wheat.
3	14	2.2
4	7	.9
5	17	2.5
6	15	2.0
7	12	1.3

The showing in these milling experiments is very satisfactory. The losses of 9 to 2.5 per cent in the flour would doubtless have been considerably lessened if the "runs" had been longer. It is impossible to perfectly adjust a mill to different kinds of wheat in the length of time devoted to these experiments. While this mill is newer than the others in the county, there is little reason for thinking that practically as good milling can not be done in the other and older mills. The importance of the miller cannot be overestimated. His skill, judgment and experience are of more moment than the stand. A good miller can do fair work with an unsatisfactory mill but a poor miller can only do unsatisfactory work, no matter how complete the mill.

Baking Tests of Flours From Milling Experiments.

The first patent flour from these seven milling experiments was sent to Mr. Foster who kindly made baking tests of them. At the same time several other flours were sent, some of which were specially procured for the purpose, while others had been sent to us for examination by the N. Y. Commission of Lunacy. There were no marks on the samples except the numbers, and Mr. Foster knew nothing of their history. His findings are, therefore, without possibility of personal bias.

DESCRIPTION OF SAMPLES SENT MR. FOSTER.

No. 6349. Patent flour from Milling Experiment No. 1 at Washburn. Made from Minnesota grown Wellman's Fife wheat. 100 pounds of wheat yielded 48 pounds of this flour.

No. 6356. First patent flour from Milling Experiment No. 2 at Washburn. Made from Minnesota grown Haynes Blue Stem wheat. 100 pounds of wheat yielded 49½ pounds of this flour.

No. 6382. Gold Medal first grade flour. Washburn-Crosby Co. Furnished by Dr. Dewey of the Long Island (N. Y.) State Hospital for the Insane.

No. 6383. Best straight, second grade flour. Washburn-Crosby Co. From same source as 6382.

No. 6384. Staten Island Best. First grade flour. Hecker-Jones-Jewell Milling Co. From same source as No. 6382.

No. 6385. Staten Island Extra. Second grade flour. Hecker-Jones-Jewell Milling Co. From same source as No. 6382.

No. 6386. Cataract Best Patent. First grade flour. Cataract City Milling Co., Niagara, N. Y. From same source as No. 6382.

No. 6605. Kirks Cyclone Patent Flour. Selected hard wheat. Kansas City.

No. 6608. Patent flour from Milling Experiment No. 3 at Houlton. Made from Maine grown fife wheat. 100 pounds of wheat yielded 55.8 pounds of this flour.

No. 6613. Patent flour from Milling Experiment No. 4 at Houlton. Made from Maine grown White Russian wheat. 100 pounds of wheat yielded 54 pounds of this flour.

No. 6618. Patent flour from Milling Experiment No. 5 at Houlton. Made from Maine grown Blue Stem wheat. 100 pounds of wheat yielded 56.3 pounds of this flour.

No. 6623. Patent flour from Milling Experiment No. 6 at Houlton. Made from northwestern grown Blue Stem wheat. 100 pounds of wheat yielded 57.5 pounds of this flour.

No. 6628. Patent flour from Milling Experiment No. 7 at Houlton. Made from northwestern grown No. 2 wheat. 100 pounds of wheat yielded 54.1 pounds of this flour.

The results of the baking test of these flours are given in the table which follows. The terms used are explained on page 150.

BAKING TEST OF FLOURS FROM MILLING EXPERIMENTS AND A FEW MISCELLANEOUS FLOURS FOR COMPARISON.

Laboratory number.	Appearance of Flour.	Dough. Viscosity.	Dough. Color.	Bread. Largest circumference of loaf.	Bread. Least circumference of loaf.	Bread. Weight.	Bread. Color.	Moist gluten.
				Inches.	Inches.	Ounces.		Per cent.
6349	Coarse	Very short..	1xw	27.75	24.00	18.50	.....	2.29
6356	Coarse............	Very short ..	1w	27.50	24.00	18.25	......	28.12
6382	(*)	(*)	1	28.60	25.00	18.75	......	35.63
6383	Even clears or bakers........ ...	....	3.5	27.45	24.10	18.75	....	35.63
6384	Uneven......	Very short..	1	27.75	24.00	18.50	......	37.92
6385	Even clears or bakers............	....	3.5	27.60	24.25	18.25	....	39.58
6386	(*)	. ...	1-	27.75	24.00	18.00	....	37.71
6605	Short gray	....	1.5	25.60	21.50	18.75	1.5	30.00
6608	Soft.................	....	1	24.25	19.75	19.00	1w	25.21
6613	Soft.	....	1w	22.90	18.50	19.00	1xw	25.00
6618	High quality.	....	1+	24.75	21.00	19.75	1xy	29.16
6623	Dark....	....	2	26.75	23.10	19 00	2	37.79
6628	High quality.......	....	1+	26.00	22.00	19.00	1+	33.12
	Standard	Standard....	1	29.25	26.25	18.25	1	38.75

(*) Compares favorably with standard. No. 6382 the best all around flour.

The flours from the two milling experiments at Washburn are too coarsely ground. The weight of the loaf is good, but the percentage of wet gluten and the size of the loaf are much less than would have been the case if the wheat (these are Minnesota grown, hard wheats) had been milled at Minneapolis. The criticisms on these flours are due to the milling and not to the wheat from which they are made. The low gluten content explains the smallness of the loaves and this is in turn due to the small amount of flour made from the wheat which left a large part of the richest gluten-bearing portions in the offals.

Although made by another company, the Minneapolis expert readily recognizes a Minneapolis milled flour in 6382 which accords quite closely to his standard of a hard flour. The second grade flours, Nos. 6383 and 6385, are equally recognized and so classed.

The Staten Island first quality flour (No. 6384) and the Cataract best patent (No. 6386), while agreeing with the standard in color and gluten, make loaves very much like the patents milled at Washburn (Nos. 6349 and 6356). The three flours from Maine grown wheats milled at Houlton (Nos. 6608, 6613 and 6618) are low in gluten and make small loaves which weigh considerably more than the standard. For example, 100 pounds of flour of No. 6618 would make a twelfth greater weight of bread than 100 pounds of the standard, but this bread would be much closer in texture and on that account less pleasing to the eye and less open to the action of digestive juices when eaten. Flours Nos. 6608 and 6613 were ground too fine for the Minneapolis standard, while Nos. 6618 and 6628 were just right. The flours from the two Minnesota wheats (Nos. 6623 and 6628) are high in gluten and make good loaves. Mr. Foster attributed the dark color of No. 6623 to the dryness of the wheat at the time of milling, which caused particles of the bran to appear in the early breaks and which could not be subsequently eliminated.

The Kansas flour (No. 6605) comes but little nearer the Minneapolis standard than those milled in Maine from Maine grown wheat. The arbitrary nature of the standard and the fact that it is applicable only to the hard wheats of the Northwest, thus becomes very evident. These wheats are so abundant that they largely regulate the ideals of the flour market and to successfully compete flour must more or less correspond to the standard. Still there is plenty of room in such a district as Aroostook county to develop the growing and the milling of wheat along its own lines. The experiments at Houlton show that most of the flour can be obtained from the wheat in our own mills. The appearance of flours Nos. 6618 and 6628 show that we can make a flour equal in that respect (and 6618 was from a Maine grown wheat) to the western flour. There is little question but that by careful breeding from wheat now being grown in Maine it would be possible to develop a strain equal for our conditions to some of the improved strains of other sections. The improvement must come, if it comes at all, by careful attention to the details of wheat breeding and wheat milling.

The Improvement of Wheat.

There are two comparatively easy ways in which trials can be made to improve the wheat grown in Aroostook county. The first, and one which most naturally suggests itself, is the introduction of new seed wheat from other localities; the other is the improvement by selection from wheat now grown in the county. The former plan is that tried by the Station and recorded in the preceding pages. Because of the great difference in climate between Maine and the Northwest, the varieties introduced speedily changed their character so that at the end of a single season they had become relatively much richer in starch. To the writers it seems that there is greater hope in the improvement of the quality of Aroostook county wheat by careful selection from wheat already grown in the county than by the introduction of seed from other localities. Not only are there several varieties of wheat now grown in Aroostook county, but these varieties differ among themselves in earliness, productiveness and capacity for making good flour. Furthermore, there will be found to be great variation in individual plants of wheat from the same lot. For example, careful examination of any field of wheat will show that occasional plants mature earlier than other plants; that some plants are taller and stockier than other plants; and that some plants will carry more and heavier kernels of wheat than others. This variability of individual plants can be used as a basis for improvement of wheat by selection.

The Minnesota Experiment Station has given much study to the methods of breeding, selecting and improvement of wheats,* and the following suggestions are based upon the results of their studies.

The first step in breeding would be to select from an Aroostook grown wheat of a good variety about 1000 of the hardest, heaviest kernels. These should be planted in carefully prepared ground, singly, in hills four inches apart each way. For convenience of working, these hills should be planted in beds not more than three feet wide. The soil should be kept free from weeds during the growing season and care should be taken that if by chance two seeds have been dropped in the same place that only

* Bulletin 62, Minnesota Experiment Station.

one plant be allowed to grow. As the two outer rows will have had greater exposure to sunlight and air than the inner ones, these plants should be cut off with shears and thrown away, just before harvesting. At the time of harvest 100 of what seem to be the best plants should be selected and the spikes cut off without any straw. These can be conveniently stored in a paper bag. The remainder of the plot can be harvested and stored in another paper bag in the same way. The seeds from these selected best heads should be sown the following season in another seed bed by themselves. The seeds from the about 900 plants which are harvested by themselves can, after being hand shelled, be picked over and 1000 seeds selected, planted and treated in the same way as in the preceding season.

While this seems laborious and a slow process, in the course of three or four years there will have been obtained several lots of seeds, sufficient to sow 1-20 of an acre each, which will give a sufficient crop to make a milling test of the wheat.

POTATO EXPERIMENTS IN 1903.

CHAS. D. WOODS.

In the season of 1903 five experiments upon the growing, harvesting, and storage of potatoes were undertaken as follows :—

Variety test for resistance to blight.

The effect of Bug Death vs. Paris green on health of vines.

The use of a ready prepared vs. quick lime for the preparation of Bordeaux mixture.

Early vs. late harvesting as affecting the amount of rot.

Storage in large bins vs. small bins, barrels and crates as affecting the development of rot in cellar.

The results of the first four experiments are here reported. The experiment on storage will be finished in April and reported as soon thereafter as practicable.

VARIETY TEST OF POTATOES FOR RESISTANCE TO BLIGHT.

Our observation and experience as well as that of practical growers had indicated a marked difference in different varieties as to their ability to withstand the attack of the fungus which blights the tops and later produces rot in the tubers. It was decided, therefore, to plant a few rows of 10 or 12 varieties, part of each to be sprayed with Bordeaux mixture and part of each to be unsprayed. After consulting some of the large growers in Aroostook county, varieties were selected and planted as follows :—

ARRANGEMENT OF PLOTS IN FIELD.

EAST SIDE OF FIELD.

1	Rose.	Three rows each. Paris green applied as spray to kill the potato bug. No treatment for blight.
2	Early Michigan.	
3	Hulett's Rust Proof.	
4	Mill's Mortgage Lifter.	
5	Green Mountain.	
6	New Queen.	
7	Polaris.	
8	Maggie Murphy.	
9	Irish Cobbler.	
10	Early Ohio.	
11	Gem of Aroostook.	
12	Bovee.	
13	Bovee.	Three rows each. Sprayed with Paris green for the potato bug and with Bordeaux mixture for blight.
14	Gem of Aroostook.	
15	Early Ohio.	
16	Irish Cobbler.	
17	Maggie Murphy.	
18	Polaris.	
19	New Queen.	
20	Green Mountain.	
21	Mill's Mortgage Lifter.	
22	Hulett's Rust Proof.	
23	Early Michigan.	
24	Rose.	

WEST SIDE OF FIELD.

The plot had an area of a little more than an acre. The land had been in grass for several years and for the preceding two seasons had been used as a run for growing chickens. The soil is a rather heavy, fairly uniform loam, with a clay subsoil. It was plowed about seven inches deep in the fall of 1902, and was worked several times in the spring of 1903 with the Clark double action cutaway harrow. Because of the unusual dryness of April and May the turf was not as well rotted and broken up as usual or desirable. The top, however, was thoroughly pulverized and would in ordinary seasons have proven a good seed bed. The seed was soaked in formaline solution for scab before cutting. About a bushel of each variety was used for seed. The piece was planted about May 12, 1903, six inches deep, with a Robbins potato planter in rows 32 inches apart and 12 inches in the row. A fertilizer carrying 3 per cent nitrogen, 7 per cent available phosphoric acid and 4 per cent potash was applied in the drill at the time of planting, at the rate of 1,000 pounds to the acre. The stand was imperfect but differed greatly with the different varieties, ranging from almost no stand with the New Queen to 2-3 stand with the Irish Cobbler and the Green Mountain. The stand with the different varieties as measured by the number of feet to obtain 55 plants (hills) at time of digging was as follows:—

STAND OF POTATOES BASED ON NUMBER OF FEET OF ROW REQUIRED FOR 55 HILLS AT TIME OF DIGGING.

Variety.	Stand. Per cent of cuttings that produced plants.
Rose	22
Early Michigan	46
Hulett's Rust Proof	37
Mills' Mortgage Lifter	20
Green Mountain	61
New Queen	1
Polaris	55
Maggie Murphy	50
Irish Cobbler	65
Early Ohio	57
Gem of Aroostook	28
Bovee	55

This very poor stand was occasioned largely by the exceptionally dry May and June. In land with proper moisture content the number of cuttings that grew would have been much greater. The differences in the way the different varieties formed plants may have been due to the vitality of the varieties themselves, or to the way in which these particular lots of seed were grown and stored, or to both causes.

The potatoes were cutivated and kept fairly free from weeds. Flat culture was practiced with the result that, owing to the compact nature of the soil, too many tubers were too near the surface and were more or less sunburned.

The east half of the field was sprayed with Paris green at the rate of 1-2 pound to the acre on the following dates: June 19, June 25, July 3, July 13, July 27, August 10. The west half was sprayed six times with Bordeaux mixture and one-half pound of Paris green, one barrel to the acre, on the above dates, and twice with Bordeaux mixture alone on August 21 and August 26.

The experiment was under careful observation during the whole of the growing season. The following extracts from the very full notes which were taken contain the most important observations. The potatoes were all past bloom except as indicated in the notes.

ROSE.

Date	Unsprayed.*	Date	Sprayed.*
Aug. 21.	Tops dark green. No blight.	*Aug. 21.*	Plants small, good color. No blight.
Aug. 26.	Some blight on most plants. Considerable blight on a few plants.	*Aug. 26.*	Quite a little blight. More on some plants than others.
Sept. 1.	Leaves on many plants one-third dead.	*Sept. 1.*	Leaves on many plants one-fourth dead.
Sept. 8.	Leaves all dead on some plants, one-half dead on others and an occasional plant still quite green.	*Sept. 8.*	On most plants leaves half dead. Stalks still good color.
Sept. 10.	Tops as on Sept. 8. Harvested 55 hills. There are apparently two varieties. The dead vines have light rose colored tubers and look like Early Rose. The vines that are still green have much redder and thicker potatoes which are inclined to grow with prongs.	*Sept. 10.*	Vines as Sept. 8. Harvested 55 hills. Mixed same as the unsprayed.
Oct. 7.	Tops all dead. Harvested 55 hills.	*Oct. 7.*	Tops all dead. Harvested 55 hills.

EARLY MICHIGAN.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	A very few spotted leaves on 3 or 4 plants. Does not look like blight. Vines good color.	*Aug. 21.*	No blight. Vines small to medium, good color.
Aug. 26.	Considerable blight.	*Aug. 26.*	Quite a little blight.
Sept. 1.	Leaves one-half dead with blight.	*Sept. 1.*	One-half of leaves dead with blight.
Sept. 8.	Vines are from three-fourths to entirely dead.	*Sept. 8.*	A few plants still vigorous. Others from three-fourths to entirely dead.
Sept. 10.	Vines as Sept. 8. Harvested 35 hills.	*Sept. 10.*	Vines as Sept. 8. Harvested 55 hills.
Oct. 7.	Vines dead. Harvested 55 hills.	*Oct. 7.*	Vines dead. Harvested 55 hills.

HULETT'S RUST PROOF.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	Strong vigorous vines. Excellent color. No blight.	*Aug. 21.*	Good vines. Dark in color. Mostly in bloom. No blight.
Aug. 26.	Vines making good growth. In bloom with many buds not open. No blight.	*Aug. 26.*	In full bloom, with still many buds to open. No blight.
Sept. 1.	Still in full bloom and more buds to open. Vines green and vigorous. An occasional spot that resembles blight.	*Sept. 1.*	Still in full bloom with some unopened buds. No blight.
Sept. 8.	Tops large and good color. A few buds to open, but for most part nearly through bloom. Very little sign of blight.	*Sept. 8.*	Still in full bloom. No signs of blight.
Sept. 10.	Harvested 7 hills. Tubers very unripe. No rot.	*Sept. 10.*	Too green to dig.
Sept. 15.	Blight beginning to appear.	*Sept. 15.*	No blight.
Sept. 19.	Vines going down with blight.	*Sept. 19.*	Very little blight.
Oct. 7.	Harvested 55 hills. Tubers still quite green and stems still green and standing. No rot.	*Oct. 7.*	Stems and a few leaves still green. Harvested 55 hills. Tubers quite green. No rot.

* By unsprayed rows are meant plots 1—12 to which Bordeaux mixture was not applied, and sprayed rows mean plots 13--24 which were sprayed seven times with Bordeaux mixture.

MILL'S MORTGAGE LIFTER.

Unsprayed.		Sprayed.	
Aug. 21.	Vines of fair color. No blight.	*Aug. 21.*	Vines healthy. No blight.
Aug. 26.	Some blight on nearly all plants.	*Aug. 26.*	Very little blight.
Sept. 1.	About half of leaves dead with blight.	*Sept. 1.*	About one-third of the leaves dead with blight.
Sept. 8.	Leaves nearly all dead. Stalks dying.	*Sept. 8.*	About one-third of the leaves more or less affected.
Sept. 10.	Tops as Sept. 8. Harvested 55 hills. Tubers unripe.	*Sept. 10.*	Too green to dig.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

GREEN MOUNTAIN.

Unsprayed.		Sprayed.	
Aug. 21.	Very vigorous vines. Possibly some blight.	*Aug. 21.*	Large, dark green vines. Some bloom. No blight.
Aug. 26.	A little blight on most all plants.	*Aug. 26.*	Still some bloom. Very little blight.
Sept. 8.	Leaves one-third dead with blight.	*Sept. 8.*	Very few diseased leaves.
Sept. 10.	Harvested 55 hills. Tubers unripe.	*Sept. 10.*	Too green to dig.
		Sept. 19.	About one-fourth of leaves still green. Stems green.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills. Stems still quite green.

NEW QUEEN.

Unsprayed.		Sprayed.	
Aug. 21.	Only a few plants. Vines small and a good many of the leaves dead from blight.	*Aug. 21.*	Very poor stand. Small vines. Good color for variety. No blight.
Aug. 26.	Leaves nearly all gone with blight. Stems still green.	*Aug. 26.*	About one-third of leaves dead with blight.
Sept. 1.	Leaves and smaller stems dead. Main stalks still green.	*Sept. 1.*	About one-half of leaves dead.
Sept. 8.	Stalks nearly all dead.	*Sept. 8.*	Leaves all dead.
Sept. 10.	Dug a few hills. Very poor yield. Small and mostly rotten.	*Sept. 10.*	Vines dead. Dug a half dozen hills. About half small and rotten.

POLARIS.

Unsprayed.		Spray d.	
Aug. 21.	Large vigorous vines of good color. Some bloom. Many leaves affected by blight.	*Aug. 21.*	More than half the plants in bloom. Strong, vigorous vines. No blight.
Aug. 26.	Some bloom. A good deal of blight.	*Aug. 26.*	Some blight. Still in bloom.
Sept. 1.	Leaves one-half dead.	*Sept. 1.*	East row not so good as other two. Very few dead leaves on two west rows. A few plants in bloom.
Sept. 8.	Leaves all dead. Stems dying.	*Sept. 8.*	Leaves about one-third dead. Stalks green and unaffected leaves of good color.
Sept. 10.	Harvested 55 hills.	*Sept. 10.*	Too green to dig.
		Sept. 19.	Vines dead.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

MAGGIE MURPHY.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	Quite a number of leaves affected with blight. Plants smaller than Polaris.	*Aug. 21.*	Vigorous plants of good color. Quite a number in bloom. No blight.
Aug. 26.	Blight had made considerable progress.	*Aug. 26.*	A little blight.
Sept. 1.	One-half of leaves dead.	*Sept. 1.*	More blight on west row than other two. East rows one-fifth dead.
Sept. 8.	Leaves all dead. Stems dying.	*Sept. 8.*	Leaves about one-third dead. Stalks green. Remaining leaves good color.
Sept. 10.	Harvested 55 hills.	*Sept. 10.*	Too green to dig.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

IRISH COBBLER.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	Plants not very large. Good color except one-third dead with blight.	*Aug. 21.*	Fairly large, dark green plants. No blight.
Aug. 26.	A good deal of blight.	*Aug. 26.*	Very little blight.
Sept. 1.	Leaves two-thirds dead.	*Sept. 1.*	Leaves one-fourth dead.
Sept. 8.	Leaves all dead and stalks nearly so.	*Sept. 8.*	Leaves one-half to two-thirds dead. Stems green.
Sept. 10.	Harvested 55 hills.	*Sept. 10.*	Stems and one-third to one-half of leaves still green. Harvested 55 hills quite unripe tubers.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

EARLY OHIO.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	Leaves ripening. Some turning from blight.	*Aug. 21.*	Pale color as if ripening Probably no blight.
Aug. 26.	Leaves half blackened. Stems still green. More blight than on any except Queen.	*Aug. 26.*	Leaves one-third dead with blight.
Sept. 1.	Leaves and stems dead.	*Sept. 1.*	Leaves mostly dead. Stems dying.
Sept. 8.	Harvested 55 hills.	*Sept. 8.*	Harvested 55 hills.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

GEM OF AROOSTOOK.

Date	Unsprayed.	Date	Sprayed.
Aug. 21.	Medium sized vines of good color. A few plants have some blight.	*Aug. 21.*	Healthy, dark green vines. Many in bloom. No blight.
Aug. 26.	A good deal of blight.	*Aug. 26.*	Very little blight.
Sept. 1.	Leaves mostly dead. Stems pale green.	*Sept. 1.*	Leaves one-fourth dead.
Sept. 8.	Leaves and stalks dead.	*Sept. 8.*	On some plants leaves all dead. On most plants leaves one-third to one-half dead. Stems green.
Sept. 10.	Harvested 55 hills.	*Sept. 10.*	Harvested 55 hills.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

BOVEE.

Unsprayed.		Sprayed.	
Aug. 21.	Vines small, good color. A few leaves blackened by blight.	*Aug. 21.*	Medium vine. Probably no blight.
Aug. 26.	A good deal of blight.	*Aug. 26.*	Some blight.
Sept. 1.	Leaves all dead. Stems yellowish green.	*Sept. 1.*	Leaves three-fourths dead. Stems dying.
Sept. 8.	Dead.	*Sept. 8.*	Dead.
Sept. 10.	Harvested 55 hills.	*Sept. 10.*	Harvested 55 hills.
Oct. 7.	Harvested 55 hills.	*Oct. 7.*	Harvested 55 hills.

YIELDS OF THE DIFFERENT VARIETIES FROM UNSPRAYED AND SPRAYED PLOTS.

The stand was poor and very uneven, as pointed out on page 141. For this reason the yield from a given area could not be taken as the measure and it was necessary to take the yield from a definite number of hills. This is obviously unfair, since with only half a stand, other things being equal, the yield should be more than half as much as would be obtained with a perfect stand. But as the best stand was only two-thirds of a full number of plants, this can be accepted as a more or less accurate measure of the comparative yields. At the distance apart the potatoes were planted there would be about 16,500 hills to the acre, and 55 hills would represent about 1-300 of an acre and this number of hills was therefore taken as the unit for comparison.

In order to compare the early and late digging upon the amount of rot, 55 hills of all varieties that were ripe or nearly ripe enough for digging, were harvested on September 8. A month later (October 7) 55 hills of all the varieties were harvested. The yields at time of digging are given in the table which follows. The Rose was made up of two varieties, one early and one late, and is omitted. The Queen is also omitted because of its poor stand (1 per cent).

YIELDS FROM FIFTY-FIVE HILLS OF TEN VARIETIES POTATOES AT TIME OF DIGGING.

Variety.	Date of harvesting.	Unsprayed.			Sprayed.		
		Good—lbs.	Rotten—lbs.	Small—lbs.	Good—lbs.	Rotten—lbs.	Small—lbs.
Early Michigan	Sept. 8	55	19	4	78	3	7
	Oct. 7	52	21	7	78	1	7
Average		54	20	6	78	2	7
Bovee	Sept. 8	45	33	6	60	12	8
	Oct. 7	59	28	5	57	11	7
Average		52	31	6	59	12	–
Early Ohio	Sept. 8	18	40	5	49	22	6
	Oct. 7	32	38	3	68	16	8
Average		25	39	4	59	19	7
Gem of Aroostook	Sept. 8	46	24	5	71	20	9
	Oct. 7	74	36	5	72	13	5
Average		60	30	5	72	17	7
Irish Cobbler	Sept. 8	95	20	9	111	12	5
	Oct. 7	66	13	7	107	6	6
Average		81	17	8	109	9	6
Hulett's Rust Proof	Sept. 8	....	....	....	....	....	....
	Oct. 7	81	1	7	99	....	6
Mill's Mortgage Lifter	Sept. 8	68	24	4	....	....	....
	Oct. 7	82	25	5	82	....	3
Average		75	25	5	82	....	3
Green Mountain	Sept. 8	68	37	4	....	....	....
	Oct. 7	84	18	5	153	11	4
Average		76	28	5	....	....	....
Polaris	Sept. 8	63	40	5	....	....	....
	Oct. 7	59	41	6	105	20	7
Average		61	41	5	....	....	....
Maggie Murphy	Sept. 8	55	28	2	....	....	....
	Oct. 7	51	45	2	87	14	2
Average		53	40	2	....	....	....
Average of 5 earlier varieties	Sept. 8	52	27	5	74	13	7
	Oct. 7	57	27	5	76	10	7
Average of 5 later varieties	Sept. 8	54	27	5	75	11	7
	Oct. 7	71	27	5	104	9	6

SUMMARY OF RESULTS.

There is a marked difference in the blight resistant properties of the different varieties. As a rule the earlier varieties were soonest attacked.

Because of the uneven stand only very general conclusions can be drawn from the yield.

With the exception of the Bovee, harvested October 7, the yield was sufficiently increased to more than equal the cost of spraying. On the average, the yield of the earlier varieties was one-third greater from the sprayed rows and in the case of the late varieties one-half greater.

The yield of merchantable potatoes from the early varieties was practically the same, whether dug in September or October. The yield of the late varieties, both sprayed and unsprayed, was a third greater at the later date.

It is planned to continue this experiment in the season of 1904.

Bug Death vs. Paris Green on Yield of Potatoes.

Pine Cone vs. Lump Lime for Bordeaux Mixture.

A four acre field on the college farm of fairly uniform soil was prepared and planted to potatoes. The soil is a medium heavy loam with heavy clay subsoil. The field had been in grass since 1898 until it was plowed in the fall of 1901. In 1902 it was quite heavily dressed with barn manure and planted to silage corn. About 600 pounds per acre of a high grade commercial fertilizer was applied in drill at time of planting the corn. The yield of silage corn was about 14 tons to the acre. Because of the backward season the ears were not filled when the corn was harvested. The land was plowed in the fall of 1902, thoroughly worked with the Clark double action cutaway harrow in the spring of 1903, and ten days before planting was cross plowed and reworked with the cutaway harrow, so that at time of planting an excellent seed bed had been prepared. May 14 and 15 the field was planted with Aroostook county grown Green Mountain potatoes, with the Robbins planter, about 6 inches deep, in rows 32 inches apart and 12 inches in the row. About 1000 pounds per acre of a fertilizer carrying 3 per cent nitrogen, 7 per cent available phosphoric acid and 4 per cent potash was applied in the row by the planter. During the season the field was kept cultivated and fairly free from weeds. The potatoes were all sprayed seven times, June 19, June 25, July 3, July 13, July 17, Aug. 13, and Aug. 19. Part of the field was sprayed with Bordeaux mixture and Bug Death at the rate of a barrel of Bordeaux and 25 pounds of Bug Death per acre to each application. A second part was sprayed with a barrel of Bordeaux mixture and a half pound of Paris green for each application, except that on July 13 the Paris green was used at the rate of a pound to the acre and no poisons were used Aug. 19. A third part of the field was sprayed the same as the second, except that the Bordeaux mixture was made by using 5 pounds of prepared Pine Cone Lime in place of that weight of lump lime. At harvesting each part of the field was dug by the Hoover potato digger. The potatoes were assorted in the field, put into sacks and taken to the barn and weighed. The crop for each part of the field was handled by itself. The stand was fairly uniform over the whole field and for the season a very good one, about 80 per cent of a perfect stand. The condensed field notes follow and in the tables beyond are given yields from the different parts of the field and the yield calculated per acre.

CONDENSED FIELD NOTES.

Bordeaux Mixture and Bug Death Part of Field.	Bordeaux Mixture and Paris Green Part of Field.	Bordeaux Mixture from Prepared Lime and Paris Green Part of Field.
Aug. 21. Vines beginning to turn yellow. Some blight. The east rows not so good color as the west rows. Very little indication of work of potato bugs.	*Aug. 21.* Vines better color than on Bug Death portion. Very little if any evidence of blight. Tops not damaged by bugs but eaten rather more than on Bug death part.	*Aug. 21.* The notes agree with those taken for the part treated with regular Bordeaux and Paris green.
Aug. 26. Whole of this part yellowing very badly. Quite a little blight.	*Aug. 26.* Vines not so yellow as where Bug Death was used but blight about the same	*Aug. 26.* Vines appear about the same as where regular Bordeaux was used.
Sept. 1. Leaves one-third dead and the rest yellowing.	*Sept. 1.* Leaves rather better than on Bug Death part.	*Sept. 1.* Leaves about the same as on regular Bordeaux part.
Sept. 8. Leaves three-fourths to wholly dead. Stems green but some quite pale.	*Sept. 8.* Leaves and stems about the same as on Bug Death part.	*Sept. 8.* Leaves and stems about the same as on other parts.

As the potatoes in the north end of the Bug Death part of the field were rotting considerably, and as there was a market for them for immediate use, it was decided to harvest the northern part of the field September 15. The remainder were harvested September 29, 1903. The table which follows shows the area of the plots, the yield per plot in pounds and the calculated yields per acre.

YIELD OF POTATOES FROM A FIELD TREATED WITH BORDEAUX MIXTURE AND BUG DEATH, REGULAR BORDEAUX AND PARIS GREEN AND BORDEAUX MIXTURE MADE FROM PINE CONE, PREPARED LIME AND PARIS GREEN.

Treatment of Tops.	Date of harvest.	Area of plot.	Yield of Potatoes. Total.	Merchantable.	Rotten.	Small.
Yields Per Plot in Pounds.		Acres.	Bush.	Pounds.	Pounds.	Pounds.
Bordeaux mixture and Bug Death	September 15.	.35	....	4,810	820	500
	September 29.	.35	... .	6,200	440	680
Total	....	.70	... ...	11,010	1,260	1,180
Regular Bordeaux and Paris green	September 15.	.37	....	5,400	500	440
	September 29.	.58	....	10,340	1,480	720
Total	....	.95	....	15,740	1,980	1,160
Bordeaux from prepared lime and Paris green	September 15	.43	....	6,870	810	400
	September 29.	.61	. .....	9,310	700	600
Total	....	1.04	....	16,180	1,510	1,030
Calculated Yields Per Acre in Bushels.				Bushels.	Bushels.	Bushels.
Bordeaux mixture and Bug Death	September 15.	.. ...	292	229	39	24
	September 29.	. ....	348	295	21	32
Average*	....	....	320	262	30	28
Regular Bordeaux and Paris green	September 15.	....	288	243	23	20
	September 29.	....	360	297	42	21
Average*	....	....	332	276	35	21
Bordeaux from prepared lime and Paris green	September 15	....	314	266	31	17
	September 29.	. ....	290	254	19	17
Average*	....	... ...	300	259	24	17

*The average was obtained from total yield of plots which takes into account the relative size of the parts harvested at different dates.

The yields were like nearly all potato yields in the season of 1903, good, ranging from about 230 to 300 bushels of merchantable potatoes. The yield was heavier on the southeast and northeast sections of the field than in the two other quarters. Whether this was due to a difference in the soil, is not clear. If the field had been harvested on one date, these differences would not have appeared, as the average yield from the three parts of the field differently sprayed ranged from 259 to 276 bushels of merchantable potatoes,—or no greater differences than must always be expected from unassignable causes. As in the experiments of last year* the use of 25 pounds of Bug Death

*See bulletin 87 of this Station.

per acre at each application effectually protected the potatoes from the ravages of the Colorado potato beetle. From its use, however, no larger crops were obtained than where Paris green was used as the poison. Desirable as it would be to find some method of controlling the potato beetle without the use of poison, there seems to be no immediate prospect of its attainment. As good crops, both as measured by total yield and starch content, can be obtained by the use of Paris green as an insecticide as by anything yet suggested as its substitute. Used in moderate amount, one-half to one pound per acre, in connection with Bordeaux mixture, there is no trustworthy evidence that the potato, as measured by growth of vines and yield of tubers and of dry matter, is injured by the use of Paris green.

The ready prepared lime was more convenient to use than the ordinary lump lime. The prepared lime does not carry as much lime per pound as pure lump lime. Since lump lime always carries more or less of impurities (sand, etc.) which are largely removed in the manufacture of the prepared lime, 5 pounds of the prepared lime is sufficient to use with 5 pounds of copper sulphate in the preparation of Bordeaux mixture. In this trial Bordeaux mixture made by the use of prepared lime was as effective against blight as that prepared in the usual way. The prepared lime costs more per pound than the lump lime but its use saves time, and hence may not in the end prove more expensive.

NOTES ON THE ANGORA GOAT.

CHAS. D. WOODS.

The Angora goat was first introduced into this country in 1849 and by the close of the century there were many thousands in the West and Southwest. At the beginning of the present century wide spread interest in these animals was aroused all over the country, and they are now to be found in every state of the Union. The original importations of Angora goats were from the province of Angora in Turkey. Because of heavy European demand for mohair, the Turkish growers, "without wise forethought, began the practice of crossing the Angora upon the common Kurd goat * * * * This fact coupled with the belief that proper care was not exercised in selecting the animals exported to this country and that they have been carelessly bred here has led some excellent judges of Angoras to express the belief that there are really no pure bred Angora goats in the United States." *

The two publications of the U. S. Department of Agriculture named in the notes at the foot of this page are enthusiastic over the possibilities of Angora goat farming, and the following paragraph on "The uses of Angora goats" is quoted from these bulletins.

"Investigations prove that the Angora goats are not only classed among the most useful of the domestic animals, and have been so classed for thousands of years, but their usefulness is manifested in a variety of ways. The fleece, called "mohair," furnishes some of the finest fabrics among ladies' goods and is used in various other manufacturies; their habit of browsing

NOTE.—Farmers' Bulletin 137 of the United States Department of Agriculture on the Angora Goat can be obtained free by applying to Congressmen, or to the Secretary of Agriculture, Washington, D. C.

* The Angora Goat, Bulletin 27, Bureau of Animal Industry, U. S. Dept. of Agriculture.

enables the farmer in a wooded locality to use them to help in subjugating the forest; their flesh is exceedingly delicate and nutritious; the milk, though not so abundant as with the milch breed of goats, is richer than cow's milk; their tanned skins, though inferior in quality to the skins of the common goat, are used for leather; their pelts make the neatest of rugs and robes; they are excellent pets for children; a few of them in a flock of sheep are a protection from wolves and dogs; their manure is noticeably helpful to the grass which follows them after they have cleaned away the underbrush."

The claims made for their browsing habits as a help to clearing wooded areas and particularly "sprout land" especially attracted the attention of this Station. Mr. Libbey of Burnham during 1900 and 1901 imported into Maine from Texas and New Mexico several hundred Angoras, from which number the Station purchased in 1901 six does and a "registered" buck, not akin to the does.

The buck bought by us has the Angora type and is probably at least fifteen-sixteenths Angora. The does are grade and apparently differ in their purity of breeding.

During the winter months the goats have been kept in a room in the sheep house with the run of a yard. In the summer they have been kept in woodland and in pasture growing up to bushes and in young woodland. In the barn the only feed has been hay, and no supplementary food was given when in pasture. This care was not sufficient in this case to successfully build up the flock. In the spring of 1902 five of the does dropped one kid each and in the spring of 1903 only two of the does produced offspring. The flock at the end of two years would thus have only doubled or increased from 7 to 14. The kids were vigorous when dropped and presented no difficulties in rearing, but at the end of 18 months they were not as large as their dams. One of the wethers was killed to test its flesh and one of the does died before it was a year old, so that we had the same number or 12 in the pasture during the seasons of 1902 and 1903. When fed on hay, the goats ate on an average 4 pounds per day. In the summer of 1901 the goats were put in a pasture with some bushes and weeds. The goats ate these in preference to the grasses.

The pasture was fenced with ordinary woven wire fencing, and the goats persisted in putting their heads through the meshes and were imprisoned by their V-shaped horns. The fence posts were braced at the end of each length of fencing, and the goats would walk up the braces and jump down on the other side of the fence. In our experience, the goats will climb any kind of a rail fence with angles, but will not jump over a fence they cannot climb. Because of the difficulties experienced in fencing, but little was learned the first of the season of their work in clearing up land.

The second season an acre of young woodland containing bushes and trees of mixed growth, from sprouts up to 6 or 7 inches in diameter, was inclosed with Elwood poultry fence (not poultry wire netting) 58 inches high. By taking care to have no braces on the inside of the fence and no spaces under it through which they could get their heads, this made a fence that would not only keep the goats in, but would also keep dogs out. In this inclosure, with a lean-to shed for them to run into in bad weather and at night, they demanded no care during the summer other than an occasional salting. In a pasture without water this would have to be provided, although they are small drinkers. They will stand low temperatures, but wet is not to their liking. With a protection open to them, there is no danger of their getting wet, as at the sound of the first sprinkling on the foliage they will all leave off feeding and make a break for shelter. In 1903 another half acre was added to this run for them. There was a quite thick growth of underbrush in the lot. The small underbrush of birch, maple, hazelbush, etc., has been cleaned up so that where there are no alders or evergreens the ground under the trees is as clean as though it had been burned over. Sweet fern they do not like very well, but they have cleaned all of the hardhack out of this piece. Ferns and brakes have been eaten to some extent. They have eaten the leaves and young sprigs of bushes in preference to grass. Birches two inches or more in diameter they have not injured, but they have stripped the bark from every maple. Even maple trees six inches in diameter have been thus killed. We have found them to be fond of the bark of apple trees, even eating the bark from old trees. The illustrations on page 154 show the appearance of the wood lot in the spring of 1902, while on page 155 are views from the same portion taken in the late summer of 1903.

TWO VIEWS SHOWING CONDITION OF OVERGROWN PASTURE IN JUNE, 1902. THIS LAND HAD NOT BEEN IN PASTURE FOR FIFTEEN YEARS.

TWO VIEWS OF THE PASTURE SHOWN ON THE OPPOSITE PAGE SHOWING THE EFFECT OF TWO SEASONS' PASTURAGE WITH ANGORA GOATS.

The fleeces averaged about three pounds each and sold for only a small advance above wool. With nearer pure bred grades and a larger number, so as to have more mohair to market, a better price would be obtained.

Our experience may be summed up as follows:—

It is practically impossible, for a moderate price, to obtain pure bred Angora goats.

They are quite hardy and thrifty and can be kept with the same winter care that sheep demand.

It requires about 750 pounds of hay to winter one goat. With plenty of young woodland or brushy pasture there will be no food cost in summering them.

They are effective in clearing up the underbrush in woodland covered with birch or evergreen. They will likely kill other varieties except very large trees. They will clear out bushes and waste growth in pastures, in preference even to the grasses.

Ordinary fencing will not hold them. A fine mesh wire fence of such height that they cannot rest the front feet upon it will hold them, even in small areas. They do not jump, but are good climbers.

The flesh has a flavor between that of lamb and venison. The carcasses are small and there is no market in the East for the flesh.

The mohair from the crosses brings a somewhat higher price than wool. Three pounds per animal is about all that can be expected from seven-eighths bred goats.

They are very docile and intelligent and make excellent pets. Their bush-eating proclivities would make them a nuisance among decorative shrubbery.

THE PRESERVATION OF HEN MANURE.

Chas. D. Woods and J. M. Bartlett.

The dung of fowls contains, in addition to the undigested residue from the food, the excrements of the kidneys, and is therefore much more nitrogenous than that of other domestic animals. Most of the nitrogen of the dung is in the form of uric acid and is very readily available to growing plants. It is, however, very quickly changed into carbonate of ammonia by putrefaction, and as hen dung is ordinarily stored much of the nitrogenous matters go off into the air as ammounia gas and are lost. The remarkable fertilizing value of guano derived from the dung of sea birds is due to the urates which it carries. Weight for weight, the droppings of the hen roost are not nearly as valuable as guano, but are of much greater value than ordinary barn manure.

While there are quite a number of European and a few American analyses of hen manure, the writers failed to find other studies upon hen dung and its use. Indeed the three pages devoted by Storer* to the dung appear to sum up about all the literature on the subject.

COMPOSITION OF HEN MANURE.

The table which follows contains all the trustworthy American analyses of fresh hen manure that the writers have found. Other analyses in which plaster in unknown amounts had been mixed with the droppings, and of dried hen manure have been reported.

The percentage of water in these samples was from 50 to 60 per cent. In all of them there had doubtless been a loss of nitrogen in the drying of the samples before analysis. The loss in the case of the samples analyzed at the New York Station was estimated at 43 per cent. A sample of fresh dung from the

* Agriculture, in some of its relations with chemistry, F. H. Storer, Chas. Scribner's Sons, New York, 1899, Vol. 1, p. 612.

same pen as Nos. 2 and 3 was found to carry 1.28 per cent of nitrogen.

The composition of the dung would vary with the food fed. According to the N. Y. Station analyses, "the manure from the fattening fowls was more valuable than from those which were laying, mostly from the larger content of nitrogen."

FERTILIZING CONSTITUENTS OF FRESH HEN MANURE. ANALYSES MADE AT AMERICAN EXPERIMENT STATIONS.

Reference number.	Source of analyses.	Weight per year.	Fertilizing Constituents. Nitrogen.	Phosphoric acid.	Potash.
		Pounds.	Per cent.	Per cent.	Per cent.
1	New Jersey Station Bulletin 84 ...	....	1.15	.92	.45
2	New York Station Report 1889	33	.81	.92	.32
3	New York Station Report..........	29	.66	.82	.25
4	New York Station Report (capons)	43	1.24	.93	.36
5	Mass. State Station Report 1886...	....	.79	.47	.18
6	Mass. State Station Report 1890....	....	1.20	1.00	.32

EXPERIMENTS IN STORING HEN DUNG TO PREVENT LOSS OF NITROGEN.

It has been a common practice for writers to recommend the addition of certain materials to hen dung to prevent loss. The N. Y. Station advises, "when the manure is not used when fresh, is is better to mix it with dry earth, muck or plaster." The Mass. State Station says: "The value of hen manure depends not less on the care which is bestowed on its keeping than on the kind of food the fowls consume. * * * A liberal use of plaster, kieserite or of good loam is highly recommendable for the absorption of ammonia. * * * A sandy soil is of little use as an absorbent."

To test the effect of chemicals upon the preservation of the nitrogen of hen dung, the following experiment was made. The roost droppings from 180 mature (20 months old) laying hens were collected each morning, and the droppings for three nights were treated as follows:—

Without anything being added.

Mixed with 27 pounds of kainit.

Mixed with 40 pounds plaster.

Mixed with 24 pounds acid phosphate.

Mixed with 15 pounds kiln dried pine sawdust.

Mixed with 15 pounds sawdust and 54 lbs. kainit.

Mixed with 15 pounds sawdust and 82 lbs. plaster.

Mixed with 15 pounds sawdust and 47 lbs. acid phosphate.

These lots were put in barrels and stored in a room in one of the barns from May, 1903, to November, 1903. They were weighed and sampled in November. The following notes on the mechanical condition were taken at the time of sampling.

Hen manure alone. Mouldy. Ammonia very distinctly coming off. Not very lumpy and broke up pretty easily.

Hen manure and sawdust. About the same as hen manure alone, except a little drier, and broke up a little more readily.

With kainit alone. Quite moist, somewhat sticky. Much like green dung in its mechanical condition.

With kainit and sawdust. Quite good mechanical condition.

With plaster. Quite dry, but lumpy.

With plaster and sawdust. Dry and hard lumps of plaster.

With acid phosphate. Rather wet and sticky.

With acid phosphate and sawdust. Quite good mechanical condition, resembling that mixed with kainit and sawdust.

The addition of the sawdust improved very decidedly the mechanical condition of the dung, particularly in the lots to which acid phosphate and kainit were added. The tendency of the plaster to lump was not much less with the sawdust than without. None of these lots could be readily fined so as to be used in a fertilizer drill, but any of them, and particularly the lots treated with sawdust and acid phosphate or kainit could be well applied with a machine similar to the Kemp manure spreader.

The results of the analyses are given in the table which follows.

THE WEIGHTS AND COMPOSITION OF THE THREE NIGHTS' DROPPING OF ONE HUNDRED EIGHTY HENS TREATED WITH DIFFERENT MATERIALS AND STORED FOR SIX MONTHS FROM MAY TO NOVEMBER.

Laboratory number.	The three nights' dung of 180 hens mixed with chemicals as below.	Percentage Composition.			Weight of Dung Mixture and Constituents.			
		Nitrogen.	Phosphoric acid.	Potash.	Total weight.	Nitrogen.	Phosphoric acid.	Potash.
		Per cent.	Per cent.	Per cent.	Lbs.	Lbs.	Lbs.	Lbs.
3359	By itself......	1.30	1.83	.84	44.5	.58	.81	.38
3356	15 pounds sawdust...	.97	1.28	.65	63.5	.62	.81	.41
3355	27 pounds kainit.....	1.27	.97	3.97	93.0	1.18	.90	3.69
3354	15 pounds sawdust.... 54 pounds kainit......	1.06	.82	5.89	116.5	1.24	.98	6.86
3357	40 pounds plaster..	1.07	.97	.41	91.0	.97	.88	.37
3350	15 pounds sawdust.... 82 pounds plaster.....	1.03	.84	.37	124.5	1.28	1.04	.45
3361	24 pounds acid phosphate	1.52	6.41	.41	78.0	1.19	5.00	.32
3360	15 pounds sawdust ... 47 pounds acid phos..	1.21	8.22	.32	107.0	1.30	8.80	.34

The three nights' droppings carried about 1.25 pounds of nitrogen. From the dung stored by itself or with sawdust more than half of this had escaped during the summer. The lot stored with 40 pounds of plaster lost about one-third while the lot stored with 82 pounds of plaster and 15 pounds of sawdust suffered no loss. The lots with kainit and acid phosphate both with and without sawdust retained practically all of the nitrogen. Both because of the danger of loss and its tendency to form into hard lumps, the plaster is less desirable than either of the chemicals tried. The addition of the sawdust materially improved the mechanical condition of the lots so treated.

The night droppings of the 180 hens (equivalent to 540 hens for 1 night) weighed about 45 pounds and carried about 1.25 pounds of nitrogen, .8 pound of phosphoric acid and .4 pound of potash, or expressed in percentages, it carried 2.8 per cent nitrogen, 1.8 per cent phosphoric acid and .9 per cent potash.

According to Storer's estimate the fertilizing constituents of 100 pounds of hen manure would be worth about 30 cents.

These estimates were based on the analysis of the ordinary air dried manure kept without the addition of preservatives. According to the analysis here reported, the fertilizing constituents of 100 pounds of fresh hen manure would be worth about 55 cents, and these can be stored without loss by the addition of a sufficient amount of land plaster, or better, acid phosphate or kainit.

The N. Y. Station (See table on page 158) found the year's night droppings per hen in one pen to be 29 pounds and in another 33 pounds. Based on these trials, the night droppings of the 180 hens gave about 30 pounds per hen per year, which would carry about .8 pound of nitrogen, .5 pound of phosphoric acid and .25 pound of potash, worth at the usual valuation of commercial fertilizers, about 14 cents.

No data upon the weight of hen dung voided when the birds are on the roosts have been collected by this Station nor to the writer's knowledge have any been published. The hens are upon the roosts much less than half of the time. Because of this and that probably less dung is voided when at roost than when taking exercise, the total droppings of a hen for a year may likely be as much as 75 pounds. Even when the floors are covered with sand and this in turn covered with straw, there would likely be considerable mechanical loss in the form of dust and otherwise. The readily decomposable urates would probably break up faster even than in the case of dung stored without chemicals, so that a very considerable part of the nitrogen of day-voided dung is probably lost for agricultural purposes. Hence while the total droppings probably carry more than twice the amounts noted in the preceding paragraphs, the fertilizing constituents actually conserved from the day droppings to be used on the land are probably not more than one-half of those contained in the night droppings.

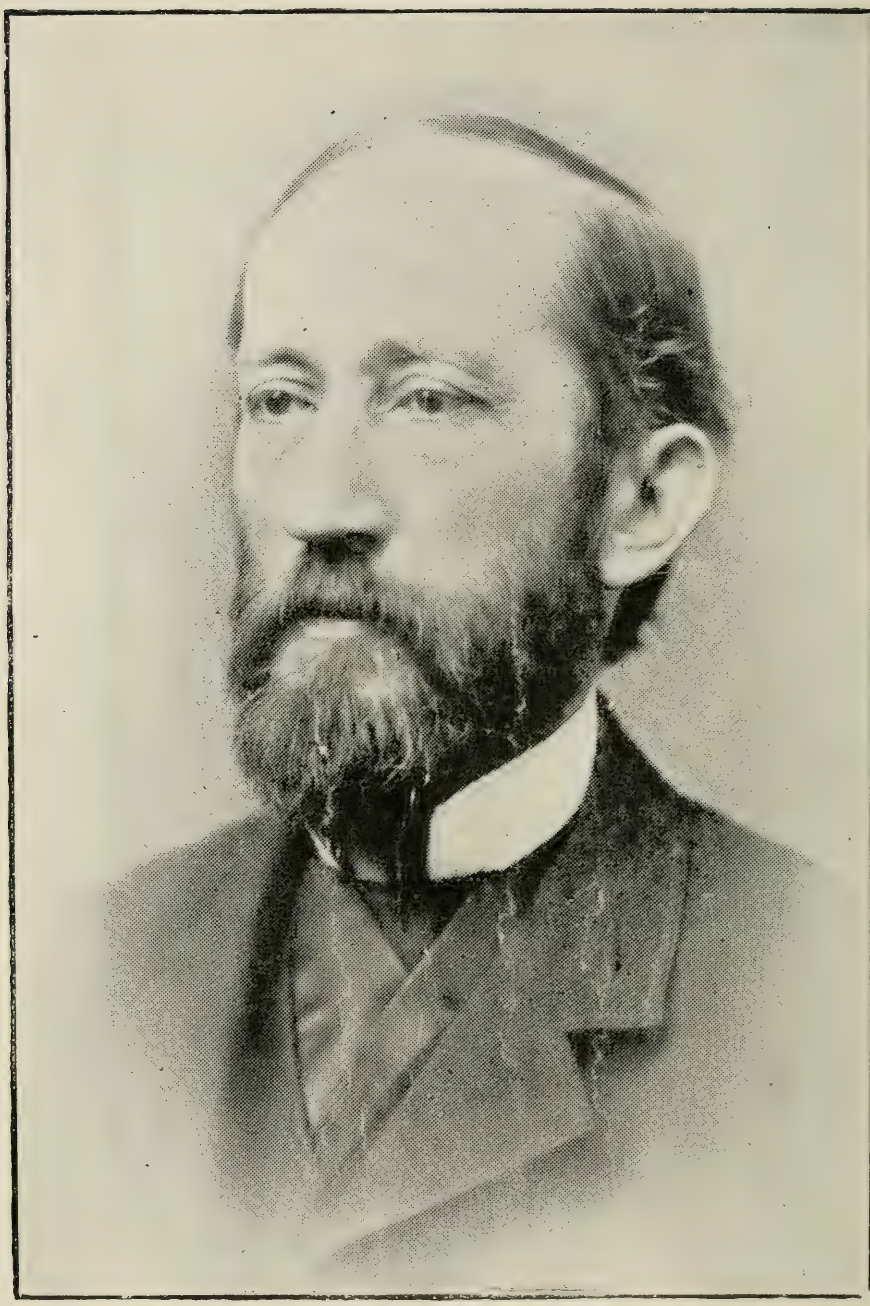
Hen manure should be applied to the land in comparatively small quantities as it carries much more plant food than ordinary farm manures. Because of the high availability of its nitrogen, it is used by gardeners as dressing for strawberry beds and similar crops. It also has been long used as an excitant for Indian corn, to be sure that the crop shall be well started. For these uses as an excitant, Storer makes the following recommendations: "An approved method of procedure is to mix the hen-manure with an equal bulk of wood ashes—together with some peat or loam, to hinder the escape of ammonia—to throw the mixture into little heaps, and to moisten them by sprinkling with a watering-pot. In this way, the uric acid is made ready to act immediately as a powerful forcing-manure. Hen-manure is apt to be sticky when fresh, and lumpy when dry, and it is not easy to make it fine enough to be sown from a drill. Its lightness (of the dried manure) also hinders it from running freely through the tubes. Hence it is better suited for the gardener and the small-way farmer, who can distribute it by hand, than for field operations. But there can be no question as to its value when properly managed."

By itself, hen dung is a one-sided nitrogenous fertilizer. As usually managed, one-half or more of its nitrogen is lost, so that as ordinarily used it does not carry so great an excess of nitrogen. Because of its excess of nitrogen it will be much more economically used in connection with manures carrying phosphoric acid and potash. As both acid phosphate and kainit prevent the loss of nitrogen, it is possible to use them in connection with sawdust or some other dry material as an absorbent (good dry loam will answer nicely) so as to make a well balanced fertilizer. For example, a mixture of 30 pounds of hen manure, 10 pounds of sawdust, 16 pounds of acid phosphate, and 8 pounds of kainit would carry about 1.25 per cent nitrogen, 4.5 per cent phosphoric acid, and 2 per cent potash, which, used at the rate of 2 tons per acre, would furnish 50 pounds nitrogen, 185 pounds phosphoric acid, and 80 pounds potash.

APPENDIX.

Annual Report of the State Pomological Society

1903-1904.



GEORGE B. SAWYER, First Secretary. See page 148.

CONTENTS.

SECRETARY'S ANNUAL REPORT.

One after another there have been three freakish years, the last of which perhaps because we are right in it, seems the worst—a frost every month in the year—a spring frost that froze everything to death it could lay its icy breath on, and an early September frost that ruined a large part of the corn that had survived the unfavorable conditions with which it was begirt. A season like this a century ago in Maine would have made a famine as great as that of which our grandmothers told us in our youthful days. Yet under these unfavorable conditions for many of our crops, the State has had a good crop of apples. The first year the fruit was in ready demand, and in not a few cases a barrel of apples paid for a barrel of flour. The second year in consequence of the immense crop in New York and other states the price was low a large part of the season, though there in many instances in consequence of careful handling and honest packing the price was satisfactory. The present season in Maine the apple crop in the State is the largest of the three, and by some is estimated as high as a million barrels. The early or fall fruit sold well, and the prices being paid later have been satisfactory to most growers.

ORCHARD CONDITIONS.

In recent years there has been a marked improvement in the care of the orchards of the State, though in many cases there is a notable absence of care.

There was about the usual planting of fruit trees in the State—a very general planting of a few trees, though not many large plantings were made. This for years has been the policy of our farmers, and while the work of extension does not go forward as fast as enthusiasts might wish, there is some wisdom in this, since it results in many new trees coming into bearing every year. So come what may there are likely to be some apples in Maine every year for the buyers. So far as we have been able to learn the trees set have done reasonably well. The nurserymen are keen business men and they realize that the industry in Maine is in its infancy. Their agents have been in the field, and the orders placed are more liberal than for years.

MEETINGS OF THE EXECUTIVE COMMITTEE.

The first meeting was at Augusta in January when the work of the year was outlined. It was voted to ask the legislature to enact a law for the protection of trees and shrubs from injurious insects and diseases. A bill was accordingly drawn up. President Gilbert and Dr. Twitchell appeared before the legislative committee and the bill presented later became a law. The bill will be found in the transactions of the society issued for 1902.

As to work it was voted to hold a field meeting with Mr. S. H. Dawes of Harrison; a winter meeting not later than March 15th; a horticultural school and the annual meeting.

It was also voted to hold another meeting if the funds of the society would permit.

The second meeting of the committee was at Cornish. At this meeting a majority of the committee favored attending the meeting of the American Pomological Society held in Boston.

The last meeting of the executive committee was an informal affair held in Boston during the meeting of the American Pomological Society, September 11th. It was voted to hold the annual meeting in Auburn. It was also voted to ask the St. Louis Exposition Commission for $5,000 to make an exhibition of Maine fruit at the exposition in 1904.

PUBLIC MEETINGS.

The winter meeting referred to was held in Cornish, March 18th, at which it was our pleasure to have Prof. F. W. Rane of the New Hampshire Agricultural College with us. As it happened the meeting followed a heavy storm and the roads were well nigh impassable. There was, however, a creditable display of fruit, and an appreciative audience. Since the meeting information has reached us that it proved helpful to those present, with assurances that the society will be again invited to meet in York county.

The second horticultural school was held in Town Hall, Winthrop. The instructors were Prof. W. M. Munson, Mrs. V. P. DeCoster, Miss Louise Klein Miller and Mr. Dick J. Crosby. There were two sessions for the children of the public schools, and two evening sessions for the general public. About two hundred and fifty school children were in attendance each afternoon, and good audiences were present each evening. In addition to the work outlined in the program Mr. Crosby visited the high school and in a most acceptable manner spoke of the value of an agricultural education. Miss Miller met the teachers and the ladies of the village and we have since learned with pleasure that much village improvement has followed.

The field meeting with Mr. S. H. Dawes, Grand View Farm, Harrison, was a most delightful occasion. The trip was made via Sebago lake and the Songo river. So enchanting was the beauty of the lake and the crookedness of the river so bewildering that we begged the privilege of returning over the same route. Grand View Farm is on a high ridge of land from which one beholds the water, the hills, Mt. Washington rising above its neighbors and a wide expanse of country dotted with farms and villages. The officers were very hospitably entertained in Mr. Dawes's spacious and charming home during our stay. The program for this meeting was largely observation and study of Mr. Dawes's fruit trees and plants. Everyone was impressed by the precision with which his work of fruit growing is carried on. The rows of trees and vines were all as straight as the eye could make them. There were no weeds among the vines for the cultivator and the hoe had made clean work among them. An object of special interest to the visitors was the effect produced by Mr. Dawes's method of fertilizing, which he took special delight in explaining to all. The vines and trees were burdened with fruit and there was revealed to us the source from which he has been able to show so much handsome fruit at our exhibitions. So great was our interest that we asked Mr. Dawes to read a paper at the annual meeting that a still larger number may be able to profit from his success and it forms a part of this volume. Following a sumptuous banquet served in his fruit house, there was a short program consisting of music and speaking by the visitors. If there was any doubt of the desirability of field meetings, it was completely silenced by the grand success of this one, which was the first held by the society.

AMERICAN POMOLOGICAL SOCIETY.

Four members of the executive committee represented the society at the meeting of the American Pomological Society in Boston, which was held in the Massachusetts Horticultural Society's new home. There was a good display of excellent fruit among which Maine fruit was not as plenty as we found it in the Boston markets. Mr. Arnold, however, from his farm showed some very fine fruit, and we all congratulated him for the deserved reward he received—a Wilder medal. Maine fruit at this time was outselling all others in the market. For one, the secretary believes that such opportunities for advertising Maine fruit among consumers should never be neglected.

The great feast of the vacation, however, was in the hall where were assembled distinguished fruit growers from nearly every state and territory. It is difficult to say which part was best, but the platform meeting under the lead of Mr. Chas. W. Garfield of Michigan was the brightest and "meatiest" fruit meeting it has ever been our privilege to attend. Several Maine fruit growers were present and had others known how much there was to be gained by meeting these enthusiastic fruit men there would have been many more.

THE WORLD'S FAIR AT ST. LOUIS.

In accordance with the vote of the society at its last annual meeting the executive committee, realizing that there was an abundance of fine fruit for an exhibition at the World's Fair to be held in St. Louis in 1904, voted to ask the exposition commission to grant the Pomological Society from the State appropriation, the sum of $5,000 for the purpose of installing and maintaining an exhibition of Maine fruit. The following letter was then prepared and sent to the commission.

To His Excellency, the Governor of the State of Maine, and the World's Fair Commission for the State of Maine:

A vote was passed by the members of the State Pomological Society at the annual meeting held at Farmington in November last, referring the matter of making an exhibition of Maine fruit at the World's Fair in 1904 to the executive committee of the society. Since then a magnificent crop of fruit has developed, and at a late meeting of the committee held in Boston it was agreed that the fruit conditions were never more favorable for showing to the world the finest apples ever grown. In behalf of the Pomological Society and the fruit growers of the State, we, as authorized by vote of the executive committee of the society, hereby respectfully request that the sum of $5,000 of the appropriation made by the last legislature for the purpose of a representation of the State at the exposition to be held in St. Louis in 1904, be set apart for the making of an exhibition of Maine fruit during the aforesaid exposition and that the expenditure of the same be made by the society under such rules as you may determine.

Recent investigations have assured our officers that the quality of the fruit this year and the importance of the fruit industry warrant us in making this request. Growers are already harvesting their fruit, and we most respectfully urge that this matter may receive early attention. The collection of fruit for exhibition purposes should begin before the crop of fruit is marketed or stored, and it should be handled by those familiar with selecting and packing exhibition fruit. Heretofore the fruit growers of the State have very largely contributed the fruit shown at the several expositions where any exhibition has been made, and we believe the time has now come when such work should be done by the State.

Should you deem it desirable to have this matter more fully discussed before taking final action upon the same we shall be very glad to arrange for some one familiar with fruit conditions to meet with you and discuss the situation. We trust you will give the matter early consideration, as the time for making the best collection of fruit is when the fruit is being gathered.

All of which we most respectfully submit to your consideration.

Dated at the office of the secretary in Farmington, this 21st day of September, 1903.

(Signed) D. H. KNOWLTON, *Secretary.*
Z. A. GILBERT, *President.*

This communication was acknowledged by the secretary of the commission, who had more or less correspondence with President Gilbert. The commission was invited to attend our annual meeting and was represented there by the secretary. The action of our society at this meeting seemed to eliminate this society from any participation in the preparation for an exhibition at so late a day. So far as the secretary knows the commission made no further recognition of our communication. The commission we learn, realizing that the fruit industry of the State is of vast importance, have arranged to install an exhibition of fruit, and the secretary can only say that so far as Maine fruit is shown at St. Louis, the Pomological Society will not appear as its representative. At the same time Maine fruit growers are entitled to a good representation at St. Louis, and the secretary is informed that it is the intention of the commission to install and maintain a display of fruit that will go far in showing the world of consumers that the land of the best apples is down in Maine.

The following letter from Mr. F. W. Taylor, Chief, Department of Horticulture, under date of November 6th, was presented at the annual meeting.

Mr. D. H. Knowlton, Secretary, Maine Pomological Society, Auburn, Me.:

Dear Sir:—I sincerely wish that it were possible for me to be present and have the pleasure of meeting yourself and your members and that I might see the fine exhibit which I am sure you are making. I especially hope that you will have up for proper decision the question of the help which your society is to give in the participation of Maine in this exposition.

Please convey to the society my compliments and best wishes and express to them from me the hope that I may have the pleasure of meeting them individually at this exposition.

Very truly yours,

F. W. TAYLOR,
Chief, Department Horticulture.

OUR PRINTED TRANSACTIONS.

It has been the custom to reserve unbound sheets of each year's transactions, and the last five of these were bound into a cloth-bound volume uniform with the volume previously bound. Several volumes have already been delivered to public libraries and others who were entitled to them. The volume is the best printed record of the growth of Maine fruit for the five years it covers.

Buyers began early in the season to ship fruit, but the crop was so large that there was much difficulty in finding sufficient help to harvest it all. Some fine fruit was ruined by the cold before it could be gathered, and the scarcity of barrels and inadequate facilities for storage were the cause of much loss as many could not protect their fruit from freezing after it was picked. Enough fruit in this way was ruined in the State to erect many storehouses, which by the way, is now one of the great needs of the fruit-growers. Realizing this situation the program for the annual meeting was largely shaped to give prominence to handling, packing and storing apples. And to all fruit growers who may read this report the papers and discussions are commended for reading and study.

The present volume is commended to those interested in Maine's great fruit industry. The topics treated are those of chief interest at the present time. The secretary has taken great pleasure in editing the papers and discussions and sending the work on its mission to the people. He only wishes that thousands might attend the meetings where the authors presented them for consideration. More and more these conventions appeal to the fruit grower, for beside these papers and discussions there is the opportunity of mingling with practical fruit growers and enthusiastic fruit lovers. In behalf of the society the secretary extends the invitation to all.

D. H. KNOWLTON,
Secretary.

FARMINGTON, ME., December 30, 1903.

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President.

Z. A. GILBERT, North Greene.

Vice-Presidents.

D. P. TRUE, Leeds Center,
* H. L. LELAND, East Sangerville.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

CHARLES S. POPE, Manchester.

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President and secretary, *ex-officio*, R. H. Libbey, Newport; V. P. DeCoster, Buckfield; C. A. Arnold, Arnold.

Trustees.

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Aroostook county, John W. Dudley, Mapleton.
Franklin county, E. F. Purington, Farmington.
Cumberland county, John W. True, New Gloucester.
Hancock county, E. W. Wooster, Hancock.
Kennebec county, E. A. Lapham, Pittston.
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Lincoln county, H. J. A. Simmons, Waldoboro.
Oxford county, * Lemuel Gurney, Hebron.
Penobscot county, A. A. Eastman, Dexter.
Piscataquis county, W. E. Leland, Sangerville.
Sagadahoc county, Edward L. White, Bowdoinham.
Somerset county, F. E. Nowell, Fairfield.
Waldo county, F. A. Putnam, Jackson.
Washington county, D. W. Campbell, Cherryfield.
York county, C. A. Hooper, Eliot.

Member of Experiment Station Council.

CHARLES S. POPE, Manchester.

Auditor.

DR. GEORGE M. TWITCHELL, Augusta.

* Deceased.

MEMBERS OF THE SOCIETY.

NOTE—Any errors or changes of residence should be promptly reported to the Secretary. Members will also confer a favor by furnishing the Secretary with their full Christian names where initials only are given.

LIFE MEMBERS.

Andrews, A. Emery	Gardiner
Andrews, Charles E	Auburn
Arnold, C. A.	Arnold
Atherton, Wm. P	Hallowell
Atkins, Charles G	Bucksport
Atwood, Fred	Winterport
Averill, David C	Temple
Bailey, W. G.	Freeport
Bennoch, John E	Orono
Bickford, Lewis I	Dixmont Center
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Blanchard, Mrs. E. M	Lewiston
Boardman, Samuel L	Bangor
Briggs, John	Turner
Burr, John	Freeport
Butler, Alonzo	Union
Chandler, Mrs. Lucy A	Freeport
Chase, Henry M., 103 Federal St.	Portland
Corbett, Herman	Farmington
Crowell, John H	Farmington
Cummings, Mrs. Anthony	Auburn
Dana, Woodbury S	Portland
Dawes, S. H	Harrison
DeRocher, Peter	Bradentown, Fla.
Dirwanger, Joseph A	Portland
Dunham, W. W.	North Paris
Dyer, Milton	Cape Elizabeth
Emerson, Charles L	South Turner
Farnsworth, B. B	Portland
Frost, Oscar F	Monmouth
Gardiner, Robert H	Gardiner
George, C. H	Hebron
Gilbert, Z. A	North Greene
Goddard, Lewis C.	Woodfords
Grover, Franklin D	Bean
Hackett, E. C	West Gloucester
Hall, Mrs. H. A	Brewer
Hanscom, John.	Saco
Harris, William M	Auburn
Hoyt, Mrs. Francis	Winthrop
Jackson, F. A	Winthrop
Keene, Charles S	Turner
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Lincoln, E. L	Wayne
Litchfield, J. H	Auburn
Litchfield, Mrs. L. K	Winthrop
Lombard, Thurston M	Auburn
Luce, Willis A	South Union
McCabe, George L	North Bangor
McLaughlin, Henry	Bangor
McManus, John	Brunswick
Merrill, T. M	Sabbathday Lake
Mitchell, Frederick H	Turner
Moody, Charles H	Turner
Moore, William G	Monmouth
Moor, F. A	Waterville
Morton, J. A	Bethel
Munson, W. M	Orono
Page, F. W	Augusta
Parsons, Howard G	Turner Center
Perley, Chas. I	Cross Hill
Pope, Charles S.	Manchester
Prince, Edward M	West Farmington
Pulsifer, D. W	Poland
Purington, E. F	West Farmington
Richards, John T	Gardiner
Ricker, A. S	Turner
Roak, George M	Auburn
Sanborn, Miss G. P	Augusta
Sawyer, Andrew S	Cape Elizabeth
Seavy, Mrs. G. M	Auburn
Simmons, H. J. A	Waldoboro
Skillings, C. W	North Auburn
Smith, Henry S	Monmouth
Snow, Mary S	Bangor
Starrett, L. F	Warren
Stetson, Henry	Auburn
Stanley, O. E	Winthrop
Stilphen, Asbury C	Gardiner

LIFE MEMBERS—*Concluded.*

Strout, S. F	West Falmouth
Taylor, Miss L. L., (Lakeside)	Belgrade
Thomas, William W	Portland
Thomas, D. S	North Auburn
Thurston, Edwin	West Farmington
Tilton, William S	Boston, Mass
Townsend, Mrs. B. T	Freeport
True, Davis P	Leeds Center
True, John W	New Gloucester
Twitchell, Geo. M	Augusta
Vickery, James	Portland
Vickery, John	Auburn
Wade, Patrick	Portland
Walker, Charles S	Peru
Walker, Elmer V	Oxford
Waterman, Willard H	East Auburn
Waugh, F. A	Amherst, Mass
Wheeler, Charles E	Chesterville
Yeaton, Samuel F	West Farmington

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Austin, Chas	South Berwick
Beal, Mrs. Altana	North Fairfield
Clark, Chas. H	Wells Branch
Copeland, Llewellyn	Dexter
Davis, Fred	Newport
Day, A. C	South Turner
DeCoster, V. P	Buckfield
DeCoster, Mrs. V. P	Buckfield
Dudley, John W	Mapleton
Dunn, A. L	Buckfield
Eastman, A. A	Dexter
Edwards, R. G	Brooks
Emery, Frank E	Laramie, Wyoming
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Johnson, C. F	Dexter
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Mathers, Mrs. A. C	Rockland
Merchant, S. L	Winthrop
Munson, W. M	Orono
Nowell, F. E	Fairfield
Phillips, W. H	Hancock Point
Plummer, Stanley	Dexter
Roberts, M. W	Brooks
Robinson, O. M	Dexter
Rowe, W. C	Brooks
Spear, Mrs. Carus T	Rockland
Stoddard, Mrs. Alma S	Farmington
Titcomb, B. M	Farmington
Waterman, L. C	Buckfield
Whittier, Phineas	Farmington Falls
Wooster, E. W	Hancock

ANNUAL MEMBERS, 1902.

Adams, J. W ....East Wilton
Alden, R .. .. Winthrop
Allen, E. F...... ....Columbia Falls
Austin, Mrs. A. F.... ....Farmington
Bradley, Mrs. Myrtie E .. ..Vienna
Brown, Mrs. C. O ... .East Wilton
Campbell, David ....Cherryfield
Campbell, D. W ....Cherryfield
Clark, Chas. H ... .West Branch
Conant, S. E .... Buckfield
Day, A. C ....South Turner
DeCoster, V. P....... ....Buckfield
DeCoster, Mrs. V. P ... .Buckfield
Dudley, John W.... ....Mapleton
Dummer, Chas. G ....Weld
Eastman, A. A ....Dexter
Field, George W ....North Vienna
Furbush, Mrs. E. F ....East Wilton
Greenleaf, A. C ....Farmington
Greenwood, Emilie . ..... .Farmington
Hall, Chas. G ....Cedar Grove
Hiscock, Mrs. W. L .... Farmington
Holley, W. B ....Farmington
Jenkins, Mrs. Elmira ....Temple
Jennings, Mrs. R. B ....Farmington
Jewell, H. D ....Farmington
Jordan, Ira ....Milbridge
Leland, Will E... ......East Sangerville
Libbey, R. H .... Newport
Libbey, Mrs. R. H ....Newport
Lincoln, E. L ....Wayne
Mayo, E. R............. .....Manchester
McAllister, Zacheus............. Lovell
McCleery, Robert ....Farmington
Merchant, S. L .... Winthrop
Niles, S. H ....North Jay
Odell, Mrs. A. J... ....Farmington
Plummer, H. A ....Addison
Purington, Mrs. E. F ....Farmington
Ricker, H. C .... Buckfield
Robinson, O. M. .. .. .Dexter
Rollins, Frank H......Farmington Falls
Sampson, R. S ....Farmington
Simmons, Mrs. J. J.... .....Farmington
Small, E. C................ .. Cherryfield
Stetson, C. S ....Alta
Stewart, Mrs. A. M.. ....Farmington
Stewart, John ....Cherryfield
Tarr, Edward. ....Mapleton
Titcomb, B. M ....Farmington
Toothaker, L. P ...... Simpson's Corner
Tucker, Benj ....North Norway
Tufts, Laforest ....Farmington
Von Herff, B. ..93 Nassau St., New York
White, Edward L .... Bowdoinham
Whittier, Phineas.... Farmington Falls
Wilbur, Georgine ....Phillips
Willey, A. B .... Cherryfield
Wiswell, M. H.......... ...East Machias
Withington, Mrs. Chas..... ...Buckfield

ANNUAL MEMBERS, 1903.

Allen, L. L ....Fairfield
Blossom, L. H.............Turner Center
Bradley, Myrtie E..... .... Vienna
Breed, W. O.... .... Harrison
Campbell, D. W...............Cherryfield
Day, A. C.................... South Turner
Dingley, Mrs. P. G........... ....Auburn
Fairbanks, A. E ....North Monmouth
Fessenden, Francis ....Portland
German Kali Works ....New York
Goodale, G. C ....Winthrop
Guptill, W. T .... .Topsham
Hall, C. G ....Cedar Grove
Harding, Nathaniel ....New Sharon
Hathaway, W. S..... ....East Auburn
Johnson, H. E. .. .. Auburn
Jones, Mrs. Barnum ......North Auburn
Jordan, Ira .. ..Milbridge
Leland, W. E ....East Sangerville
Libby, R. H ....Newport
Libby, Mrs. R. H ... . Newport
Lord, T. Merrill......North Parsonsfield
Mayo, E. R... ....Manchester
McAllister, G ....West Lovell
Merchant, S. L... ....Winthrop
Merrill, A. L...... ....North Auburn
Morrill, Stephen.............. Lewiston
Nowell, F. E.......... ....Fairfield
Payson, H. L .. ..Rockland
Phinney, C. S ... ...Standish
Roberts, J. A..... ....Norway
Smith, F. W . ...Rockland
Smith, Geo. R .... Augusta
Staples, Mrs. Arthur G...... ...Auburn
Tarr, Edward . ...Mapleton
Toothaker, L. P ....Simpson's Corner
Tucker, Benjamin..... ...North Norway
White, Edward L ... .Bowdoinham
Whitman, H. H.... .... ..South Turner
Whittier, Phineas .....Farmington Falls
Willey, A. B....... ....Cherryfield
Woodside, E. G ....Lewiston

ANNUAL MEMBERS, 1904.

Warren, Henry P ....Albany, N. Y

TREASURER'S REPORT.

		Dr.
Received from Treasurer 1902		$251 93
Jan. 1.	Interest Farmington National Bank	20 00
	Interest Merchants Bank Gardiner	3 00
	State stipend	1,000 00
	Interest Augusta Trust Co	42 35
	V. P. DeCoster, rebate on R. R. ticket	2 66
	Fees of annual members	42 00
	Fees of life members	20 00
	Balance due Treasurer	73 72
		$1,455 66
		Cr.
Jan.	By paid premiums awarded at Farmington.	$342 50
	D. H. Knowlton, expenses as member Ex. Com. Augusta	17 20
	V. P. DeCoster, expenses as Ex. Committee at Augusta	7 95
	Z. A Gilbert, expenses as Ex. Committee	7 45
	C. A. Arnold, expenses as Ex. Committee	7 50
	R. H. Libbey, expenses as Ex. Committee	7 00
	D. H. Knowlton, sundry cash items, Cornish	22 16
	C. A. Arnold, expenses at Cornish.	13 79
	V. P. DeCoster, expenses at Cornish	8 55
	R. H. Libbey, expenses at Cornish	13 75
	Z. A. Gilbert, expenses at Cornish.	7 47
	F. W. Rane, services and expenses at Cornish	16 75
	D. H. Knowlton, salary	75 00
	Dick J. Crosby, expenses at Winthrop	45 50
	Louise Klien Miller, expenses at Winthrop	50 00
	Premiums awarded at Cornish.	22 50
	Mrs. V. P. DeCoster, expenses at Winthrop	13 10
	W. M. Munson, expenses at Winthrop	15 10
	D. H. Knowlton, sundry expenses.	16 10
	Burleigh & Flynt, printing.	3 00
	C. A. Arnold, expenses to Harrison	19 75
	V. P. DeCoster, expenses to Harrison	13 30
	Z. A. Gilbert, expenses to Harrison.	19 17
	D. H. Knowlton, expenses to Harrison	13 99
	W. F. Rane, expenses to Harrison.	22 85
	Knowlton, McLeary & Co., printing	34 14
	D. H. Knowlton, postage	14 56
	N. Y. and Boston Calcium Light Co	3 00
	Chas. S. Pope, expenses	18 75
	Z. A. Gilbert, expenses at American Pomological meeting.	11 60
	D. H. Knowlton, postage, express, etc	29 41
	R. H. Libbey, expenses as Ex. Committee	11 14
	V. P. DeCoster, expenses as Ex. Committee	6 40

Jan.	By paid C. A. Arnold, expenses as Ex. Committee	$4 50
	Knowlton, McLeary & Co., printing	47 89
	Merrill & Webber, printing	7 00
	Julia Harris May, poem at annual meeting	5 00
	Z. A. Gilbert, paid labor at annual meeting	4 50
	Bliss Business College, writing certificates	6 40
	G. Harold Powell, travel and board at Auburn	44 85
	L. C. Corbett, travel and board at Auburn	43 95
	Wood, Robinson & Co., paper for tables	3 06
	D. H. Knowlton, postage	15 00
	C. A. Arnold, expenses at American Pomological meeting	19 00
	V. P. DeCoster, expenses at American Pomological meeting	8 95
	F. Bartlett & Son, bunting for tables	3 00
	S. T. Maynard, services as judge at Auburn	27 78
	C. L. Cushman, use of lantern, Auburn	8 00
	Abel F. Stevens, services at Auburn	20 00
	Emelie Greenwood, services as clerk, Auburn	7 70
	A. L. Lane, services as speaker, Auburn	9 14
	John W. Clark, services as speaker, Auburn	24 62
	Geo. H. Clarke, board of officers and speakers, Auburn	51 50
	Flavel R. Jordan, Jr., use of piano, Auburn	3 00
	E. F. Bonners, labor and trucking	16 50
	D. H. Knowlton, salary	75 00
	W. M. Munson, expenses at Auburn	5 45
	Deposit to credit of permanent fund	20 00
	Lillie B. Raynes, stenographer at Auburn	44 04
		$1,455 66

PERMANENT FUND ACCOUNT, 1902.

To stock First National Bank, Farmington	400 00
deposited Augusta Trust Company, Augusta	1,060 00
	$1,460 00

CR.

By 144 life members' fees	$1,440 00
Received George L. McCabe, North Bangor, membership fee	10 00
Mrs. G. M. Seavey, Auburn, membership fee	10 00
	$1,460 00

CHAS. S. POPE, Treasurer.

BUSINESS TRANSACTIONS.

MEETINGS OF EXECUTIVE COMMITTEE.

AUGUSTA, January 27, 1903.

On the vote in March, 1902, that 150 copies of the society's transactions be bound, the volume to consist of enough years' transactions to make a good sized volume, it was voted to instruct the treasurer to carry out said vote and that the volume consist of about 500 pages of the recent volumes of the society's transactions.

Voted, That our members of Congress be requested to support the bill, already passed by the Senate, appropriating two and one-half million dollars for the erection of a new building for the suitable housing of the agricultural department in Washington.

The committee considered it inexpedient at this time to ask for legislation requiring an efficient inspection of fruit.

For the protection of our State against the bringing in of infected and diseased nursery stock, it was voted that the legislature be requested to give passage to a law providing for the protection of trees and shrubs from injurious insects and diseases.

Voted, That the drafting of such a bill or law be referred to the president and secretary and that they be requested to present the same or cause the same to be presented to the legislature now in session.

Voted, To sell the refrigerator and case used heretofore for exhibition purposes to C. A. Arnold for $5.

Voted, That Mr. Gilbert be instructed to visit New Gloucester and have the exhibition outfit, stored there with John W. True, sorted and so far as the same may be of value to the society for exhibition purposes, cause it to be packed and sent to R. H. Libbey, Newport, for storage.

Voted, That the treasurer be authorized to draw the interest on permanent fund and deposit the same for society's use.

As to work for the coming year it was voted as follows:

To accept the invitation of Mr. S. H. Dawes of Harrison to hold a field meeting at his place.

To hold a late winter meeting not later than March 15th, at such place as the president and secretary may decide.

To arrange for fruit and flower study if satisfactory arrangements can be made.

To hold the annual meeting sometime in the month of November prior to the 15th.

That if the funds of the society admit one or more additional meetings may be held.

Voted, To have 1,500 copies of Announcements and Premium Lists printed.

CORNISH, March 18, 1903.

Voted, To send representatives to the meeting of the American Pomological Society to be held in Boston next fall.

Treasurer's bond for 1903 was approved.

BOSTON, September 11, 1903.

Meeting of the executive committee held in an anti-room of Massachusetts Horticultural Society's building.

An invitation to hold the annual meeting with the University of Maine at Orono was presented.

President Gilbert stated that he was authorized to extend an invitation from the Auburn Board of Trade to hold the annual meeting in that city.

Voted, To hold the meeting in Auburn, November 10, 11, and 12, 1903.

The president and secretary were requested to ask the St. Louis exposition commission that the sum of $5,000 of the $40,000 appropriated by the State for a representation at the exposition, be set apart for installing and maintaining an exhibition of Maine fruit at the exposition, and that the same may be expended by the State Pomological Society.

AUBURN, November 10, 1903.

Appointed the following judges:

On Apples, single plates—Prof. S. T. Maynard.

On Collections—Abel F. Stevens.

On Pears—Chas. S. Pope.

On Canned Goods, Etc.—Mrs. V. P. DeCoster.

The secretary was invited to respond to the address of welcome.

In accordance with the vote passed by the committee January 27, 1903, the treasurer had 150 copies of transactions for the years 1897, 1898, 1899, 1900, 1901 and 1902 bound in cloth.

The secretary in accordance with vote passed at same meeting sent a copy of vote relating to the appropriation for a new agricultural building to our members of Congress.

A bill was drawn up by the president and secretary to provide for the protection of the State against the introduction of infected and diseased nursery stock. It was afterwards presented to the legislature, President Gilbert and Dr. Geo. M. Twitchell appearing before the committee to whom it was referred, and the legislature passed the same. This law was published in the secretary's portfolio of last year's transactions.

President Gilbert visited New Gloucester, and had whatever of the exhibition paraphernalia he considered of any value to the society forwarded to R. H. Libby, Newport, for storage.

Other doings of the executive committee are referred to in the secretary's annual report, contained in this volume, and the transactions of the society.

PUBLIC MEETINGS.

The spring meeting of the society was held in Cornish, March 18, 1903. The morning session was devoted to the assignment of fruit and a short talk on the "Varieties to Plant," by President Gilbert. The program for the afternoon session consisted of short talks, Fertilizing the Orchard, V. P. DeCoster; What the Market Calls For, C. A. Arnold; Small Fruits for the Home, Chas. S. Pope; Small Fruits for the Market, R. H. Libbey, and a closing paper by Prof. F. W. Rane of Durham, N. H., on Definiteness in Horticulture. The evening session the exercises were give up to Lantern Talks on Horticultural Topics, Culture and Care, by D. H. Knowlton, and Horticultural Work at the N. H. Experiment Station, by Prof. F. W. Rane. The meeting was preceded by a severe storm and the traveling was very bad, and in consequence the attendance was not large, but those present seemed much interested and enjoyed the meeting.

THE HORTICULTURAL SCHOOL.

The horticultural school was held in Winthrop, May 14 and 15, 1903. The instructors for this school were Mrs. V. P. DeCoster of Buckfield; Mr. Dick J. Crosby, Washington, D. C.; Prof. W. M. Munson, Orono; Miss Louise Klein Miller, Day-

Pupils of Winthrop Schools on the way to Horticultural School.

ton, Ohio. The exercises were held in the town hall and were generally attended by the schools. The evening sessions were of more general interest and good audiences were present. The work of Miss Miller was especially valuable and on the street, the platform and the home, she made her influence for beautifying the home and the town felt. Since this meeting a Village

Improvement Society has been organized in the town and all reports indicate that it is rendering the town a most valuable service.

FIELD MEETING.

In accordance with the wishes of many of the members of the society, arrangements were made for a field meeting with Mr. S. H. Dawes of Harrison, July 2, 1903. The program for the occasion consisted of an examination of Mr. Dawes's fruit gardens and orchard, a lunch during the noon hour, followed by remarks from Pres. Gilbert, Secretary Knowlton, J. W. True, Chas. S. Pope, Mrs. V. P. DeCoster, Mr. W. O. Breed, Rev. M. Whitman and others. Pres. Gilbert's opening remarks were responded to by Mr. S. H. Dawes, and the exercises closed with an address by Prof. F. W. Rane. Excellent music was furnished by local talent.

Before separating, Mr. DeCoster offered the following resolutions, which were unanimously passed:

Resolved, That the Maine State Pomological Society and other visitors present hereby tender sincere thanks to Mr. S. H. Dawes, his family, and his local friends for the magnificent reception he has given us at this, the first field meeting held by the Pomological Society.

Resolved, That we extend to Mr. Dawes our hearty congratulations for the wonderfully successful results he has attained and so kindly shown us today.

Resolved, That as a parting expression of our good will we extend to Mr. Dawes and his family our best wishes for many years of pleasant and peaceful enjoyment of the delightful influences with which he has surrounded his charming home.

THE ANNUAL MEETING.

The annual meeting was held, by invitation of the Auburn board of trade, in City hall, Auburn, Nov. 10, 11 and 12, 1903. The program was as follows:

TUESDAY EVENING—An informal reception by the Auburn board of trade.

OPENING SESSION—Prayer by Rev. Fred M. Preble, D. D., Auburn; address of welcome by Hon. Geo. C. Wing, Auburn;

response by D. H. Knowlton, Farmington; annual address by Pres. Z. A. Gilbert, North Greene.

Wednesday Afternoon—Practical Results of Fruit Storage by the Grower, John W. Clark, North Hadley, Mass.; How to Handle the Apple for Cold Storage, G. Harold Powell, Washington, D. C.

Wednesday Evening—Civic Improvement—What Has Been Done in Other States, Mrs. Emma Dow Armstrong, President Maine Federation Women's Clubs, Lewiston; Civic Improvement Locally, Geo. H. Clarke, Auburn; Home Decorations, Prof. L. C. Corbett, Washington, D. C. Music for this session furnished by Mr. Jordan and ladies of Auburn.

Thursday Morning—Annual Meeting; report of treasurer; report of secretary; report of special committee on sweepstakes prize, Dr. G. M. Twitchell, Mrs. V. P. DeCoster, Mrs. Lucy A. Chandler, referred from last annual meeting; amendment to Sect. 1, Art. II, of by-laws; election of officers; miscellaneous business.

Thursday Afternoon—Orchard Fertility: Results from Use of Chemical Fertilizers, S. H. Dawes, Harrison, C. S. Phinny, Standish; Results from Barn Manures, V. P. DeCoster, Buckfield; Results from Tillage and Cover Crops, Prof. W. M. Munson, Orono; Fruit Packages: The Barrel and the Box, D. H. Knowlton; Other Packages, R. H. Libbey, Newport.

Thursday Evening—Poem, Miss Julia H. May, Auburn; Chrysanthemums, Abel F. Stevens, Wellesley, Mass.; Among Fruits and Flowers, Prof. A. L. Lane, East Fairfield. Music for the evening furnished by the Lotus Quartette.

The chairman of the committee on a Sweepstakes Prize offered the following report:

Your committee to whom was referred the subject of an appropriate recognition for those winning the sweepstake prizes, has attended to its duties and presents the following report.

We believe that the time has arrived when this society may well recognize the efforts of individual growers in making extensive exhibits of many varieties and of such excellence and would recommend that in addition to the money prize awarded, this society provide itself with an attractive diploma of proper size and quality and that one of the same be presented to the winner of the sweepstake prize yearly.

G. M. TWITCHELL,
MRS. V. P. DeCOSTER,
MRS. L. A. CHANDLER,
Committee.

Voted, That said report be accepted.

Voted, That the selection of a design and the proper wording of the award be submitted to the same committee for their action.

The committee on president's address, by its chairman offered their report as follows:

Your committee to whom was referred the address of Pres. Gilbert and report of Sec. Knowlton, would submit the following:

That this society expresses itself in decided terms of condemnation over the selection of the log cabin as the Maine building at St. Louis as unfortunate and inappropriate for the reason that no matter how artistic, it will speak only of the forest and in no sense can it represent the social or industrial life of the State of Maine or the culture and enterprise of its inhabitants. Maine is today a State of farms, villages, towns, cities and manufacturing and not a forest.

Representing the fruit growers of the State, and an industry exceeding two million dollars annually, we believe a serious injury has been done through the failure of the St. Louis Commission to make reply and grant the application of this society for an adequate appropriation by which a fair representation of Maine fruit might have been made at St. Louis. As the time has now passed it is well for the people of the State to know that the failure in no way attaches to the officers of this society or our fruit growers.

We believe that the press of the State can aid materially our fruit industry by frequently calling attention to the fact that our domestic consumption of fruit is of far greater importance than the foreign trade, as out of forty million barrels grown only about three million are exported annually. The superior quality of this fruit and its possible increase in the future are subjects of vital interest and may well form the basis for frequent editorials.

It is most important that the statistical work to which attention is called by both the president and secretary be taken up and facts and figures regarding the planting of orchards and especially the volume of fruit produced be made a subject of authentic record year by year. And we urge upon the executive committee that definite measures be adopted by which these records may be obtained.

We recommend that the executive committee investigate the subject of packages for marketing boxes for half bushel, bushel and half barrel, ascertain cost of manufacture to insure lightness and strength and exhibit same at future meetings thereby helping to an uniformity of shipping packages, and that the subject of legislation to require the use of such uniform packages be investigated and report made at the next annual meeting of this society.

G. M. TWITCHELL,
C. S. PHINNEY,
C. S. STETSON,
DAVID W. CAMPBELL,
W. O. BREED.

Voted, That the report be accepted.

Voted, To amend Section 1, Article II, of by-laws, so that said section when amended shall read as follows:

That the elective members of the executive committee upon the adoption of this amendment be elected one for one year, one for two years and one for three years, and that thereafter one member shall be elected annually for three years.

The following officers were elected for 1904:

President—Z. A. Gilbert, North Greene.

Vice Presidents—D. P. True, Leeds Center; C. H. George, Hebron.

Secretary—D. H. Knowlton, Farmington.

Treasurer—Charles S. Pope, Manchester.

Executive Committee—President and secretary, *ex-officio;* R. H. Libbey, Newport, for one year; V. P. DeCoster, Buckfield, for two years; C. A. Arnold, Arnold, for three years.

Trustees—Androscoggin county, A. C. Day, South Turner; Aroostook county, John W. Dudley, Mapleton; Franklin county,

E. F. Purington, Farmington; Cumberland county, John W. True, New Gloucester; Hancock county, E. W. Wooster, Hancock; Kennebec county, E. A. Lapham, Pittston; Knox county, Alonzo Butler, Union; Lincoln county, H. J. A. Simmons, Waldoboro; Oxford county, J. A. Roberts, Norway; Penobscot county, A. A. Eastman, Dexter; Piscataquis county, W. E. Leland, Sangerville; Sagadahoc county, A. P. Ring, Richmond Corner; Somerset county, Frank E. Nowell, Fairfield; Waldo county, Fred Atwood, Winterport; Washington county, D. W. Campbell, Cherryfield; York county, C. A. Hooper, Eliot.

Auditor—Dr. Geo. M. Twitchell, Augusta.

Member of Experiment Station Council—Charles S. Pope, Manchester.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Your committee would submit the following as representing the sentiments of the society concerning the very successful meeting now closing:

Resolved, That the Maine Pomological Society recognizes and appreciates the courtesies extended by the Board of Trade and the citizens of Auburn in their untiring efforts to make the visit of the society a successful and profitable one; and that the thanks of the society are hereby extended.

Resolved, That the society hereby extends to the press of the State which has so generously advertised and reported its meetings our gratitude for these courtesies.

Resolved, That the thanks of the society are hereby extended to the Maine Central, Grand Trunk and Portland & Rumford Falls Railroads for excursion rates granted on account of the meeting.

Resolved, That the efforts of Mr. Abel F. Stevens of Massachusetts in making an excellent display of chrysanthemums of the finest quality is appreciated, and that the thanks of the society be extended to Mr. Stevens.

Resolved, That the thanks of the society are hereby extended to the University of Maine for the excellent exhibit of flowers, fruits and photographs of the college buildings which added greatly to the attractiveness of the exhibit, and that the society recognizes and endorses the work which the University and the Experiment Station are doing for the fruit interests of the State.

Resolved, That the society recognizes the grand work which the U. S. Dept. of Agriculture is doing for horticulture, and especially its efforts to solve the problems of fruit storage and shipment and the trucking interests of the country; and further that the thanks of the society are extended to Professor L. C. Corbett and Professor G. Harold Powell for their part in making the program of this meeting a profitable one.

Resolved, That the thanks of the society are extended to Mr. Jordan and the members of the Lotus Quartette for the excellent music with which this meeting has been favored.

The resolutions were accepted by a rising vote.

Respectfully submitted,

W. M. MUNSON,
MRS. V. P. DeCOSTER,
CHAS. S. POPE.

PAPERS, ADDRESSES AND DISCUSSIONS OFFERED AT VARIOUS MEETINGS OF THE SOCIETY.

INVOCATION.

By Rev. F. M. Preble of Auburn.

Our Father who art in heaven, it seems to us very fitting that we should pause a moment in the exercises of this day and lift our thoughts and our hearts to thee. We feel that the most appropriate language of our lips should be the language of a Psalm, and the Psalm of Thanksgiving. In the midst of the things which surround us, upon which our eyes look at the close of the harvest season, we should come with the song of praise and thanksgiving, the glad song of the return of the harvesters. "Thou crownest the year with thy goodness, and thy paths drop fatness. They drop upon the pastures in the wilderness. The pastures are clothed with cattle. They also shout, they also sing."

We thank thee this morning for the close of the year and for the exhibitions of our Father's continued prosperity and goodness to us, His children. We feel that each son and daughter of our blessed and well favored commonwealth may say, "My lines have fallen to me in pleasant places. I have a goodly heritage." Surely every child of this beloved State may feel that he indeed has a goodly heritage; and for all that has come to us in the past we feel profoundly thankful.

And we are thankful this morning for the exhibition that is being able to be made here at this time; the fruits of the field, the flowers of the garden, the products of the orchards, are showing the goodness and the mercy and the kindness of our God. We pray thy blessing to rest then upon this exhibition and upon the councils that are here had. Be with the officers of this society, be with all that may be said so that it shall tend to the prosperity, the increase of prosperity in our State, that we may become with the growing years more and more a State where thy favors rest. We pray thee, our Father, that thou wilt indeed be with every session of this convention.

We remember with a great deal of gratitude, some of us men and women who have been called from the fields, the pastures and the orchards, we remember the early days. We pray thy blessing, then, to rest upon the husbandmen, these men and women who come from the fields, come from the places that are nearest to the heart of God for they are near the heart of nature, these men and women who toil, labor and live in the fresh, beautiful country, among the orchards and vineyards and pastures and fields. Help us to learn there where thou hast placed us the lesson of faith and contentment, to hear amidst the flowers as they bloom the teachings of the Divine Master, "Consider the lilies of the field, how they grow, they toil not, neither do they spin." Help us to learn the lesson of abiding in the Divine Master. As the branch abides in the vine, so may we learn to abide in thee. And help us in all our lives to yield the peaceable fruits of righteousness, love, joy, peace, longsuffering, gentleness, goodness, faith, meekness, temperance,—against such there is no law. And so by the means of culture and the means of information that shall come from this gathering of thy servants and thy husbandmen here in our city, may it tend to the increase of contentment and prosperity and peace throughout our borders.

We ask it all in the name of Him who has taught us to say "our Father." Amen.

ADDRESS OF WELCOME.

By Hon. George C. Wing of Auburn.

I must confess that my feelings have been moved and stirred by the prayer that has been offered here. I was taken back a great many years when I, a farmer's boy, was taught those lines of poetry which run something like this:

"The Harvest Giver is their friend,
The Maker of the soil,
And earth, the mother, gives them bread
And cheers their patient toil."

Auburn is distinctively a city of homes, and in her homes hearty hospitality and welcome are ever present for the friend and visitor. She feels an honest pride when permitted to draw the latch and open wide her gates to receive those who are willing to devote their time in showing their respect by paying her a visit. She has been often honored by the presence of distinguished guests, yet she has never been flattered by a call from an organization more respected and more welcome than the State Pomological Society, and now, in her behalf, I bid you, who represent that visiting organization, a welcome to Auburn most cordial and sincere, and at the same time I want to assure you that the interest of all our citizens in this event is something more than usual, and is in no sense artificial or perfunctory.

The benefits to the public and to the State that are directly traceable to your organization are appreciated throughout our entire domain. The rapid and pronounced improvement in the character, quality, variety and amount of fruits grown in Maine, are reasons to convince the most skeptical that a society made up of influential, practical and enterprising fruit growers, is of great and positive value. The assembling together of so large a number of energetic, active members, the discussion of topics of common interest, the comparison of varieties, of methods, of experiments and results, together with that spirit of friendly emulation which is engendered by an exhibition of the character produced by your society, cannot fail to produce results that are far reaching in character, and valuable in outcome.

There is another consideration, which underlies all others. It is your direct dealings with nature. The immediate favors which you obtain from her, growing out of your close and intimate relations, while an inspiration to you, are at once the admiration of every citizen, no matter how he may be employed. The fact that you are able to produce these beautiful fruits and flowers, are results that while stimulating and increasing your self respect, make you the friends of all. The rest of the world, otherwise employed, are obliged to look to you as obtaining from first hands the product of your labor, and ever appreciate results of efforts made in their behalf.

To you as an educated, experienced and painstaking class, I only express the desire of every good citizen when I wish you every success, and in addition a suitable expression of appreciation from all for the great work in which you are engaged, and again assuring you of a most hearty welcome in Auburn, and of my great pleasure personally in voicing the cordial feeling of her citizens, I bespeak for your exhibition here a greater measure of success than it has ever had elsewhere, and a continuance of the great public favor it now enjoys.

I must say that I am surprised at the extent and the variety of your exhibition. It is a revelation to me. I expected a great deal but my expectations are very much disappointed. This meeting cannot fail to have the very best possible results. It should have the attention, the support, the endorsement and the encouragement of the people of this State. It has it now in a great measure but it should be universal.

The State owes you a great obligation and they should not be slow in expressing it. These meetings will be productive of great results. I remember attending about the first of these meetings. The exhibition today is, I should say, ten fold what it was at its beginning. This should encourage all, and in connection with the fruits, the beautiful flowers that are exhibited here are a great assistance and a great help in every direction, to uplift, hold up and continue the moral sentiment of the community. That which is beautiful gives an inspiration that is lasting and desirable to all our citizens, and I personally want to thank you, each and every one of the members of this society, in my own behalf aside from what I say representing the city of Auburn, for your great exhibition here today.

RESPONSE TO ADDRESS OF WELCOME.

By D. H. Knowlton of Farmington.

It was an unexpected pleasure to me that the executive committee conferred at their meeting last evening in inviting me to respond to the words of welcome so graciously extended by our friend Judge Wing, on behalf of the board of trade and the good people of Auburn. I am very glad to say a few words because in saying them I hope that I may not only express somewhat the measure of our gratitude for the cordial reception given us, but also give you here and there an idea or two in connection with the great industry which the Pomological Society represents.

Now the occasion for which we have assembled here is the 31st annual meeting of the society. For some reason, I don't know why, an annual meeting has never been held in either Auburn or Lewiston. It has been held once in the town of Turner, and that is the only instance in which it has been held in the county of Androscoggin. And I can assure Judge Wing and the members of the board of trade whom he represents on this occasion, that we are delighted to be here, and we are delighted to be here because we can show such grand results along the line of fruit culture in the State of Maine.

We had some difficulty in making up our program—that is, some embarrassment in making it up—because when we came to sit down and talk it over, and talk over what appeared to be the needs of the State, we were almost appalled at the magnitude of the crop of apples which we were harvesting here in the State of Maine. And do you know that crop of apples is going to measure fully a million barrels? It is an item of great importance, especially in a year like this when the frost came and froze to death so many things the farmers had counted on for a few dollars. Now we were appalled, so to speak, because we had gone perhaps about far enough in encouraging people to plant trees and to cultivate them, because we had got all this crop on our hands and what were we going to do with it? It was a serious question this year especially, because we had no storehouses in the State to speak of, and another thing we didn't know how we were going to put our apples up—couldn't get any barrels.

haven't got enough now in the State to contain the apples. So we were embarrassed along the line of making up this program, and we decided that we should very largely give prominence to the marketing of the fruit, and to the various manipulations of the fruit that lead up to the marketing. So as one of the chief considerations we have put storage first, and we have called from the Agricultural Department a man thoroughly conversant with the commercial interests of storage, and a practical man from Massachusetts who has a large storehouse of his own and is operating it very successfully, and I am sure you will be satisfied when you come to hear him that his plan is a practical one and one of the best plans for storage in Maine which can be adopted. Last evening in the very pleasant entertainment which was given in honor of our presence here, one of the speakers made the statement that here in Auburn, concentrated in your various moneyed institutions there was more than ten million dollars. Now it has occurred to me that if some of that ten million dollars could be utilized in a system of storage of fruit along the lines of our various railroads here, that Lewiston and Auburn might be made the center of an immense fruit business that would represent a large part of the State.

Then going a little further than that. We were told last night of the new power which is being developed, so that some 10,000 horse power that in years past has been running wild down the Androscoggin river will be soon available for manufacturing purposes. Well, now, why cannot some portion of that be put into the manufacture of barrels and boxes and things of that kind, that will not only help the people who put in the capital but also help the county and the State at large? I sincerely hope that out of this meeting and out of this discussion something of that kind may be developed, and for one I should be glad to see its home in this beautiful city of Auburn.

The export of apples made for the year 1902 from the State of Maine, and by export I mean apples that are sent across the Atlantic, was over 500,000 barrels. So that the measure of the crop last year must have exceeded quite a good deal 500,000 barrels. From these figures I conclude that we are entirely safe in placing the crop this year at a million barrels.

Now I wish, sir, again to express our full appreciation of your numerous courtesies, and I also wish to thank the representatives of the press for the work which they have put into this meeting. I say this at the opening of the meeting because they have done everything that we have asked them to, and they have even done a great deal more to call the attention of the public to this meeting, and to them we owe much for the success of this occasion. And I am sure, sir, that with the united efforts of your board of trade and your people here, we shall have one of the grandest and most successful meetings that has ever been held in the State, and I am sure we shall go from Auburn feeling happy over our visit and grateful to you and your people for your very cordial hospitality.

ANNUAL ADDRESS.

By Z. A. GILBERT, President, North Greene.

Another year of experience in the fruit garden and orchard has brought us together again in annual convention, and with it lays the formality of an opening address from your president. A knowledge of fruit growing in all its relations is not a simple acquirement. There is always something more just ahead—a little further on—that invites attention, a knowledge of which will give its possessor better command of the situation. So whatever knowledge the individual or an association may acquire they never can reach a point where they will "know it all." Study and investigation must ever continue.

In approaching the fruit industry from the standpoint of business success we at once run up against two great factors or divisions of the industry, namely, production and selling. From this standpoint while production is first in order it is certainly of no more importance than is the sale of its products after produced. It is the sale that brings compensation. In the opening of the annual convention one year ago it was there claimed that in our public exercises, and in our individual attention to the business, we have been giving more of study and more of attention to production than to the disposal of the fruits of our efforts after they were in our possession. The situation is not yet essentially changed. There is still a call, a necessity, in fact, for greater efforts to be put forth in working up the market side of our fruit industry. Knowledge has given us such control that production, great as it now is, has but just begun. The people want fruit. How shall we get it to them so that the cost to them will not be greater than the demand can bear, and at the same time the compensation to the grower be such as to stimulate production? These—not production—are the great problems of our fruit industry at the present time calling for attention.

It has generally been accepted that the value of our leading commercial fruits was chiefly controlled by the prices our surplus would sell for in foreign markets. Two years ago this society took measures to keep its members and growers in general posted on the extent and condition of the crop in our country at large, that from such knowledge they might draw conclusions to aid them in deciding upon the best time to dispose of their crop. The present season, without official sanction, your president determined to leave no opportunity unimproved to study the market outlets and the crop of fruit with the view to learning how closely demand and supply control the market prices, and also along with this study the best time for Maine growers to sell.

In the pursuance of this study I have gone far enough to be ready to say that it is a great subject and involves many factors. No man, grower or buyer, single or in association, is big enough to grasp all these factors in this broad fruit-growing country of ours, and determine their full bearing, as affecting the prices fruit ought to sell for. With all the organization that can be effected I question whether it is possible to get any nearer a solution of the problem than we are at the present time.

The people of this country are using up enormous quantities of fruit. It would be rare indeed if a year should ever occur when there is an equally full crop in every locality. There will be some section, some nook or corner where the crop is a failure. Yet those people will not go without fruit. Hence there will be an unlooked for draft from an unexpected quarter to fill that vacuum. These vacancies cannot always be foreseen was their demand measured in extent. An apt illustration, and on a broad scale, is met this year: the crop of fruit in the near-by states of Massachusetts and New Hampshire this year was light. Massa-

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chusetts is a great consuming state. This condition which no one foresaw till it was upon us has given an opening for a vast amount of our choice Maine fruit at extremely liberal prices, and has put many hundred thousand dollars into the hands of our growers that otherwise they never would have realized. And the end is not yet—it has cleared the way of a glut of perishable fruit, leaving the trade in the later keeping sorts open to a healthy traffic.

All of us have known of the great "Ozark apple region" in Southern Missouri and Northern Arkansas—the land of the "Great Red Apples," where orchards have been planted in thousand-acre multiples, and fortunes made in the millions. This year the crop is comparatively light in that important section. The vast stores of York Imperials, Ben Davis, and Johnathans, formerly drawn from that fruitful locality to fill the storehouses of the great cities of the Mississippi valley are not forthcoming. This is another factor serving to stiffen the trade, over which, up to the present time, dealers have not seen it for their interest to public gossip.

Again, there can be no question but there is a general shortage of fruit in European countries where so much of our fruit finds a market. Never in the history of the trade has there been so clean a market abroad at fairly paying prices for such quantities of our surplus as thus far this season.

Further, and the last that space and time will allow of mention the shortage of packages has held the trade at bay. The market could not be choked for the reason there were no more barrels to put them in.

These are the principal factors, that with an immense crop of fruit on hand seeking a market, and the growers crazy to sell, have served to hold an open market free and clear of panic prices, and now quite likely to continue so long as these forces hold control. Better far medium prices and a steady demand than premium prices followed by panic and losses.

Thus it is seen that the distribution of fruit is the greater problem before growers at the present time, and it may well receive chief deliberation at your hands. The production of fruit has but just begun—in fact is in its infancy. So, too, the consumption of fruit is enormous. Where the fruit shall come from and how it shall be placed before consumers, and the producers retain a fair share in the combine is the great problem before us. This fact must never be overlooked, that DOMESTIC CONSUMPTION IS A FAR GREATER FACTOR OF THE PROBLEM THAN THE FOREIGN TRADE.

In accordance with the action of the society at the annual meeting a year ago the officers kept an eye out on the proposed State appropriation in aid of a representation of our State at the St. Louis Exposition in 1904. As soon, therefore, as the legislature at its extra session passed the forty thousand dollars appropriation for that purpose your executive committee made application for a part of the appropriation to be used in aid of an exhibition of Maine fruits at that exposition. The secretary for the commission acknowledged the receipt of the application with the statement that it would be placed before the commission. Up to the present time not one word has been heard from the commission in regard to the application. The plans of the exposition commission in regard to the expenditure of the very respectable appropriation are well known to all. Forty thousand dollars to certify to visitors to the great exposition that Maine is a wilderness and game its principal production and hunting its chief industry! Shades of the fathers looking down upon us in this enlightened year of 1903—but I forbear and stop right here!

"The working system of our society is well organized and in good order. But there is room for more gearing.

"(1.) There should be a statistical attachment that would give us a better knowledge of the extent and increase of planting, and also more definite and reliable knowledge of the actual crop from year to year.

"(2.) There should be more of recorded experiments, carrying the weight of recognized authority. I respectfully raise the question, whether our fruit industry is getting the aid from the Experiment Station that its importance rightfully calls for.

"(3.) There is also pressing need for annual and continued authoritative attention to varieties, new and old, as a guide to beginners in the business. There is too much mistaken planting."

These suggestions I lay before you at this time for your consideration, and for you to take such action upon as it may appear their importance calls for. Congratulating the society on its standing at the present time, and on the extent and merit of the exhibition it has drawn together on this occasion, I announce the convention now open for further business.

THE APPLE IN COLD STORAGE.

By G. Harold Powell, Pomologist in Charge of Fruit Storage Investigations, U. S. Department of Agriculture.

(The following is an outline of an illustrated talk by Mr. Powell on the above subject.)

There has been a remarkable development in commercial apple growing in the United States within the last 30 years following the opening of the interior of the country by the transcontinental railway, and by more recently completed lines. Apple culture at the present time is no longer an infant industry but it ranks as a highly specialized form of American agriculture. In 1900 there were more than 200,000,000 apple trees in the United States which yield from 40,000,000 to 60,000,000 barrels of fruit in a normal season. In the decade from 1890 to 1900 about 80,000,000 apple trees came into bearing or an average annual increase of nearly 7 per cent. during that period.

Nature does not produce her crops uniformly throughout the year, and unless there is some means of equalizing the distribution of the crop temporary gluts are bound to follow in the markets. Not long ago the apple crop had to be sold quickly after harvesting near the centers of production to prevent excessive waste from decay. The quantities received were often so great that the large markets were congested at the height of the season when enormous amounts of fruit were sacrificed for less than the cost of freight. At the same time the supply in many of the larger distant cities and in most of the smaller interior towns, was unequal to the demand, while all of the markets were practically barren of apples during a greater part of the year. The danger from gluts in the fruit market, as in every other industry, is reduced as we master the art of handling the temporary supply by storing it and distributing it at home and abroad in time of greater need.

The cold storage business has developed largely within the last 15 years, and in its broadest economic relation, it is destined to equalize the distribution of fruits, and to increase the demand for them both in domestic and foreign markets. It holds the same relation to the fruit industry that the great railroads bear to the older industries, such as grain, cotton and tobacco. Accurate statistics concerning the magnitude of the cold storage warehousing business are difficult to obtain, but it is probable that there are not less than 600 houses distributed throughout the country that are devoted in a greater or less degree to fruit storage.

The following figures represent the number of barrels of apples held in the United States in cold storage about December 1st of each year since 1898, and give a conception of the magnitude and growth of the apple storage business as a whole:

APPLES IN STORAGE ABOUT DECEMBER 1, 1898-1902.

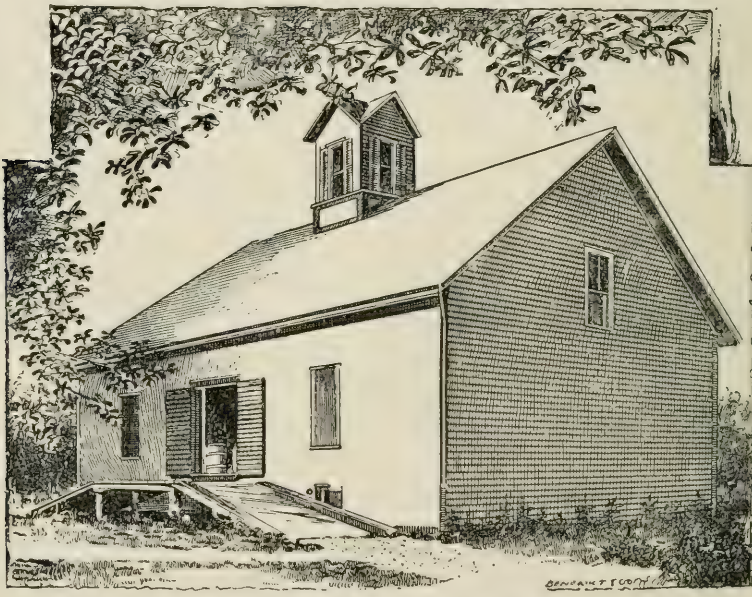
Date.	Barrels in cold storage.	Barrels in common storage.	Date	Barrels in cold storage.	Barrels in common storage.
1898	800,000	400,000	1901	1,771,200	138,600
1899	1,518,750	634,500	1902	2,978,050	1,236,750
1900	1,226,900	794,000			

There are many practical difficulties in the cold storage of apples and these difficulties arise through lack of information concerning the principles which govern the production of the fruit in the orchard and the effect of various conditions of growth, of the different commercial methods of handling the crop in the orchard and in transit, and the treatment of the fruit during transportation and storage, on its vital processes. This condition leads to frequent misunderstandings between the warehouseman, the fruit grower, and fruit handler which might be avoided and the condition of the fruit storage business improved if there was a clear understanding of the principles of fruit growing in their relation to the ultimate keeping quality of the fruit itself.

The United States Department of Agriculture has been investigating many of these problems during the last two years, and I desire to present a few of the practical results that have been emphasized by our investigations.

INFLUENCE OF TEMPERATURE ON THE KEEPING QUALITY OF THE FRUIT.

A fruit is a living organism in which the life processes go forward more slowly in low temperatures. When the fruit naturally reaches the end of its life, it dies from old age. It may be killed prematurely by rots which lodge on the fruit before it is picked or sometime afterward. A cold temperature is designed to arrest the ripening processes and thereby to pro-

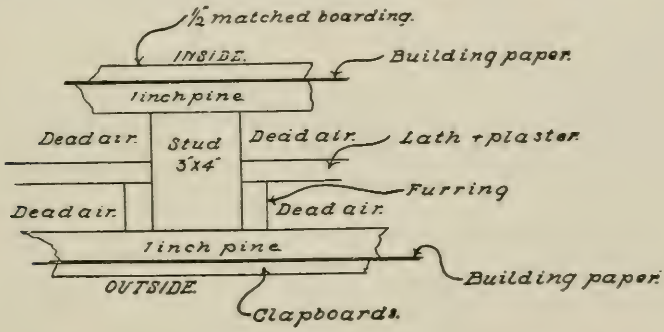


A VERMONT APPLE STORAGE HOUSE.
From Prof. F. A. Waugh's "Fruit Harvesting, Storing, Marketing," by courtesy of the Orange Judd Company, New York.

long its life history. It is designed also to check the development of the diseases with which the fruit is affected, but it cannot prevent the ripening of the fruit nor the slow growth of some of the diseases. The lower the temperature in which the fruit may be safely stored, the more nearly are the ripening processes stopped. In the investigations of the department, apples have been stored in temperatures ranging from 31 to 36° and it has been found that a temperature of 31 to 32° is more efficient in checking ripening than a higher temperature, and that the quality of the fruit and its other characteristics are in no way injured by the lower temperature in comparison with the higher one. The low temperature also retards the development of scald, and the fruit on leaving the storage house stands up for a longer time on account of its being in a less mature condition.

INFLUENCE OF DEGREE OF MATURITY OF THE FRUIT.

In recent years there has been a tendency to pick the apple crop relatively earlier in the season than formerly. It is quite generally supposed that the longest keeping apples are not fully developed in size of maturity, and that the most highly colored fruit is less able to endure the abuses that arise in picking, packing and shipping. There are many economic factors which have influenced the harvesting time of the apple crop. A large pro-



Section Showing Wall of the Apple Storage House.

portion of the crop is purchased in the orchard by comparatively few apple dealers, and with the growing scarcity of farm hands and other labor, it is often necessary to begin picking relatively earlier in the autumn to secure the crop before the fall storms or winter months set in. The great increase in freight traffic has overtaxed the carrying capacity of the railroads and has influenced the apple dealers to extend the shipping season over the longest possible time in order to avoid congestion and the delays in shipping the fruit. In localities where the entire crop is sometimes ruined by the bitter rot after the fruit is half grown, the picking is often begun early in the season in order to secure the largest amount of perfect fruit.

The investigations indicate, however, that the immature and partly colored fruit has not always the best keeping quality. On the other hand an apple that is not overgreen and which has attained full size and high color, but is still hard and firm when picked, equals the less mature fruit and often surpasses it. The more mature fruit is superior in flavor and texture, and is often more attractive to the purchaser and therefore of greater money value. It retains its plumpness longer and is less subject to apple scald. If, however, the fruit is not picked until overripe it is already near the end of its life history and will deteriorate rapidly unless stored soon after picking in the low temperature.

The experiments indicate that so far as maturity is concerned, the ideal keeping apple is one that is fully grown, highly colored, but still hard and firm when picked. Apples that are to be stored in a local cold storage house to be distributed to the markets in cooler weather may be picked much later than fruit requiring ten days or more in transit, but the use of the refrigerator car makes the picking possible when the fruit must be in transit for considerable time in warm weather in reaching a distant storage house.

It has been found that there is a close relation between the degree of maturity of the fruit when picked and its subsequent susceptibility to scald. Apple scald is one of the most serious difficulties with which the fruit storer has to contend. The nature of the trouble is not well understood, but it is supposed to be caused by a ferment called enzyme. It is not a contagious disease and is in no way connected with the action of parasitic organisms, such as mould or bacteria. It appears to be closely connected with the changes that occur in ripening after the fruit is picked, and is most injurious in its effects as the fruit approaches the end of its life.

The scald always appears first on the green or less mature side of an apple. The portions grown in the shade, and under-colored are therefore most seriously affected. When the apple crop is picked before it is matured the fruit is more susceptible to scald than it would have been later in the season, as the more mature and more highly colored fruit is less susceptible to injury. The relative susceptibility of immature and more mature apples is brought out in the following table:

SCALD ON MATURE AND IMMATURE APPLES.

Variety.	Locality grown.	Mature, well colored.	Immature, partly colored.
		Per cent.	Per cent.
Baldwin	New York	3.1	29.2
Ben Davis	Illinois	2.6	15.8
Ben Davis	Virginia	13.1	41.6
Rhode Island Greening	New York	25.4	43.4
Winesap	Illinois	0.2	31.8
Yellow Newtown	Virginia	2.3	9.4
York Imperial	Virginia	2.0	18.2
Average		6.9	27.0

In the practical handling of orchards the fundamental corrective of scald lies in practicing those cultural and harvesting methods that develop maturity and a highly colored fruit. The picking of the fruit when too green, dense-headed trees that shut out the sunlight, heavy soil, a location or season that causes the fruit to mature later than usual and makes it still green at picking time—these are among the conditions that make it particularly susceptible to the development of the scald.

INFLUENCE OF DELAYING THE STORAGE OF THE FRUIT.

The removal of an apple from the tree hastens its ripening. After picking the fruit matures more rapidly than it does when growing on the tree and maturing at the same time. The rapidity of ripening increases as the temperature rises, and the more mature the fruit when picked the less rapidly the maturing processes seem to progress. Fruit that is grown abnormally large seems to ripen relatively faster than medium sized fruit, and different varieties vary widely in the rapidity with which they pass through their normal life history. Therefore, from the theoretical standpoint, any condition in the management of the fruit that causes it to ripen after it is picked shortens its life in the storage house, for it is already so much nearer the end of its life history when stored.

It is probable that a large proportion of all the difficulties with apples in cold storage is due to delaying the storage of the fruit after it is picked. This is especially true in hot weather, and in fruit that comes from sections where the autumn months are usually hot. If the fruit is delayed in piles in the orchard, or in piles or in packages in closed buildings where the ventilation is poor, if transportation is delayed, or the fruit is detained at the terminal point, the ripening progresses rapidly and the fruit may already be near the point of deterioration or may even have commenced to deteriorate from scald or mellowness or decay when the storage house is reached. On the contrary, if the picking season is cool, a delay during a similar period of time might cause no serious injury to the keeping quality.

Delaying the storage of the fruit in warm weather increases its susceptibility to scald. The following table brings out the injury that may be caused by delaying the storage of fruit in hot weather. In this particular case the mean average temperature between September 15-30, 1902, was about 62° F. Fruit picked from the same trees in October and stored two weeks later when the temperature was about 53° F. was not injured by the delay.

SCALD ON IMMEDIATE AND DELAYED STORED APPLES IN FEB., 1903.

Variety.	Picked Sept. 12, 1902; stored Sept 15.	Picked Sept. 15; stored Sept. 30.	Picked Oct. 4; stored Oct 9.	Picked Oct. 5; stored Oct. 19.
	Per cent.	Per cent.	Per cent.	Per cent.
Rhode Island Greening	0	38	(No record)	(No record)
Sutton	0	33	0	0
Tompkins King	0	15	0	0

From the standpoint of the orchardist or apple dealer who cannot secure quick transportation to a distant warehouse, or who cannot obtain refrigerator cars, or who is geographically situated where the weather is usually warm in apple picking time, the local storage plant in which the fruit can be stored at once and distributed in cool weather, offers important advantages.

INFLUENCE OF CULTURAL CONDITIONS.

There seems to be a wide difference in the keeping quality of the same variety when grown under different conditions. It has been observed that the Tompkins King, Hubbardston, and Sutton apples from rapid growing young trees ripen faster than smaller fruit from older, slower growing trees, and therefore reach the end of their life history sooner. From older trees these varieties have kept well until the middle of April, while from young trees the commercial storage limit is sometimes three months shorter.

It has been observed that Rhode Island Greenings, Mann, and Baldwin apples grown on sandy land ripen more rapidly than similar fruit from clay land where all the other conditions of growth were similar.

In the southwest in the younger apple growing sections where the orchards have been planted on new land, the trees grow rapidly and produce an abundance of fruit, but under these conditions the keeping quality of the fruit does not appear to equal that of the same variety from older, slower growing trees.

It does not follow, however, that the longest keeping type of the same variety is the most valuable. An apple that is large and highly colored, brilliant in color, and with commanding style may be worth 50% more—though it will not keep longer than early winter—than the same variety grown under other conditions that causes it to be small and poorly colored and giving it a keeping quality until the spring.

INFLUENCE OF THE TYPE OF PACKAGE.

There has been a good deal of discussion concerning the relative value of closed and ventilated barrels for apple storage. The investigations indicate that the chief advantage of the ventilated package lies in the greater rapidity with which its contents cool off. Apples in a ventilated package, if the ventilation is considerable, are checked in their ripening processes sooner than those in a closed package, and the influence of the package in this respect is most marked with varieties that ripen entirely and in hot weather.

Apples in ventilated packages, however, are likely to shrivel if the fruit is stored for any length of time, and it is, therefore, not practicable under the present commercial methods of storage to store fruit in packages in which there is much exposure of the fruit to the air.

The smaller the package the quicker the fruit cools off, and therefore the sooner the ripening processes are checked. It has been observed that apples kept longer in bushel boxes than in barrels on this account, and that the fruit can be held much later in the spring in the smaller package as the weight of the fruit itself may cause it to bruise after it begins to mellow.

INFLUENCE OF WRAPPER ON KEEPING QUALITY.

It has been found that a fruit wrapper may influence the keeping quality in several ways. It appears to retard the normal ripening of the fruit and thereby extends its life history. The wrappers are usually useful in extending the season of early winter sorts, or in making the long keeping varieties available beyond the usual period of storage.

The greatest value in the wrapper appears to follow the protection that it gives the apple against bruising and the discoloration that may result from improper packing or rough handling, but especially in preventing the transfer of rot of one apple to another. If the fungus is capable of growing in the storage temperature, it is not likely that the wrapper retards its growth, but it confines the spores when they develop within their wrapper, and their dissemination is difficult or impossible.

The importance of a wrapper in protecting the fruit from decay is brought out by the following table:

AMOUNT OF DECAYED FRUIT APRIL 29, 1903, IN BUSHEL PACKAGES.

Variety.	Newspaper wrapped.	Unwrapped.	Variety.	Newspaper wrapped.	Unwrapped.
	Per cent.	Per cent.		Per cent.	Per cent.
Baker	3.7	27.2	Northern Spy	5.6	52.0
Dickenson	6.4	43.0	Wagener	38.0	63.0
McIntosh	7.7	15.0	Wealthy	42.0	60.0
McIntosh (second lot)	19.7	32.0			

The double wrapper is more efficient in retarding ripening than a single wrapper. A good combination consists of a porous newspaper next to the fruit with an impervious wax or paraffine wrapper on the outside.

From the commercial standpoint it would not be profitable to wrap the common grades of fruit, but for the finest grades, and for the tender varieties like McIntosh, Wealthy, Northern Spy, Belleflower, Jonathan, and Grimes, it is probable that no operation connected with the packing of the fruit would bring greater returns.

BEHAVIOR OF THE FRUIT WHEN REMOVED FROM STORAGE.

There is a general impression that cold storage apples deteriorate quickly after removal from the warehouse. As a matter of fact, however, storage apples do not deteriorate more quickly than other apples that are equally ripe and are held in the same outside temperature. The rapidity with which the fruit deteriorates on removal from storage depends, first, upon the degree of maturity when removed, and second, on the temperature into which it is taken. Late in the spring the fruit is far advanced in its life and the weather is becoming warmer and therefore the apples break down more quickly at that time than early in winter. In commercial practice a large proportion of the fruit is held in storage late in the season for an advance in price, and the owner removes it not because the price has advanced but a longer storage would result in serious deterioration from advanced rots and over-ripeness. When a considerable amount of stock is decayed on removal from the warehouse, the evidence is conclusive the apples should have been sold earlier in the season.

The following table shows the amount of decay on Baldwin apples removed from the same barrel to different temperatures.

AMOUNT OF DECAY AFTER REMOVAL FROM STORAGE TO DIFFERENT TEMPERATURES.

Variety.	Date removed from storage, (1903).	Date inspected.	Per Cent Rot.			
			44° F.	48° F.	61° F.	67° F.
Baldwin	Jan. 29	Jan. 29	0	0	0	0
		Feb. 10	0	0	3	10
		Feb. 13	0	0	12	14
		Feb. 16	0	0	21	24
		Feb. 20	0	4	23	28
		March 3	5	10	....	....
		March 7	5	15	....	....
		March 24 ...	20	....	....	....
		April 6	36	....	....	....

THE IMPORTANCE OF GOOD FRUIT.

Apples do not improve in grade in cold storage. In handling a crop too much care can not be given to grading the fruit properly before it enters the storage house. The contents of many packages are injured by the spread of disease from a few imperfect apples. Rots enter the fruit most easily wherever the skin is bruised or broken, and in the early stages of the rot development it is common to see the diseases manifesting themselves around worm holes or bruises occasioned by rough handling, from nails that protrude through the barrels, or from other causes.

When the crop is light it may pay to store apples that are not of the first grade, but such fruit should be rigidly eliminated from the best stock and stored where it can be removed earlier in the season than the better qualities.

The attractiveness and the value of the best fruit is often injured by careless handling. A bruised spot dies and discolors. Finger marks made by pickers, graders, and packers, and injuries from the shifting of the fruit in transit or from rough handling, become more apparent as the season advances. In fact, all of the investigations of the department of agriculture emphasize the fundamental importance of well-grown, carefully handled fruit in successful storage operations.

FRUIT STORAGE.

By JOHN W. CLARK, North Hadley, Mass.

Some years ago in growing berries, I found that I wanted something where I could hold them a little to cool them off and I built a little house, a lean-to from my icehouse that would hold —if I call it apples—about thirty bushels of apples. This I run for about four or five years and I found that with berries I did better to get them to market as quick as I could and not put them in it. But if I wanted to ship them I could put them in the house and take the heat out of them and get them cool, put them in there for a few hours, and then I could ship them and they would ship better.

Well, I made up my mind that I wanted a larger house for apples and I looked the matter over and figured on it, and I built a house without ever seeing one before. The house works well and it has proved a good investment and it is a simple, cheap kind of a house.

In order to keep pace with the changes that have taken and are taking place in the handling and marketing of our different fruits the orchardist must change the methods of conducting his business in such a way that he can keep pace with the times and secure the greatest possible returns on the capital and labor invested in his business. To do this he must understand that success does not depend on any one branch of his business, but upon each separate branch being conducted in a careful business-like way. One may have a good orchard, but if the fruit is not well grown and free from imperfections or disease, or if the fruit is well grown but not handled or marketed as it should be, the returns to the grower will be smaller than they might have been, or as it proves in many cases the balance is on the wrong side of the ledger.

The orchardist must not wait until the fruit is ready to be picked before he takes any notice or care of it; he must begin as soon as the buds start their growth in spring to see that the different insects or diseases do not get a hold upon the tree or fruit during its season of growth, that the fruit may go into storage well grown and free from disease or imperfections.

Cold storage does not add anything to the appearance or quality of the fruit. An apple never looks any better than when it is first picked from the tree if properly ripened. Cold storage simply retards the ripening of the fruit and checks the rapid spread of whatever disease it may be affected with. Neither decay or spread of disease will be entirely checked unless the fruit is kept continually frozen, but they will go on more slowly as the temperature approaches the freezing point. One cannot put poor and imperfect fruit in storage and take out good.

Apples as a rule, to give the best results should not be picked before they are fairly well colored. The Baldwin for example, if poorly colored is more apt to scald than when well colored. Different varieties of apples vary in their ability to withstand scald while in cold storage. An apple should not be left on the tree until it is over ripe before being picked or its life will be short even in cold storage. Apples should not be put in heaps upon the ground or kept in a warm place, for they ripen much faster after being picked than before. An apple that begins to ripen before it is put in cold storage will continue to ripen after it is stored but much slower, while an apple that is picked at the proper time and placed at once in cold storage will keep almost indefinitely.

The house that I have was built in 1898. The building is 42 feet by 32 feet with 7 feet posts with 2 x 4-inch studding between. On the outside the house is boarded with Novelty siding; building paper is put between the studding and then boarded with matched pine; this is papered, then 2 x 4-inch studding is put up and then boarded; the 4-inch space made by this boarding is filled with charcoal dust; paper is put on this boarding and 2 x 4-inch studding again put up and again it is boarded. This makes a wall about 16 inches thick with three four-inch spaces, the middle one filled with charcoal dust, the outside and inside spaces dead air spaces. The foundation is of stone with six courses of brick for underpinning.

In the roof above the main part of the building is an ice box 6 x 9 feet running the whole length of the house. The floor beneath the ice is covered with galvanized iron and inclined one inch to carry the water from the melting ice into a gutter from which it is carried by waste pipes to the ground into a tile drain. Extending the whole length of the ice box on each side is an open space fifteen inches wide connecting the ice box with the main part of the house for the circulation of air between the two. In each end of the ice box are double doors for putting in the ice which is stored in an ice house near the rear end of the cold storage. The ice is drawn up to the ice box by a horse and pulleys. About 200 twenty-inch cakes are used to fill the ice box, which must be filled three or four times to carry the apples through the season.

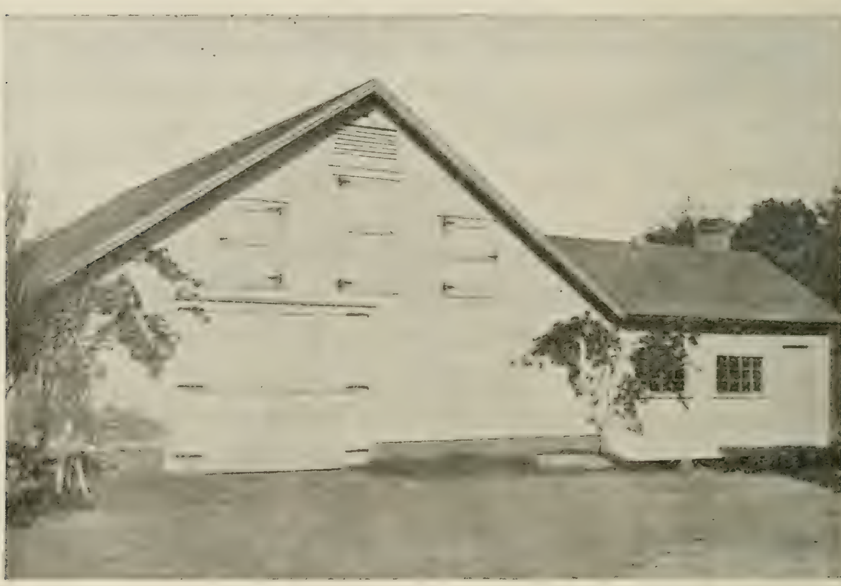
In the main building at each end are double doors, between these are sliding doors with iron rods three inches apart to keep out intruders when the house is left open at night to cool it down. The floor is of brick with the exception of a concrete driveway nine feet wide and a walk four feet wide to the work-room which is 22 x 14 feet, connected with main store-room by doors.

When ice alone is used to cool the house the temperature will not be lowered much below 40° F. When frosty nights occur the house can be opened and the temperature inside lowered to 32° F., at which the house should be held if possible.

In running my house cold weather has never troubled me. As long as it is cold outside there is little variation as the heat of the earth rising through the brick floor prevents the house getting too cold, while the ice in the ice box regulates the temperature during the warm days that come in winter. Ice should be kept in the ice box as long as the fruit is stored in the house.

Trouble is often experienced from moisture condensing on the fruit and inside of the house. In caring for my house I have experienced little if any trouble to keep the house dry if care is taken not to open the house and admit the outside atmosphere when it is warmer than the temperature inside, for when a warm atmosphere strikes a cold surface its moisture is condensed and deposited on that surface; but this never happens when a cold atmosphere comes in contact with a warmer surface and it has been my practice to open my house cold nights during the fall to help lower the temperature inside and save the ice.

When I left yesterday my house stood about 35, and I can keep it there right along probably until we have cold weather when I can get it down as I want it to about 32 degrees, and I actually think that I can take apples right from my orchard and put them in there every day as fast as they are picked—pick them and put them in barrels, and putting them in barrels I don't head the barrels. I let the barrels stay open for then the apples are warm—if gradually chill through and will keep steadily cold, and as I said, I really think that by putting my apples in at once every day as they are picked, starting at 40 degrees and keeping them at forty degrees for two or three weeks until you can get the temperature lower, I can keep those apples as long as if they had been out a



John W. Clark's Cold Storage House, Showing Front and Work Room.

week, shipped to Boston and put in those artificial cold storage houses where they put the temperature right down the first day perhaps to 28 and then raise it to 32 and keep it continually at 32—I actually think I can keep my apples in my house as long as they can in that house if those apples have been out a week or ten days. That has been my experience. Now I know one year I had some 600 barrels of A1 Baldwins in a room in a cold storage house in Boston. I went there in the middle of the winter and we went into the house and looked at them and they were just the same as when they were put in, didn't look as you will go in the house after those apples have been in there it will almost seem like an oven until those apples get cooled. After a day or so, the top of the apples are cooled and they will though they had changed at all, really looked greener it seemed to me. I went into another room that was kept just the same temperature and there were half a dozen men in there picking over apples and those barrels were half of them a mess of rot. They were apples that the dealers had had shipped them, or bought, and finding little or no sale for them in the fall, the markets were so filled with apples, and what to do with them they did not know but thought it would be the better way to put them in cold storage. Well, those apples had begun to ripen and they continued to ripen there. While in one room apples were kept way into the spring. On my lot of 600 barrels, the shrinkage was only half a barrel, apples picked and barreled in the orchard and probably not over four days' time from the tree to the city storehouse, if there was that. So that after apples have

Rear of Mr. Clark's Cold Storage—Filling Ice Box.

begun to ripen they will gradually go on, as Mr. Powell has said, they will gradually go on and ripen in your cold storage.

Now in running this house of mine, I found that I needed ice in it in winter just as much as I did in summer. Now my house is built with a brick floor, except a concrete driveway nine feet wide and a walk to the work-room four feet wide. I built it of brick for this reason. If I put in a floor of wood, or if I put in a solid concrete floor, as I found by some that have done it, the air in the house is liable to wither the fruit if the fruit is open, but with a brick floor there is the moisture gradually coming through that brick into the atmosphere which keeps the fruit from ripening. Now last year I was bothered for want of barrels. I shipped some 1,600 barrels to Boston and had them stored, then I stored the balance of mine at home, filled my house with bins. The inside of the house is about 29 x 39 feet. It will hold about a thousand barrels. I had this solid, three bins high, and with only one walk, narrow walk, through the house, and those apples were in bins and they kept just as sound, just as plump as when they went in.

Now I find in my experience that the best way I can handle my apples is when they get to a certain stage of ripeness to pick them just as quick as I possibly can get them off the tree. Now if there are no storms the first week or ten days after the fruit is ripe enough to pick it won't drop of itself much of any. After that, if there is any wind, it will begin gradually to drop and as you continue picking for two or three weeks or a month you sometimes will find half of your crop has dropped from your trees. Now an apple that has dropped is not worth over half price in the market what it would have been if it had been picked and properly handled. That none of you will dispute. Now if I can hasten the time of picking a week by putting on all my help but just what I need to run my apples over and barrel the A1s that I have to send in, if I can put all the rest of the help on the picking, why I can hurry up my work very much indeed. Now this year I had about 800 barrels of apples. Well, I got in help enough and had it all cleaned up in three days. It will more than pay the extra that you will have to give for your help. I pay them a little extra. I told them if they would come and stay by me I would give them so much, if they didn't I wouldn't give them but so much—and they all stayed. Every barrel that I can save from dropping I save a dollar on. That I guess any one that has handled good fruit won't dispute; from a picked apple to a dropped apple there is at least a dollar's difference in the price. So that it hastens the time of picking and saves loss from dropping. Then it gives you a chance to hold this poorer or cheaper grade of fruit until they are cleaned up in the market and you can get instead of eight cents a bushel that I got, 25 cents a barrel for apples sent in the fall, $1.80 in the winter—you don't always do that—last year my dropped apples I got about $1.35 when in the fall they wouldn't have been worth,—well, you couldn't have sold them for cider apples. Then it lets you hold your fruit until the market calls for it, if you store your good fruit, or if you haven't any storage for good fruit you have got to sell it in the fall, for if you haven't storage the sooner you can get your fruit off your hands into money the more money you will have, even if the prices are low, because fruit goes back very fast and there is a great deal of waste and cost in handling it. Now of course the barreling—when you have it in cold storage you can do it in the winter without hiring as much help, when help is more plenty than it is in the fall, and you can very often do it without hiring any at all, any extra help. So that you gain in this way, you save the loss from dropping, you save your cheaper grades of fruit and get something out of them. And I usually intend to have these cheaper grades pay my bills, and my good fruit I have for myself, or try to. So that I have found that running this house has paid me and I really couldn't get along without it and handle my crop as it should be. Because it is hard to get help in the fall.

Mr. ATHERTON: Mr. Clark, I would like to inquire if you have any means of ventilation otherwise than by opening the windows and the doors?

Mr. CLARK: There are no windows in the building. I have a scuttle over the ice box that I can open but I don't open it. I find I can control it full as well without opening that and it seems as if I save ice by not opening it. When it is warm it seems as though the ice near that scuttle goes a great deal faster than it does when it is closed, and as the air comes from the chamber underneath, comes up over the ice and down as it grows colder, this circulation keeps the house, I think, full as cold and a little colder perhaps than as if I had ventilation, had this open; although I open it some and in the fall, frosty nights, and that leads us now you speak of it, perhaps I had better speak of that—I open the door in the main part of the building and also up in the ice box, each end, because when there is a difference in the level of the doors that are open there is a better circulation of air, and I cool the house down better with the same cold outside than I would if I simply opened the lower one and left the upper one closed.

Mr. ATHERTON: Now there is one other question I would like to ask you, what means have you overhead—now a friend of mine who has what I call an ideal fruit house, in my judgment it is better than artificial cold storage—it is what I call natural cold storage—round the walls about 14 inches he fills with sawdust, overhead he has hay stored, not keeping any stock at all, he has means of ventilation at the side of the barn floor, and I think he has underneath the barn floor, he has sawdust space there, a space constructed so he can put sawdust there but otherwise he has hay there. Now I would like to ask what means you have in your cold storage house overhead to keep the air from above?

Mr. CLARK: Why this same wall that goes all about the building, the ice box is boarded the same as the rest of the building; four boardings, three spaces, two of them air spaces, one, the middle one, filled with charcoal dust. But round the ice box the spaces are not quite as thick, one of them I think is not over 1½ in., none of them over 2 in. Around the main part of the house the space is four inches in each, that is, the air chambers and the charcoal. The posts of this building are 7 ft. so that if I store them in barrels I pile three barrels high on end, and store, as I said, about a thousand barrels of apples.

Q. I would like to know if the top barrel keeps as well as the bottom barrel?

Mr. CLARK: I have not seen any difference.

Q. The ice probably takes care of that?

Mr. CLARK: The ice will probably take care of that. Constant circulation will keep it pretty even.

Q. Why do you pile your barrels one on top of another?

Mr. CLARK: I don't put one barrel just over the other. I have them alternate. I don't fill the barrels full enough so that the fruit is above, and you won't hit the fruit, that is, to bruise it. In your lower row there will be one barrel more than in the next row, that is, you lose one barrel, and in that way you can pile your barrels up and leave an open space so that the air from the house can go down into the barrel and the warm air come out.

Q. I would ask about the expense of the building.

Mr. CLARK: Of course that will depend on the price of lumber. When I built the house I had the carpenters put the house up, and board it on the outside and make the doors, and we went to work and finished it up ourselves, and this house cost me about $1,000 in money beside the labor that we put in ourselves. I built it five years ago. Probably if I had hired all the work done and everything it would have cost me about $1,500.

Q. What is the expense in Boston cold storage houses for the season where you have stored your fruit you spoke of?

Mr. CLARK: The expense of putting apples in these large storehouses of course depends on the amount that you put in. Last year it was easy to get storage space. This year I was told in the Quincy Market cold storage house, controlled by a trust now, it is almost impossible to get them to offer you a space in the cold storage house because they are using it for butter and eggs and that class of products which they hold longer and charge them more for the space than for apples. The firm that I have shipped to ever since I began, engaged space last year for 5,000 barrels, they said they were going to; well all of mine went right in that I shipped, some 1,600 barrels. This year they said they began in July to try to engage space and they wouldn't promise them any, and they did get space for a carload for me and I shipped them, then they told me to ship and take the chances, so I billed right to the cold storage house and they wrote me they went in all right, but you took your chances. So it is harder to get space now than it was. There is cold storage in Springfield, Mass., that is twenty miles below where I live. Their price for the season was 40 cents a barrel. In Boston, the price for 5,000 barrels for the season, that is from October to May, after the first of May it is so much a month per barrel, but it is about 35 cents a barrel, that is what it costs. As far as the cost of this storage being an expense to the grower, it is not. Why, just think of it! I put in 1,600 barrels of apples in the cold storage in Boston last year, right from the orchard as they were barreled. When they sent me my check for the apples, the number of barrels of apples was not a single barrel less than what I sent. There wasn't a single apple for shrinkage discounted, while if they had been in ordinary storage there would have been more than 35 cents a barrel waste. Without any decay it would have taken more than that to fill the barrels what they would have shrunk. So that when you come down to the cost of cold storage, if you will figure the shrinkage and waste of your apples in common storage, you have more apples in the spring than you have with your common storage and your storage has not cost you anything, in fact you have made money by putting them in by saving shrinkage even if there is no rise in the price of fruit from fall to spring.

Q. How long did those apples that you speak of remain in cold storage?

Mr. Clark: There were about 300 barrels of Hubbardstons and Kings and those of course were sold early in the season. The rest were all Baldwins and they didn't sell them till way into March, begin on them, and way into May before they closed them up.

Q. Did you give us to understand that there was no shrinkage on those apples?

Mr. Clark: Not a single apple did they discount on.

Q. But the apples shrunk?

Mr. Clark: Not enough to have to fill the barrels.

Q. What we want to know is if cold storage in Boston will hold an apple from picking time up to March without the general shrinkage that it would get in common storage?

Mr. Clark: It will hold it with a great deal less. Two years before I had 600 barrels in there, they didn't look them over at all, they just took one barrel and when they found a barrel that was a little slack they put in an apple here and there to fill it, and they took one barrel to fill up the 600 barrels so that they were fit for sale. This last year I got them in there sooner and they didn't shrink me a single apple on 1,600 barrels.

Q. Can you tell me where these apples were sold?

Mr. Clark: Right in the markets of Boston. They were not shipped.

Q. Speaking about the difference between cold storage and common storage, did you put your house in the class of common storage, or the common storage of farmers?

Mr. Clark: Common storage as farmers.

Mr. Gilbert: In connection with this matter of home storage of fruit, I will ask Mr. F. H. Morse of Waterford to describe to you a fruit house he has constructed on his own premises.

Mr. Morse: Perhaps I will spend just a minute in telling you why I needed it. In the spring of '86 I bought an old farm, a mile and a half or two miles from my place, well covered with natural fruit apple trees, very thrifty, and all they needed was grafting and caring for to make them bear. The next spring I grafted and also bought 300 more trees and set those out. Well, very soon I found that I had got to have some place to put the apples. There were old buildings on the farm but of course they would only keep apples for a very short time, and that left me wholly at the mercy of the buyers to sell just as soon as they were picked. Well, I am a little bit of an independent disposition and like to use my judgment instead of being obliged to sell at just such a time, so in the summer of '94 I began to look around to find out what was the best provision I could make to store these apples. I went to Harrison and saw Mr. Dawes' fruit house, but he could keep his only by keeping a fire. I then went to the State Fair, and spoke with all the members of this society whom I could conveniently and whom I knew, and I wished very much to go up to Franklin county to Mr. Whittier's and see his house. I finally went up there with your Secretary and saw Mr. Whittier's. I came back to the State Fair and the first man I met was your president, and he gave me just the hints that I wanted to build the house I contemplated building,—he gave me the general idea, I had to work out the details myself. We had an old stable on the place which we tore down and moved down where we wanted this, and it is built wholly on the cold air—the dead air space principle. As you remember, Mr. Clark's house was built with the middle space filled with charcoal dust, but ours is simply cold air, dead air. We made three dead air spaces, very much the same as he only that instead of using one thickness of board and paper, we used cheap boards and paper between, being very careful indeed to break all the joints so that it would be dead air. I might say here that if any of you do it, you don't want to leave it—I don't care how good a carpenter you get or how good a man you have—you want to oversee that part of it yourself unless you can find better men than I could. They won't realize the necessity of a complete air-tight space enough to do the work as it ought to be.

Ours is built a little different in one other respect than his. The floor, instead of being brick and concrete, as his is, is wood. We were very particular to have the underpinning fit and then we used a mixture of lime and cement to point up with, and that work had to be done very thoroughly indeed so that it would be entirely air-tight, except that we left of course, had to leave two open windows to let in air or the floor would rot out in a very short time, and also as I have used it since to get ventilation. Overhead ours is simply double-boarded on the flooring with paper between, and then at the same time, whenever we have stored apples we have had a small quantity of hay up there —we use it partly to store hay but mainly for the storage of barrels, but we intend to have a little hay there. We thought we could do that cheaper than we could put in three air spaces as we did on the sides. We used this house, we put in our first apples in 1895. We have used it more or less every year since, and for a cheap building that any one can construct I don't know of anything that equals it. It seems to me from the experience that I have had, that it isn't so much the cold air as it is the even temperature that keeps the apples. Now we put our apples in there, and whoever we have sold to, and whoever has packed them, whether it was in November or February, has without one exception said that they never have seen apples that kept so perfectly as they did in that house. I sold one year when we had a very small crop sixty barrels to a man and he took twenty of them out Thanksgiving time and the rest he wanted I should keep, he thought, till Christmas. Well, they finally stayed there until the 10th of February. They were just three months from the day they were sorted. They kept so well that he didn't sort them at all. They shrunk a little, he filled the barrels and shipped them just as they were without any sorting at all.

Q. About the ice, Mr. Morse, how did you arrange to store ice?

A. I didn't use any ice. I neglected to make that point. Mine is simply a storage house, not cold storage, the cheapest way possible.

Q. I would ask the speaker how much shrinkage there would be?

A. I think they took about two bushels to fill the forty barrels full enough for foreign shipment, if I remember right. That was five or six years ago, but I am sure that was about the amount they used.

Q. You put them in barrels?

A. Yes, sir, usually, but I found three years ago we had nearly 700 barrels that year and the house was only supposed to hold 600 barrels as they are set in, just as they set them in in barrels, three tiers high. We found when they were about half picked that the house was not going to hold the apples that we had, so instead of putting them in the barrels, we had them set up clear across the back side of the house, then left a space perhaps five feet wide inside, up two tiers with my barrels, and put them over in behind. We did that in two different places so that when we had the house full there were two bins running clear across this building 23 feet, with the apples perhaps five or six feet deep in these bins, and I found when we came to take these apples out—when we commenced to pick it was very warm weather indeed and we picked from 50 to 100 barrels a day—and this brings me to a point I forgot to mention. In building this, it is built simply with a door in the south end. I didn't have any door to drive through—I think Mr. Clark's has a door in each end—but there is a door in the south end and a window in the south corner, and another in the southwest corner, so it makes that corner light enough for packing purposes; but in setting in so many of those apples in the barrels and picked in such warm weather, I found they were very slow in cooling off. When we came to take them out the apples that were put in first, they showed the effect of the warmth a great deal more than those that were picked later, so last year and this I have used a large bin running clear across the building with the boards put apart an inch or so, so as to give a chance, and also build up from the floor a little, so as to give a circulation of air in there around this bin. And I cut a hole through the floor back of it, so I got a draft of air through the floor back of the bin and so through the apples, and in that way it cools them off more readily. And if I were to build another—as soon as I can get to it I intend to do it—a year ago this summer if my health hadn't failed me I should have bought this round tiling about a foot in diameter and laid two rows of that off through the ground perhaps thirty feet, and had that come up on the back side of the building so as to get a cool draft of air to come up from the ground to a depth that would have cooled the air as it came in. I have a stairway that goes up into the upstairs from the main part of the building, which I can push up or down according as I want it, close it up or not. So when I want to open it, with that open, and the ventilator up chamber, and this ventilation that I intend to put in—I have now a hole cut in the floor which makes some—I think I can cool them in the back part of the building as readily as in the front. The winters I have kept them in there, I have been in there several times and the thermometer would not vary somtimes a degree in a month or two. I almost thought while Mr. Clark was talking yesterday I could hold them more evenly than he did with his ice, but I suppose I am a little egotistical on that point. But certainly for anything that is so cheap, and anything that any one of you can do—now if a man has any space, any barn room, one part of his barn that he can spare, by fixing it up with these air spaces it is just as good as to build a separate building. You see I am at a disadvantage. This building is a mile and a half away from my home. If it was right at home I could go out in the evening and open all the ventilators and let in the cold air and I think I could have it down way below forty —it was almost down to 40 Monday. Mr. Clark told you that home storage house down to forty was as good as cold storage I believe at 32 in his case. I have been there a few times during these cold snaps and opened it, and have gone up when it grew warmer and shut it up, and in that way I think it was down to 42 or 43 when I was up there last. Of course this warm weather it may work up a little but it is so gradual the apples don't change as they would in an open building.

Mr. GILBERT: Have you held your apples through any considerable, prolonged seasons of low temperature?

A. The year that we had those 40 barrels that I spoke of in there, he said he would like to leave them there, as I said, until about Christmas, and I simply shut the house up very carelessly and didn't put on any battens as I should have if I had supposed they were going to stay till February. About ten days before he took them the thermometer went down to 25 below zero, and those apples they had chilled the least bit, but not so but what they barreled them up as they were. It was an old buyer that bought them. Of course they couldn't have been very badly chilled or he wouldn't have shipped them without thawing out. If I had known they were to stay there I could have had it warm enough. There is not the least trouble to keep them from freezing if you attend to it properly. I don't worry a mite about that, I shouldn't about keeping them from now to next April if I thought it was the proper thing to do as far as the market goes.

Mr. POWELL: I take a great deal of interest in this home storage question and I want to make just one suggestion. The State of Illinois appropriated about $10,000 two years ago to take up the question of fruit storage among other things. They have been paying special attention to the construction of these farm storage houses and the University of Illinois constructed a farm storage plant on the lines that they thought

STORAGE HOUSE OF CHAS. L. GREEN, EAST WILTON.

Mr. Green kindly furnishes the photograph and sends the following description of his storage house built in 1903.

In reply will say the building is 30x40 feet with 12 foot posts. We dug the cellar out of a steep, hard gravel bank with end to the south. This permits the team to back the apples into cellar without unloading. The walks of the cellar are built of quarried granite laid solid in cement.

The underpinning is of granite pinners laid in Portland cement and lined with brick. This gives me a cellar three barrels high and will hold 1,000 barrels or that amount in bulk. I store them the latter way.

The building is sheathed on outside with matched hemlock. thick sheathing paper outside of that then clapboards and paint. The inside is sheathed 8 feet high also overhead. We then set another course of studding clear round and sheathed again. This gives two dead air spaces and three matched sheathings besides paper. clapboards and paint. The floor between this room and cellar is double with hemlock for under course and matched beech on top and heavy paper between. This room as well as cellar has double doors and windows with matched board blinds inside of windows. This room will hold 1,050 barrels with some room to spare. The attic has room for perhaps 1,200 empty barrels. This makes a very handy arrangement for an apple store house. The cost of this building is about $1,200.

would be advisable for farmers to construct them for that country. The suggestion I want to make is this, that in case any one desires to do it, you write to the University of Illinois at Urbana, and ask them for their bulletin describing the cold storage house. They will send you that bulletin without any charge. It gives all the plans, specifications and drawings, with cost of lumber and other things, in the construction of this house. There are several things in that house different from any other house that I have seen. They were able to hold it for eight months in succession at a temperature of 33 to 34 degrees.

FRUIT PACKAGES.

By D. H. Knowlton.

One of the important questions which arise in connection with our great fruit crop, not only this year but in years to come, is—What shall we pack the apples in? A few years ago when any one said anything about boxes he was almost hooted, because nearly every one said the ideal package for apples was the barrel. I have always believed in the box or basket or anything else for a package that would enable us to sell our fruit. A great many times I am asked what is the best package, and I almost invariably tell people, any package that will enable you to sell your fruit to the best advantage. A gentleman at Farmington who is interested in growing fruit has asked me repeatedly, "Why don't your society determine what is the best size for a box?" Well, now, I don't know what it is. I don't think anybody does. Perhaps we may never find out. But this is true and is going to be verified in the years to come, that the man who packs his apples in a box or basket, or anything else, that people like and fancy, his apples are going to sell. And that is just the secret of this whole thing. You cannot make a law that will determine it or anything of the kind.

The difficulty of obtaining barrels this year seems to be the turning point with many and we find many are now favoring the box. There has been a great change in sentiment and the question comes, What kind of a box? Well, there are several kinds of boxes being used. Some like one kind, some like another.

No one yet knows which the best kind is. There are several kinds in the hall. The box which I now show you is one to which considerable interest attaches. You see upon the box there what it contained when it came into our possession. It was a box of Oregon Spitzenburg.

Now as to how these apples were put up, you see these pieces of blue cardboard in my hand. In the bottom of the box was one of these pieces of blue cardboard. Each apple was wrapped in white paper. There were four rows as I remember it of apples in each layer. Then after the first layer was in, another piece of blue cardboard went in, and so on through the box, and at the top went one of these sheets of cardboard laid over the whole. That was the shape we got that box in, and that is the Oregon style of apple box, and I think it is about the same size as most of the apple boxes from the Pacific states that are found in our Eastern markets.

In the back part of the hall are several boxes to which I wish to call attention. There are several boxes there from the Wells, Higman Company of St. Joseph, Michigan. We found quite a lot of those things in Boston at the meeting of the American Pomological Society, and I thought it was an entirely proper thing for the fruit growers of Maine to have an opportunity of examining them. The largest Michigan box manufactured by this concern is the one with the small red apples in. It contains a bushel. I won't trouble to give the dimensions of these boxes because you can see them there for yourselves. Those sell according to the price list which I have in my hand at $10 per hundred there. It is a hardwood box. There is another box there in which the Northern Spies are packed. That also is a bushel box. The price of that box is $7 per 100 on the cars, where they are manufactured. There are also some smaller boxes. One of them is a half bushel box. I don't recall exactly what the price is. Mr. Nowell in Boston called my attention especially to some baskets that came from this same concern that were on exhibition there, and so when I sent my letter to them I requested them to send me also some of those baskets. The bushel baskets are popular for the selling of peaches and they are also using them very largely in Michigan this year for the marketing of apples. A letter under date of October 22 from these manufacturers says: "Barrels are worth forty cents each here and there are not enough to supply the demand. Have you ever tried bushel baskets with slat covers for shipping apples? A great many are using them in this section. We can furnish you bushel baskets with covers delivered to Boston in car lots at $1.50 per dozen." In another letter they say: "Nearly all of our large peach crop and a good share of the apple crop in Michigan has been marketed in bushel baskets. This package seems to be growing in favor with the shipper everywhere."

In connection with the berry and fruit packages which are exhibited on the table—and I wish everyone interested in the matter of small fruits would give them careful examination—are a lot of berry baskets manufactured from paper, lined with paraffine. It seems to me that they are about as nearly an ideal package as anything that we can have for small fruits.

There is also another exhibit—I speak of it now because I may not think of it again—the paring machines, apple knives and various articles, tools, etc., connected with the use of apples, from the Goodale Company. They have sent a good lot of circulars and I wish every lady would take one of the circulars "Turning apples into gold." There are interesting and perhaps valuable recipes in connection with manufacturing apples in various ways for domestic use.

A recent newspaper item says: "A New Jersey fruit grower, Mr. Samuel A. Miller, packs his apples in bushel boxes lined with corrugated paper, and tissue inside of that. The apples are polished to bring out the beauty of the coloring and then placed in regular rows, three layers deep, 84 apples to the box." These apples command a fancy price only on account of the care used in packing, and the market for such fruit has never been glutted.

J. H. Hale who has several times been with us in Maine, is one of the most successful peach growers in the United States, and has devoted a great deal of attention to growing and packing for long shipments. At the Pomological Convention in Boston, he declared that fruit well matured on the tree, if rightly handled, will keep better, look better, and sell better than fruit packed half ripe. Mr. Hale also stated that fruit packed in paper wrappings sells from 10 to 25 per cent higher than the market price.

Until quite recently every commission man in New England would tell you emphatically that you must not send apples to him in boxes. But this year a change has been coming about, as you will see by the communications which I am going to read to you. Mr. A. W. Otis, in a recent interview, said he had been adverse to the use of boxes because of the cost of handling the box, costing more to truck, etc., but if the box is to be used—you see he gives in a little—if the box is to be used he favored a half barrel box. And that gives me an opportunity of referring to the box of fruit exhibited by Mr. Phinney, which contains just a half barrel of apples. It also contains, this particular box, wrapped apples, which shows the style in which he is marketing his fruit, and I have no doubt he will realize a good price for it.

A. & O. W. Mead & Company, who have handled this year quite a large quantity of Maine apples, write me as follows:

"In regard to packing apples in boxes, would say that it has been our experience that the fruit does not bring as much when packed in boxes as it does in barrels. The trade is not accustomed to buying in boxes, and will not buy them unless at a reduced figure.

"We know that for the last few years barrels have been pretty scarce and consequently very high, and the question of package is very important to the farmer. It seems to us that in sections where there are a good many apples farmers could easily supply themselves with barrels at a co-operative factory in their section. Each farmer would know how many barrels he would need, and they could be made up ahead so that no one would be without barrels in the packing season. It seems to us that this is the most practical way out of the difficulty."

One embarrassment which is existing the present season in regard to barrels is that somehow or other, I don't know why, the buyers seem to have all the barrels.

York & Whitney, another firm who have sold a good many Maine apples, writes me as follows—this particular letter was written by Mr. York:

"I realize that your association is of great importance to the public in general. The product that interests me the most at the present time is the apple, which I consider the most important of all fruits, as demand is increasing each year, not only in our own country but for exporting, and every year the packages seem to be a more and more difficult problem. Many of the growers of fruit at this season of the year, find themselves without packages to ship in or with half enough, thus causing the fruit to lay around for want of proper packages, and get more or less over-ripe and in many cases arriving in the market in poor condition and thus causing poor results. I feel after a long experience in the business in gathering, packing and selling the fruit, that there should be some action taken by the growers whereby they can provide themselves with suitable packages for marketing their fruit before it lays around and gets sweaty and over-ripe. I feel that there is no package better than a good full sized barrel that will hold three bushels, and it seems as if the growers in different sections could band together, and start barrel manufactories so as to provide themselves with packages suitable to ship in. The question of using boxes has been more or less discussed for the last few years. While I do not wish to say that this is not practical, I feel that it will take a long time to get people accustomed to buying fruit in such packages. Also the transportation companies would have to arrange different rates probably. If the growers should decide to make a change and ship some of their fruit in boxes, I would suggest boxes that would hold a bushel and a half, to be made solid and closed up tight for winter use. In marketing the fruit would suggest that they mark it on the end of the box, the variety, the quality, and shipper's name. Always bear in mind and keep the quality A1.

"I feel that Maine has one of the best prospects for the culture of apples, of any of our states as their fruit is growing more and more in favor in Europe each year, and they being right on the seaboard, can market their fruit as cheap, or cheaper, than most any other state."

I crossed over the street from York & Whitney's to examine a pile of boxes which I found contained apples from Maine. They were the ordinary 50 ℔. evaporated apple box. Mr. Lawrence of Lawrence & Company told me the people down in Maine kept writing him to know what to do with their apples—they could not get barrels. He replied, telling them to pack in these boxes if they could get them. A car load of them came in. His neighbors laughed at him. But he examined the apples and found they were good, and he put a label upon them which he thought would be all right, and the apples began to disappear. He found he could sell them for a little better price than he had been selling the barrels. Not long after this some of his neighbors came to him and wanted to know how it was he was able to make larger returns to the growers than they were. "Do you see those boxes?" he replied, "There is the secret. People won't buy a barrel of apples but they are glad to get a box. I used to buy a barrel of flour at a time, but now I buy a bag instead. Wife likes it better and so do I." He has kindly sent me the following letter:

"In answer to your inquiry of the 3d inst. would say that till this season we did not favor the box for apples, but owing to the high price of barrels we did advise boxes and the results have proved very satisfactory to both shipper and ourselves, and advise the box with the following dimensions: 18 inches square, 8 inches deep, inside measurement. A box of this size can be utilized for other purposes.

"We have received several thousand boxes this season and we find they meet the requirements of this market, especially to those supplying the family trade, where a barrel is in many cases too large a quantity. To command high price only best stock should be used, and utmost care used in packing."

There are, in my opinion, even more desirable packages for the dessert apple. Not long since when in Boston, I saw some fine Somerset apples. They sold for three cents each, and I was exceedingly glad to get one for I wanted a Maine apple. I am quite sure a man rushing for the train would be glad to pick up a small basket of these for his wife, when he would not think of buying a bushel or even a half a barrel, and as for putting them up in a paper bag he would not think of waiting for that. And I believe earnestly and sincerely that one thing we want to work for all it is worth, in the State of Maine, in Massachusetts and everywhere else Maine apples go in the United States, is to put our fruit up in such way that the local dealer, that people who eat apples in Maine cities and Massachusetts cities and elsewhere, will feel that they want some as quick as they see them, and will take them home any way because they are in packages in which they can carry them conveniently.

Mr. Pope: I notice that the firm of Manchester & Son, orchardists, in Bristol, Connecticut, are selling all their fruit this year in these baskets (showing one). This only holds a half a bushel, costs 5¼ cents, cheaper than the box, has a bail to it—a man comes along in the market and he finds a handsome apple that can be bought with the package that he can catch on his arm—you see the inducement there is to take it home with him. That one (indicating basket) will hold just about half a bushel. The cover fastens on. He wrote that he was selling his apples at a much higher price in that way than in the barrel.

ORCHARD FERTILITY.

RESULTS FROM USE OF CHEMICAL FERTILIZERS.

S. H. Dawes, Grand View Farm, Harrison: I do not claim to be an expert in the use of chemicals, nor any authority whatever on the subject, neither am I introducing anything new.

The formula that I have been using, I am told, was originated by Dr. Fisher, a noted fruit grower of Fitchburg, Mass. All that I know or can say of him is, that if all of his prescriptions prove as successful as this one, he must be a good doctor, and all I can do is to give you the benefit of my short experience with his formula for the last two seasons.

I have always been skeptical in regard to the use of commercial fertilizers especially the different brands of phosphates, such as our farmers and fruit growers have been in the habit of using. I do not believe that on the average they get their money back. It is of no benefit whatever to the farmer or fruit grower to use any kind of a fertilizer just because it will make things grow, if it does not leave a good margin of profit over and above all that it costs; and I am the last man to use them myself or recommend them to others. If I should hear anyone else make the statements that I am about to make I should call him a lunatic; and it won't hurt my feelings if you call me one, as long as I know that they are facts; and I have the fruit.

My attention was first called to their use by one of my neighbors, who used them around his trees, and took me into his orchard to see its effects. I noticed that the grass made a luxuriant growth around the trees, but I thought to myself that the grass would get all the benefit there was in it, and that it would not do the tree or fruit much if any good. Later on I took another look at them and was somewhat surprised to see that the trees had changed their foliage from a light sickly color to a dark green

Section of S. H. Dawes' Pear Orchard, Harrison.

and had a healthy, thrifty look; but I could not discover much difference in the fruit as it was too early in the season for that, and I went away about as skeptical as ever. I did not see them again that season, but after he had gathered his fruit he brought me some samples to look at, and I must say that I was completely surprised. I had always known the farm, but there were never such specimens raised there before, and I never saw their equal anywhere. As I did not exactly fancy having my neighbor grow larger and better fruit than I could, it induced me, the following spring of 1902, to try the chemicals in a small way, and I purchased 500 lbs. at a cost of about ten dollars, mixing them according to the formula.

Following is the fruit fertilizer formula:

Nitrate of Soda, ...	350 lbs.
Sulph. of Ammonia, ...	150 lbs.
Sulph. of Potash, ...	230 lbs.
Acid Phosphate, ...	220 lbs.
Keiseret, ...	50 lbs.

All to be thoroughly mixed and sown on the surface under the tree, out a little further than the limbs extend, at the rate of ten lbs. to a medium sized tree, from the first until the tenth of May, or as soon as the blossom buds begin to open.

I shoveled this mixture into a cart and drove through the orchard and applied ten pounds to the tree, to about all the different kinds of fruit, selecting only those going to blossom, and only one or two of a kind, to see what the effect would be in the different sorts. But somehow or other I could not help feeling that a fool and his money had soon parted, for I was loath to believe that it would amount to anything to sow just ten pounds, a little less than four quarts, on the grass ground that was seeded down nine years ago, without its being hoed or raked in. One could scarcely see it after it was applied. But the results were marvelous. I do know and can prove that I got extra fruit enough from two trees—a McIntosh Red and a Fallawater—to more than pay the whole expense of the chemicals.

I was so well pleased with the results that I purchased two tons the present year and applied in same manner, with the exception that I made the application to lots of trees, that had no blossoms and of course I received no benefit from those the present season. But I wished to see what the effect would be the next year and if it would cause the tree to set more fruit buds, to blossom and bear fruit the following season.

In order to satisfy myself and others more fully in regard to the real merits of this fertilizer I tried the following experiment: On the east end of my main orchard I have a block of just one hundred Baldwin trees, five rows, twenty trees in each row, and the conditions as to size and soil are as nearly equal as it is possible to have them.

On the middle row I made no application whatever, but applied it, at the rate of ten pounds to the tree, to all the rest of the block, with the following result. On the row where there were none of the chemicals used I picked just twenty-one barrels, including all the windfalls. The average yield to the other four rows was just forty-eight barrels to each row, including the windfalls, making an aggregate of one hundred and eight barrels extra, just as they were picked, that I got on the four rows where the chemicals were used.

Their value could not be less than seventy-five cents per barrel as there were but few culls among them, which amounts to eighty-one dollars. The cost of the formula, including two pounds extra that I applied to one row, was not over eighteen dollars, which deducted from eighty-one dollars leaves a net profit of sixty-three dollars on the four rows, more than I should have had if none of the chemicals had been used. It must be borne in mind that the results would have been far more satisfactory, if the trees had all blossomed. A good many had only a very few and quite a number none at all, consequently there was no benefit derived from those although they were all treated alike. The fruit on the treated trees was much larger and superior in every respect, with the exception of the color, which was not quite as good, with less No. 2 fruit and culls.

The results were equally satisfactory on all the rest of the orchard where it was applied. Especially so with the Bellflowers, where I applied it to trees that never bore anything but culls I had the largest and finest specimens I ever raised. I also applied it to my pear trees with like good results, as a proof of which I shall refer you to my fruit on the exhibition table for further evidence. I also derived another benefit from its use that I consider worth mentioning. I certainly cut not less than one ton of good hay more than I should have had in the orchard if the chemicals had not been used, and if the results prove in the future as they have in the past, I shall feel that the problem is solved that you can grow hay and fruit to good advantage in the same orchard, and you can enjoy more religion in sorting up the fruit. Why it was just fun to sort those big fellows into the barrels.

Mr. Archibald, the man who bought my fruit, said that during his four years' experience in buying and packing apples, he had never sorted up Baldwins that averaged as large as mine did this season, where I used the chemicals.

What the results will be in the future, in different soils and changed conditions, or what the effect will be on the trees, I will not venture to predict. The seasons have a great influence on almost everything that grows. The two past ones will go into history as the coldest and most freaky of any that we have known. Noted for their average low temperatures, the failure of the corn crop, little pumpkins, big potatoes, with a tremendous fruit crop for the odd year.

These may have had an influence one way or another, in the use of chemicals. But I do know that they have done all for me that I claim, and my faith in them is so strong that I shall use more of them next season than ever, and would recommend to all those interested in fruit growing, to try them in a small way at first and study the results.

Mr. GILBERT: While the author of the paper is unable to respond to any questions it may not be out of place to say that we have here present with us "the other fellow" who was likely to or had been beating Mr. Dawes and by whom Mr. Dawes himself did not like to be "downed" and as a matter of endorsement of what he has given to you I will call upon Mr. Breed.

Mr. W. O. BREED: I came into the State of Maine two years ago last spring and bought a farm that was a tough proposition, I assure you, especially the orchard end of it. The farm had been running down for years. The apple crop—well, I got the first season that I was there, 75 barrels off from about 1400 trees, and you can imagine how much of a crop it was compared with what it ought to have been. The orchard was a rugged, rocky pasture. The former owner said there were 300,000 feet of first class pine on the farm. The logging pines on the farm were all inside of a half acre, but I concluded I got my 300,000 feet of pine in lineal feet instead of board measure because the orchard was full of pine. I went to work and cleared off the pine. To go back, I wrote to three different parties, the Experiment Station at Orono, the Agricultural College at Amherst, Mass., and to Dr. Fisher whom I knew of as being one of the horticultural lights of Massachusetts, stated the case, told them that I hadn't any fertilizer to start this orchard up and asked for their advice. All three parties sent me formulas. I studied them over and came to the conclusion that Dr. Fisher was as near right as any one of them, if not more so. I took his formula and went to work. When my friend, Mr. Dawes, asked me what I was going to do, I told him. "Now," he says, "young man, go slow." He says "I have used lots of commercial fertilizer on my orchard," or "I have used commercial fertilizer and I never got a new dollar for an old one." When I told him I was going to use $150 worth, he said "Don't do it, your money is gone." I had faith in the stuff and I put it in. Mr. Dawes came over and as he says, he was surprised at the results, and I was surprised, and when he came round the following winter and says, "Well, Breed, if you have got anything there that you are willing to give away, or willing to let me know," I thought I had captured one good convert. The result as he has outlined it with him is everything that he has stated. But here is one point that I wish to raise in connection with that middle row of Baldwins which he did not fertilize. His trees are only 24½ feet apart and those roots of course are interlocking roots. The roots from the unfertilized row went over into the other row, couldn't help it. They got some fertilizer from the next row, and I claim that that middle row from which he got the 21 barrels was several barrels ahead of what it would have been if nothing had been put on either row. And the consequence is that the showing, if you get right down to facts, would be even greater than he shows. But it is not my purpose to take up your time. I will say however that I trust that every one won't go into this business. If you do barrels will be worth a dollar and a half apiece and the filled barrels will be worth about fifty cents. I don't think there will be much money in it.

Mr. GILBERT: Will you please to state how many barrels of apples you have picked the present year from that run down orchard?

Mr. Breed: You touch my modesty, Mr. President. Up to the present year my friend Dawes tells me—and he knows the farm, we touch elbows over the back fence, our farms join at the rear—he tells me that 600 barrels has been the maximum crop. This year my crop is almost 1400. But I will say right here that since the first year that I was on the farm, with the exception of making slight applications of nitrate of soda I have not used any chemicals on my apple orchard. I fenced off a small portion of one of the orchards, or the main orchard, and put pigs in there the first year that I was there. The result was so pleasing to me that last year I took in the whole orchard or about 14 acres and fenced it and turned in about thirty, large and small, swine. They went to work and worked it over. I didn't feed them at all after the middle of May until I took them out of the orchard just before picking the fruit. The consequence was they didn't grow as swine would that had been fed but I got some work out of them. I told them it was "root, hog, or die" and they took the easiest part of it which was to root. I put them in there the same this year, and at the present time of the whole fourteen acres there isn't a half acre but what has been completely turned over by the pigs.

Q. Haven't they done as much as the phosphate in your judgment?

A. I will say this that in my judgment the fruit is not so large this year as it would have been if I had used chemicals, for this reason: The first year that I was there I used the chemicals and I had some of the finest and largest Baldwin apples that I ever saw. I cannot say it of this year. But what has been lost in size and all that has been more than made up in number. I have got a big crop but I really don't think that the apples are so large on the average, in fact I know they have not been so large as they were the first year I was there, those trees around which I placed the chemicals.

Mr. Gilbert: We have another fruit grower with us who has been after the same object but approached it from a slightly different tangent. I will call upon Mr. Phinney of Standish who has been successful in renovating an old orchard and in growing a new one, and in obtaining fruit from both.

C. S. Phinney: Some time ago the secretary of this society approached me and asked me if I would prepare a paper on the use of chemicals in the orchard. I told him I didn't think I could prepare anything that could be dignified by the name of a paper or address, but if the subject was opened up here that I would be glad to help along with a few words in the discussion.

Now my vocation is that of a commercial traveler and I have been following that business for eighteen years, and I have acquired the habit of being very bashful, so that it is embarrassing for me to appear here before such a large crowd. I could take one man I think out in some corner or in some secluded place and I could either paralyze him or I could sell him a bill of goods, but it is very embarrassing to speak here. However, I will give you as briefly as I can my experience on chemicals in an orchard.

I want to say first that I was brought up on a farm and I have always had an interest in fruit growing and always liked it and always thought I would like to have an orchard. So in 1891, when I had an opportunity to buy a comparatively small orchard, about 150 trees with 16 acres of land, I purchased the land and the orchard. Being away from home all the time as I am, I keep no stock. The field was in a run out condition and if I did anything with it I had got to do it with commercial fertilizer. I commenced first by plowing up this orchard, and I want to say that this was an orchard that had been set out perhaps thirty years, twenty-five to thirty years, and had never yielded what might be called a fair crop. I plowed it in the spring of 1891 and applied commercial fertilizer at the rate of about fifteen hundred pounds to the acre and planted it to potatoes. The next year I sold $400 worth of apples off that orchard. I thought that was a success and that I would try some more trees. I bought and set out 300, using commercial fertilizer in the holes where they were set, perhaps a quart or a quart and a half to a tree, and where I set these young trees I plowed a narrow strip perhaps 6 to 8 feet wide up and down the row, and I have kept them cultivated from that time to this and have applied each year a moderate amount of commercial fertilizer. On the larger trees I have applied about 400 or 500 pounds, since the first application of 1500 pounds I have applied about 400 or 500 pounds to the acre sowed broadcast and harrowed in. The result has been that that orchard has been very profitable. Since 1892 when I got my first crop I have failed but one year to get a good fair crop of apples. That year the trees bloomed well but we had a cold, drenching rain when they were in full bloom and I didn't harvest a peck of apples. With that exception, as I say, I have had a good fair crop each year and they have been all good quality, kept well and sold well in the market. The younger trees I have just harvested—about 100 Ben Davis that were set out 8 years ago,—100 barrels of very nice Ben Davis apples. And my Spies—I picked 99 barrels of Spies from 11 trees this year. The Spies were not large but they were of good quality. I want to say that these trees, the orchard of bearing trees and the small trees, have all been cultivated all this time, it has been under tillage—not always plowed every year, but harrowed if not plowed. The grass has been kept down or plowed under, and while I believe that a moderate application of fertilizer will pay, in fact I know it has paid me wonderfully well, I want to say that I believe as much or more in tillage as I do in the fertilization. I believe on a great many of our farms that if you would till the land and do nothing else that you would meet with very good success. Of course we know that on most farms the supply of stable manure is limited,—while it may be as good or even better than the commercial fertilizer for the trees, the amount of it is limited, and if we are going into growing apples extensively, if a man is going to have fifteen or twenty acres of orchard, or thirty or forty, he would hardly have the stable manure to spare, and there is no limit to the amount of fertilizer he can obtain, if he can use it with a profit. If he can't use it with a profit, of course he don't want to use it at all, as Brother Dawes says. I believe that many of these old farms could be set out to fruit orchards and cultivated and fertilized with commercial fertilizer, and I want to say right here that you don't want to buy your fertilizer at haphazard. You want the right kind, you want the right formula. The fertilizer that I use contains 3 to 4% of ammonia; 7 to 9% soluble and available phosphoric acid; 13 to 15% total phosphoric acid, equal to 28 to 32% bone phosphate; 10 to 12% potash (K_2O), equal to 18 to 22% muriate of potash.

Q. I would ask the gentleman if he does any spraying?

A. Yes, sir, I do, I have sprayed ever since I have owned an orchard. I spray just as the buds are about ready to open up.

Q. What time do you do your second spraying?

A. After the petals have all fallen, while it sticks out on the stem, before it gets heavy enough to bend it. If I understand it correctly the first brood of coddling moths commence their operations in the blossom end of the apple, and you want to spray while that is exposed so that your spray will take that in. Spray again the third time when the apple is perhaps as large as a small walnut, or a pigeon's egg, something like that, according to the season. Now in this connection there is something I want to say. Last year I was situated so I could not spray my orchard at the proper time. When I picked my apples in the fall they looked as fair and nice as could be, but in the course of five or six weeks after they were put in the cellar there wasn't more than a third of them that were really fit to go into the market they were spotted so badly. This year my apples have shown no indication of a spot yet. They were sprayed this summer. Still further, I had an opportunity to buy a few apples in a little orchard near me—the party was not living on the place and he wanted to sell them and I bought them on the tree and put them into my cellar. I am packing now a carload of apples to ship away and I packed those up first and out of sixteen barrels I picked from that orchard I don't believe there are three barrels fit to sell. They were all spotted—my apples in the same cellar are not spotted.

Q. Do you mean the scab or the black spot?

A. A little spot that looks as if the apple had the small pox, but I imagine it will develop into that fungus later on, but the apple is spoiled for the market.

Q. May I ask what you use to spray with?

A. Formerly I used the Bordeaux mixture as recommended by our Experiment Station. I am using now a prepared form of Bordeaux mixture which is both an insecticide and a fungicide. The insecticide is in the form of arsenate of lead which is superior for fruit trees I think to Paris green, in that it won't burn the foliage and it will stick on. The trees I sprayed last spring there was sufficient poison on the leaves to kill the web moth, fall web worm. When they hatch out in August or the first of September, they will hatch out on the tip of the limb and spin their web back on the limb until they get to the old leaves, and they will very soon drop off. I have no trouble at all with caterpillars or web worms or any insects of that kind in the trees. I don't think a man would make very big wages hunting for wormy

NINE BARRELS OF BALDWINS, 1903.

apples in my orchard at five cents apiece, not on trees that are thoroughly sprayed.

Mr. GILBERT: Or any other orchard this year?

A. Well, no, I have seen wormy apples this year. I can take you right into my orchard on some trees that were not sprayed and show you lots of wormy apples. They are very free from worms as a rule, that is true.

Mr. BREED: Mr. President, I see that the speaker is in rather an embarrassing situation and some of us are not getting what information we would like to have. I see he is very chary about giving us that information. He does not tell us the name of this preparation.

Mr. PHINNEY: I hoped, Mr. Breed, that that question would not be asked. I did not come here to talk shop—for spraying I use Pyrox that is manufactured by the Bowker Chemical Company. It may be a little more expensive than the home made but it is more convenient.

Prof. MAYNARD: I would like to ask the speaker how much fertilizer he uses per acre. He has given us the formula but not the amount.

Mr. PHINNEY: The first application I made on this orchard was about 1500 pounds to the acre. I am using now not over 500 pounds to the acre and that seems to force the trees all that is necessary with the tillage that is given them. I have here a picture of a tree from which I took 13 barrels of Spies this year. If you could visit my orchard today—all the leaves are on that tree now and I think it is admitted that is an indication of vigor in a tree, and further than that I think it would show that it has made a reasonable growth notwithstanding this great load of fruit. I don't believe you want to use too much fertilizer and drive the trees too hard.

RESULTS FROM THE USE OF BARN MANURES.

Mr. GILBERT: For fear that we might leave the impression that there was no further use for barn manure, or that barn manures were not good for orchard culture, we introduce one of our associates who has had some experience with barn manures in making orchards bear.

V. P. DECOSTER: I feel very much this afternoon as the man did that was called to the sick bed of his wife. She said "Before

I die I want you to make me a promise and that is that you will ride with my mother to my grave." "Well, wife, I will make the promise but it takes all the pleasure from the ride." Now that is just the case with me this afternoon, it has taken all the pleasure from this meeting, being called upon at this time.

Mr. Phinney says to us that he is a travelling man. He buys his fertilizers and says "Boys, go and do so and so." Now I say to you "I am a farmer." What has been done to my trees, I have had to take my coat off, roll up my sleeves and take the shovel, and say "Come, boys, let's fertilize those trees." I suppose that I am put upon this question of barn dressing to represent the poor man, the man that does not have the means that Mr. Dawes and Mr. Phinney have to purchase commercial fertilizers. But I assure you, gentlemen, I am a thorough believer in barn dressing for my trees. Now I have taken my trees from the seeds. I haven't twenty-five trees on my farm of nearly 500 trees but what I have grown from the seed. Why, those trees are almost like one of the family. I have trimmed them, pruned them, cared for them until today they are capable of raising eight or nine barrels of fruit to a tree; and that has been due to barn dressing. You may talk about your commercial fertilizers—I have used them and believe in them in a measure—but I do believe the farmers of this State cannot rely wholly upon commercial fertilizers for their fruit trees. My trees, as I said before, I raised from the seed. I gave them the first initiation, the first degree upon barn dressing. I dug a good trench and threw my seed upon that dressing, had barn dressing. The next year they came up. Why how I watched those seeds as they came through the ground. I want to say right here there is not a young man in this house today but what should start his own trees. You can't realize the pleasure and the satisfaction it is to you to watch those trees. It makes you love the old farm, you hate to go away and leave the children you are bringing up. You can't imagine the pleasure and satisfaction it is to have something to watch and care for,—and something that will keep the boys home upon the farm,—I don't care if they are girls too. As those trees grew, I grafted some of them in the nursery, some I splice grafted, some I budded, others I set out as seedlings. And I will say right here I prefer the seedling tree. I find I get fruit just as quickly as those grafted in the nursery close to the ground, and I prefer them for many reasons. I lost a lot of my scions by their growing so rapidly they winter-killed. But I must not touch upon that point. I could not help it. It came into my mind. After those trees became large enough to set out, I kept that field plowed. I used to put on an application of dressing, 10 to 20 loads to the acre, as the case may be, and I not only grew my trees but my crops, my corn, potatoes, my garden stuff, not only grew my trees but I grew that which I produced upon the farm. When those trees got so large that they shaded the ground so much I couldn't raise my crops, and at the present time—and I have had to keep thinning them out—I put on not a very heavy application of barn dressing and plowed it under and I kept that piece plowed and harrowed the next year until some time in July, and then I sowed clover or put on something for a cover crop—which will be explained to you later—and the next year I plow under whatever comes up after July, and I don't put on any dressing the next year. And some years I will let it run in clover one or two years, but you need not be afraid to use the plow and the harrow in your orchards. Sometimes I think that the plow and the harrow do more than the dressing. Why, the result is wonderful, what barn dressing will do for our fruit trees. Why, go with me right across from where I live only a few miles to Mr. Ricker's orchard. What have they done? This year they sold 2,600 barrels of apples. Can you realize a man raising 2,600 barrels of apples? He has not used any chemicals of any amount. It has all been done by work, by barn dressing, by the plow, by the harrow. You may talk about your chemicals, but when you get ahead of barn dressing you have got some work to do. We get there just the same with barn dressing as they do with fertilizers. And that is not saying anything against fertilizers. I am experimenting now with them. I am getting a little avaricious perhaps. I don't like to spare it for my fruit trees and this year I bought some commercial fertilizer to put around my trees. The trees blossomed but the frost killed the blossoms and of course I cannot give you the results from that fertilizer, but the trees have grown rapidly, and perhaps some time in the future I can speak more upon the application of fertilizers.

I want to touch upon another point. When you have dressed and fertilized your trees, you shouldn't stop right there. I have seen trees that have been dressed, that have grown beautifully and blossomed full, but in the fall there would be no fruit. Why? Because of growing all limbs and no fruit. I had a little experience with a pear tree in regard to pruning. I want to give you a few points on pruning, and then I will give way to some other brother. I had a Beurre d'Anjou pear tree that blossomed nicely every year and when it came fall there would be a few scattering pears; when I put them in my cellar to keep them they would wither, they didn't have any sap or juice in them. I said, I will graft those trees—I won't keep them in my orchard. I grafted one of them and I left two limbs that I didn't cut off, and the result was upon those two limbs I raised more pears than I would have raised on the whole tree. It was a grand object lesson to me. As those pears matured they were one of the most beautiful pears I ever ate. I found the fault was in me, the pear was all right. The next year I pruned my remaining trees and the result was I got four or five bushels of as nice pears as you ever say. So much for the pruning of a pear tree and it is the same with apples. Some need pruning more than others. Northern Spies and Rhode Island Greenings need much more pruning than Baldwins. The Ben Davis—well there, I ought to stop right there, the Ben Davis I was going to say you ought to prune right down to the bottom, perhaps I won't say it. Do you realize, brother farmers, you go to one of the agents selling fruit trees and ask what they are doing? Why, half to two-thirds of the fruit trees we are selling today are Ben Davis apples. Can you imagine what the future will be for the Ben Davis apple, an apple you can't sell today in the New England market, an apple today that the buyers say "We don't want it." The European market will find out by and by that the Ben Davis apple is not good for anything. One year ago at this time I was up to Farmington and a man got up there and extolled the Ben Davis apple, recommended it to the farmers, and I have not had a clear conscience since, to stand upon the floor representing this State Pomological Society and have a man get up and recommend the Ben Davis to farmers of the State of Maine. I don't believe, brother farmers, you want it.

THE EFFECT OF TILLAGE AND COVER CROPS.

Prof. W. M. Munson, University of Maine, Orono.

(Abstract.)

Of the particular lines of agricultural work open to the farmers of Maine, none is more promising than that of fruit-growing. As a rule, however, farmers have made the serious mistake of regarding fruit as one of the secondary farm products. The fence corner, the hedge row, and the roadside have been the places devoted to the apple trees; or in event of there being a definite area set apart as an orchard, some rocky hillside unfit for cultivation has been the location most usually sought. Whether from an inherent dislike to the business of working the soil, or an inborn love for flocks and herds, dating from the time when

> "First Cain was born, to tillage all addicted
> Then Abel, most to keeping flocks affected,"

or whatever the cause, the tendency among orchardists has for many years been distinctly away from cultivation and toward some easier method of handling their trees.

There is an element of uncertainty in all agricultural work. The skilled mechanic may select his material and, applying the principles he has learned, can construct a machine that shall be practically complete and in accordance with his plans and expectations. No farmer or fruit-grower can, however, predict with certainty the outcome of his labors. Nature and Providence have much to do with the processes, and we can only assist the one and submit to the other—we can control neither. As there is no royal road to learning, so there is no royal road to successful fruit-growing, success comes as a result of patient, persistent effort. The man behind the plow is the power which sets at work the various forces of nature and insures the best results that soil and season will permit. We hear much of plant food, of phosphoric acid, potash and nitrogen, of commercial fertilizers and stable manure, but in the absence of a suitable physical condition of the soil, the application of plant food is a foolish waste of time and money.

From the earliest times tillage has been regarded as a necessity, to be disposed of as easily and quickly as possible. Seed must be planted, weeds must be killed and crops must be harvested. To till the soil would seem to be the simplest and dullest thing in the world; and if viewed only as labor, to be most quickly and easily disposed of, this conception of tillage is a natural one—the work must be done because in some way plants thrive best when it is done. At the present time, however, men are coming more and more to till for the sake of tillage; to recognize the fact that there is merit in the mere operation of turning and stirring the soil.

Cultivated plot in 1899. Tallman in the foreground.

The first effect of tillage is to ameliorate and modify the soil itself. Its secondary and most important effects are directly concerned with the plant. The soil is a vast storehouse of plant food, and the first effort of the husbandman should be to make this store available to plants, rather than to add to the already large amount of material locked up. This is just what tillage does. By stirring the soil, food materials are set free, chemical changes are promoted, and moisture is conserved.

The physical condition of soil is nearly always of more importance than mere richness in plant food. The chemical composition of a soil is not necessarily a measure of its productive capacity, since plant food is of no consequence unless the plant can make use of it. If there is sufficient material available to produce only a stunted growth of trees and grass at the same time, it is evident that the surface application of additional food may temporarily stimulate the growth of both. Hard lumpy soils, however, will not produce good crops, no matter how much fertilizer may be applied, and there is no doubt that the number of "worn out" farms in New England is much smaller than is generally supposed. I have little doubt that much of the benefit recorded by those who have used commercial fertilizers in their orchards, as well as by those who have used stable manure, has resulted from the tillage given at the time of application rather than from the particular form or amount of plant food applied.

Plant food to be of value must be in solution, and must be so distributed that the greatest number of fine feeding roots may lay hold of it. It is obvious that the fine fibrous roots will find their way among the minute particles of a finely pulverized soil much more readily than they will force their way into a stiff clay or through heavy clods. It is also obvious that those soils which are open and porous, which contain a large number of spaces between the particles, will take and retain the moisture to better advantage than will a compact soil—in the same way that a sponge will take up a larger amount of moisture than a block of wood. Now since the amount of water which falls during the growing season is, as a rule, entirely inadequate for the growth of plants during that time this storage or conservation of the melting snows and spring rains may play a most important part in the success or failure of a given crop. By deep plowing and thorough working before the trees are planted, and by continued working and the addition of organic matter by means of cover crops after planting, this spongy condition of the soil which is essential to the best growth of trees and farm crops alike, is best obtained.

But not all New England orchards are susceptible of cultivation in the ordinary way. In such cases some other method of treatment must be devised. A heavy mulch of hay, leaves or sawdust (preferably not fresh sawdust) conserves the moisture and prevents the growth of robber plants—weeds; to this extent favoring the growth of trees. With this treatment, however, the roots are developed near the surface and in time of severe drought, especially if the mulching is not carefully renewed as required, the trees are liable to injury. In the management of orchard lands it is not so much a question of how the tillage shall be performed, as that it be given. So in lands where the plow cannot be used I say unhesitatingly—though aware that I am treading on dangerous ground—use hogs. From frequent observation of the practical use of hogs in orchards that have reached a bearing age I am convinced that they may be used to advantage. The practice in this case would be to use shotes,

Cultivated plot in 1902. Tallman shown in figure 6 in the foreground.

rather than hogs a year or more old. If six or eight young hogs are put in an enclosure of about an acre, they will during the season, if not too highly fed, pulverize the soil as completely as could be done with plow and harrow, and will in addition serve an important purpose in destroying fruit infested with noxious insects.

I have referred to the use of cover crops under certain conditions, and before referring to specific work in orchard culture, it may be well to consider the purpose of these very useful adjuncts. Briefly speaking, a cover crop is some quick growing herbaceous crop which is sown in mid-summer for the specific purpose of covering or protecting the land during the winter. Its action is to utilize the moisture and check growth of the trees in the fall; to protect the roots, fix plant food and prevent leaching and washing in winter; to aid in warming and drying the soil in spring; and to add organic matter to the soil. Several crops have been recommended for this purpose but in general practice I know of nothing better than winter rye. If sown even as late as the middle of August, though the ground should not be stirred so late as a late tender growth of the trees may be

Neglected trees lose their leaves early.

induced, it will form a heavy mat over the whole surface of the ground before winter. In the spring the rye should be turned under early, before it begins to spindle, as it is liable to make too much green material to be quickly decayed and thus may cause injury if the season is very dry. Furthermore, if left too long the drying of the soil by the cover crop may be too great and cause actual injury to the trees.

Oats are often used for a cover crop and they serve the purpose of protection very well. They are of course killed in winter, however, and do not assist in drying the soil in spring.

Canada field peas have been recommended, but they make a poor winter cover and are of no use in spring.

In orchards which require an addition of nitrogen,—and what orchard in Maine does not require more of this element—the vetches are strongly recommended. Crimson clover is used farther south, but has not proved satisfactory in this climate. The winter, or hairy vetch (*vicia villosa*) is the one most largely used in orchard sections, and it is almost an ideal plant for this purpose. The cost of seed is almost prohibitive at present, however. The spring vetch (*Vicia sativa*) is a larger leaved and slightly stronger growing plant than the hairy vetch, and makes an admirable cover for fall and winter; but of course the plants are killed by the cold weather. [Photographs taken in the orchard at the Experiment Station May 20, this year, were used to illustrate the points mentioned.]

An additional advantage of cover crops on stony land needs only to be suggested to be appreciated. The loss of fruit during high winds, in the absence of some protection, will frequently be considerably more than the cost of time, labor and seed for the cover crop, to say nothing of the advantages already mentioned.

As to specific results from the use of tillage and cover crops I can only refer you to the work which has been carried on under my direction at the Experiment Station and in the orchard of Mr. Charles S. Pope of Manchester. Mr. Pope's orchard is in the heart of one of Maine's best orchard counties, and is much better suited for studies of this kind than is the Station orchard at Orono. The details of this work are clearly stated in Bulletin 89 of the Maine Experiment Station, and I need only give a summary of results at this time.

For a comparison of the effects of cultivation and mulch, as well as of the use of different kinds of fertilizers, a young orchard of Tallman's and Gravensteins was selected in 1898. The trees were eight to ten years old at this time. The trees were planted 25 x 30 feet apart. The soil was a rocky, sandy, virgin loam pasture with an eastern aspect. No cultivation was given and no special attention paid to the orchard, except to keep out borers and give an occasional mulching, until May, 1898, when the work was taken up by the Experiment Station.

Of that portion of the orchard selected for work, forty trees were placed under cultivation, an equal number were mulched but otherwise fertilized and treated as the first. The adjacent portion of the orchard, planted to Kings, remained in the condition the whole orchard was in at the commencement of the work.

The results were most pronounced from the very first. The cultivated trees took on a rich green color, made a strong growth and retained their foliage late in the season. The mulched trees also made a good growth but not equal to those which were cultivated; while the untreated trees were yellow, made little growth and lost their foliage before the first of October.

Cultivated and sprayed trees retain their foliage late in the season.

The orchard did not come into bearing till 1902, when it was found that of both Gravensteins and Tollman's the number of trees producing fruit was fifty per cent greater on the cultivated than on the mulched land. The average total yield per tree was also about ten per cent higher on the cultivated trees. In 1903 another good crop of fruit was borne; many of the same trees which bore a good crop the year before being among the best ones this year.

The systematic mulching and feeding of the trees adjacent to the cultivated plat have had a marked effect, and these trees would ordinarily be regarded as making a satisfactory growth. They are not, however, as large nor as productive as the cultivated trees. The untreated portion of the orchard has dropped so far behind as to be out of the race.

As a result of the work above referred to, and of general observation throughout the eastern states, I am convinced that the average New England hillside contains a sufficient amount of food material, or nearly so, to insure good crops if the land is properly handled; and tillage, by improving the texture of the soil, is the key to unlock this store of wealth. By fining the soil, and thus increasing the feeding surface for the roots; by increasing the depth, and thus giving a greater foraging area; by warming and drying the soil in the spring; and by reducing the extremes of temperature and moisture, the physical condition will be rendered best for giving up the accumulated plant food.

In ordinary orchard management mulching may be practiced under certain circumstances; but, where possible, thorough tillage in early summer with a good cover crop sown by the first of August is, I believe, the only proper treatment.

HOME DECORATION.

By Prof. L. C. CORBETT, Department of Agriculture, Washington, D. C.

"What a desolate place would be a world without a flower; it would be a face without a smile—a feast without a welcome." Flowers are nature's expressions of pleasure. While flowers are primarily utilitarian in purpose the end is attained by attractive and alluring means. The beauty, fragrance, and sweetness of the flower are not vain attributes; each is designed for a subtile purpose. The bright colors are the gala day attire of these natural fairies to attract and allure the passerby, be he insect, bird, or man. The perfume wafted upon the still night air suggests the whereabouts of the fragrant night-blooming flowers to the moths and other night-flying insects; while the cups of honey at the base of the petals hold a reward for those who have heeded the signal of the color or the odor. The pot of nectar is a sufficient reward for the insect and the transfer of pollen from anther to stigma by the clumsy but welcome guest is the end for which all this beauty, fragrance, and sweetness has been produced. Flowers are nature's expression of love. Love makes the objects of our affection beautiful; flowers are beautiful and therefore expressions of love.

Art is but the imitation of the beautiful in nature. Men make long journeys to study art, to view the masterpieces in oil and crayon. Yet by bestowing a little attention upon a few tiny plants, nature's artists will throw over the canvas of mother earth a background of green upon which she will paint the purity of the lily or the ardor of the rose. If you will but give her the suggestion of your wishes in the form of a few choice seeds, nature will paint for you the rich shades of the pansy or the phlox; she will carpet your floor with a velvet rug of green and strew upon its surface in bold contrast the golden disks of the dandelion or the bright saucy faces of the crocus. She will drape your walls with a festoon of green and hide therein rich gems of purple, of crimson, and of white, and if you ask it, she will screen one apartment from another with barriers of green which may or may not carry bright floral gems. These wonderful missionaries of nature are constantly at work attempting to cover some ugly scar which civilized man has made in his struggle with the earth to wrest from her the living which he claims she owes him.

In flowers we find, according to our ability to interpret, expressions of beauty, of love, of truth, and of purity. In order to appreciate these beautiful attributes of plants and flowers the mind of the observer must be trained to interpret and appreciate these expressions. The more fully the observer is familiar with the functions of the plant, the structure and purpose of its leaves and flowers the more fully and completely will he appreciate and interpret these subtle attributes. To plant a seed and observe the unfolding of the first leaves, the increasing stature of the plant from day to day and finally its fruition with the accompanying production of flowers and fruit and be able to see in this brief life of but one summer the model for man's existence is in itself a worthy end.

Beautiful plants and flowers naturally grouped are pleasing because they are restful anl quiet. Association with nature is soothing because the crudities of man's invention in which friction is such a large factor are all eliminated. The sounds in the woods are musical, harmonious, and rhythmical, soothing, and pleasing in effect; the colors are beautifully blended and harmonious; they hold the eye and the attention without effort and without fatigue. Nature in such moods is restful.

While man can not call in upon a small place these larger and broader expressions of nature, he can pleasingly use a limited number of the factors which go to make up this final result for the purpose of adding beauty to his abiding place. Trees may be used to give protection from wind and sun. The varieties may be so chosen as to give expressions of pleasure, of restfulness, of sprightliness, or of sorrow. Trees have all these expressions and they influence to a great degree the lives and characters of the persons who daily go among them. It therefore behooves us in selecting trees for the adornment of our home grounds to choose those with pleasant and elevating, rather than those with somber and depressing, expressions.

Trees are not only attractive while in leaf and capable of giving refreshing shade but after the beautiful autumn tints have all disappeared and the broad bare arms of the tree stand out they become interesting particularly if the tree be of some age. While in a deciduous condition many trees particularly the oaks become exceedingly picturesque. The strong arms with perhaps many scars tell the story of conflicts with the elements which have wrested from them a part of themselves but by weathering the storm the tree as a whole has assumed more the carriage and attitude of the triumphant hero. The angle at which the branches leave the main trunk, the size, and distribution of these branches are all factors which contribute to the general expressions of the plant. The black gum with its straight central axis and numerous small lateral branches spread out in a horizontal position are particularly attractive and are quite distinctive. In addition to this interesting and distinctive feature this tree transforms its rich glossy summer garb to a most beautiful one of crimson and dark shades of red during October. The pin oak is somewhat similar in its habit of growth although its branches are in general more drooping and its autumn coloring less vivid.

While trees must be relied upon as the general structural or framework part in the adornment of a place, shrubs, grasses, and annual flowering plants make up the detail. And it is the detail which gives finish and completeness to the place as a whole. It frequently happens that in attempting to recall a particular building, room, or painting some one detail may serve to give the mind a clew to the whole; the general plan or outline may be lost and a single factor of the finish serve to identify the whole, hence the importance of these finishing factors. Shrubs are important and satisfactory because when once established in their proper relations to one another as well as to the general scheme of improvement, each year adds to their beauty and their value. Not so with the annual planting. It is the one factor through which novelty and variety may be introduced, trees and shrubs may be considered fixtures while annual plants serve as pictures which may be shifted from season to season to suit the pleasure of the occupant. Annual plants too are the only forms of embellishment which a tenant will ever care to bestow upon a place. Annual plants give quick returns and large profits from a small outlay of time and labor.

The range of size, variety in foliage and bloom afforded in the list of annual plants which can be successfully grown from seeds each year is sufficient to enable one to quite successfully secure, by their use, temporary effects which it would take many years to obtain from shrubs. While no one should feel content with this form of emergency planting yet new places and temporary locations can be greatly softened and beautified by the judicious use of these annual plants.

THE USE OF FLOWERS ABOUT THE DWELLING.

Annual plants which have a suitable habit of growth and adequate foliage may be made to do duty about the dwelling and upon the grounds in the place of the more appropriate shrubs, and perennials. The one great drawback to which such annual plantations is subjected is the yearly destruction by the first hard frost of the season. This scene is particularly unpleasant. It is not at all agreeable to observe the blighted forms of the plants which for a season have by their charm, appropriateness and beauty become one's daily companions. The scene of death and desolation which follows the frost is not pleasant to contemplate, but aside from this one feature, which it is hoped will not impress others as it does the writer, the annual plants such as cosmos, castor bean, sunflower, aster, zinnia, and flowering sage may all be made to serve as substitutes for shrubbery plantations until the shrubs themselves have grown to sufficient size to command the situation.

Tall growing, broad leaved plants like the castor bean can be used with advantage as screens for drive ways or walks, by placing a mass of the plants in the bay of the walk or drive. Tall growing plants of this description when massed against buildings, fences, or other obtrusive objects serve as attractive and efficient temporary screens. Low growing plants are more effective when massed in borders along the boundary of the place with taller growing annuals or shrubs as a background than when used in beds at the front or side of the dwelling. In fact the formal bed either in the shape of an oval, circle, or star in the center of a greensward is generally more obtrusive than pleasing. The next best place for the annuals after the border is in masses about the foundations of the building. And if vines of a temporary nature are desired some of the rapid growing sorts such as *Cobea scandens,* the Moonflower, Morning-glory, or Cypress vine may be appropriately used for training over fences, walls, or about porches.

When annual plants are desired for the bloom which they produce, to be used for cut flowers, the best disposition for them is to plant them in an area set apart for a flower garden or to devote a portion of the vegetable garden proper to the purpose. When grown for cut bloom merely, the most satisfactory and economical plan is to plant them in long rows with ample space both between the rows and the individuals in the row. Unless the plants are given ample room for full development the flowers which they produce will be inferior in size and in form. For best results from the plants to be used in this way rich soil, ample space, and good culture are essential. While it is advantageous to sow the seed thickly at planting time in order to insure a stand of plants it is equally desirable to have the plants thoroughly thinned in order to provide ample space for their full development. If the flower garden is a distinct feature of the place and its mission is to furnish an attractive retreat as well as cut flowers its general plan may be more pretentious; the straight rows may give place to irregular groups or masses or even to formal beds and designs, so long as these are not made the leading feature in the general adornment of the place. In fact curved pathways in the flower garden allow an opportunity for demonstrating the fitness of certain plants for special purposes. The bays of the curves can be filled with tall growing, dense foliaged plants for the purpose of hiding the beds or groups which lie further on. Curved walks are more pleasing than straight ones and lend themselves more kindly to the needs of the different classes of plants which find a place in the home flower garden. If the flower garden is to be a permanent feature of the adornment of a place the walks may be arranged to conform to the contour of the land or if level may be given some geometrical character or design, and made permanent by use of gravel and grass borders. If a fixed design is to be adopted the soil in various areas of the garden may be so modified by the addition of sand, muck, or clay and the use of plant foods as to suit particular areas to the needs of special plants. Those which enjoy a dry sandy soil can be provided for while those which thrive best in a heavy soil can also be accommodated. If on the other hand a less formal and fixed character in the garden seems desirable the whole area may be annually spaded or plowed up; the walks given a new course and the general scheme of planting changed. Such an arrangement will give variety and novelty to the garden and for most purposes will prove quite as successful as the more formal arrangement. During wet times, unless the soil is of a sandy character, the lack of graveled walks will prove a disadvantage.

THE GREENSWARD.

The grading and making of a lawn are two of the most important operations in connection with the adornment of a place. The greensward is the canvas on which all architectural and floral decorations must be placed. Nothing is to me more pleasing than a well made and well tended lawn. Now-a-days we hear much about the beautiful in nature, about the beauty of the over grown, unkept fence corners, the straggling briars and the like. I admit that these features make beautiful pictures when the subjects are well chosen. The bramble when allowed unrestricted development is charmingly graceful and pleasing, and the tall grasses, the golden rod, and the aster are all appropriate to a sylvan roadside or the corner of that most picturesque of all fences—the rail fence. But place these naturally graceful plants against the foundation of a well executed piece of architecture and note the effect. Even a rustic cottage must be built of rough slabs or logs in order to harmonize with such surroundings. The farm home, the suburban place, or the village lot must leave these pastoral features out of their scheme of adornment in order to prove pleasing and effective. The old saying that "when in Rome do as the Romans do" is as good for the adornment of a place as for one's demeanor. By that I mean that well kept lawns, closely cropped, if you like, with the lawn mower are more in keeping with the rigid lines of shingled or clapboarded house than are the conditions of the roadway just mentioned even if the one is formal and artificial. Graceful trees, shrubs, and flowering plants show to better advantage upon a cropped lawn than they do in an abandoned lot. While it should be the aim, in all work of adornment, to modify the natural characteristics of things as little as possible in order to have them conform to the object before us; yet true harmony and conformity with the character of the place should always be foremost.

While trees, shrubs, flowers, and grassy lawns are all essential to our highest enjoyment and while they are important factors in the development of one's higher nature yet it can not be said that these attributes are essential factors in the maintenance of human life. We are told that man has three primary wants, namely, food, clothing and shelter. The trees, flowers, shrubs, and grass contribute to one of these primary wants only—shelter. But no home acre whether in the town, village, or country can be considered complete unless it has upon it the means of meeting, in part at least, one more of these primary wants—food. The home acre should be provided with a fruit garden as well as with a vegetable garden. One will not materially interfere with the other and both will contribute liberally to the support and comfort of the family. The satisfaction of serving fresh fruits and vegetables of one's own growing is in itself a pleasure for which it is worth striving. One does not appreciate these privileges until deprived of them. The resident of the country with a good garden, an ample supply of fresh fruit in season and a cow and chickens, knows nothing of what it means to supply the wants of every meal from the market house. It is often said that the variety from the home place is limited and restricted to certain seasons. This if true is not necessary. A few hotbed sashes will greatly extend the seasons at both ends. A judicious selection of crops with frequent plantings throughout the season will insure lettuce radishes, peas, beans, onions, beets, cabbage, turnips, spinach, tomatoes, etc., in succession from early spring to late autumn. With no system of horticulture can so much be secured from a given area in one year as from a well planned and well tended vegetable garden and yet only about fifty per cent of the farms of the country even so much as maintain a vegetable garden. This condition of affairs exists in the face of the fact that the census shows the area devoted to this use is about five times as remunerative as the same area devoted to the grains or to cotton.

In the State of Maine there are 59,299 farms 27,392 of which maintain vegetable gardens of one-third acre in extent, that being the average size of garden for the farms of the State. The estimated return per acre from these gardens is $64.73 while the value per acre of the cereals grown in Maine is $12.81 which is considerably above the average value per acre of such crops for the whole United States which is only $8.02 per acre. Stop for a moment and compare these statistics. The value of each acre devoted to home garden purposes in the United States is $49.42 against a return of $8.02 per acre for all lands in the United States devoted to cereal grains which are considered as staple crops.

We must not be mislead by these comparisons, however, for only a small acreage in vegetable as compared with the cereals can on the average farm be made to pay. The point is right here if the supplies for the table which it would take five acres of grain to *purchase* can be grown on one acre will it not be profitable to cultivate that one acre in vegetables? Aside from the actual money value which comes from the garden there is another which cannot be overlooked, it is the value of vegetables as well as fruit as a factor in one's diet. They give variety and by so doing prevent one from tiring of the heavier essentials which admit of less variety. I have reference to the flesh diet. There is not so wide a range in meats to choose from. Then too, most farmers depend largely upon home production for the meat supply and, if this is the case, the range is limited by the poultry yard, the pig pen, and the pasture, which may contain either beef or mutton or both. Here is the possible rather than the actual range, poultry, salt fish, and pork in one form or another will, I venture to say, cover the variety in the meat diet in 75 per cent of the farm homes of our country. While this is a sufficient range a constant diet of meat and potatoes will soon grow monotonous, but with fruit and vegetables in season the sameness in other articles is lost sight of, fruits and vegetables have, therefore, a worth aside from their market value.

Since the vegetable garden must be looked upon as an economic factor in the maintenance of the home, the expense of caring for the garden itself must be considered. It will naturally cost less to maintain a farm garden than to maintain a garden upon a town lot or suburban place. Upon the farm, land is not so much of an item. The garden can be made rectangular in form, the crops can be planted in long straight rows and the greater part of the cultivation given with horse power implements. Upon the town or suburban place unless one owns a horse the work of the garden aside from plowing in the spring will be done by hand. Notwithstanding this I will venture to say that I believe there are a larger percentage of gardens maintained under these more difficult conditions than are maintained upon the farm. The trouble is farmers as a class do not appreciate the value of small things like the garden. They do not maintain a garden, neither do they use vegetables, they get along without them, and yet it is safe to say that if the vegetable garden were to be properly maintained that the actual profit derived from it would be more than the averages above stated.

While it is not possible to produce statistics to illustrate the value of fruit in the economy of the family, I am convinced that their value is even greater than that of vegetables, particularly from the standpoint of dietetics. The actual money value of the fruit which can be produced on a carefully planted and cultivated acre will be equal to that from the vegetable garden. To illustrate what can be planted on an acre I will give you a list of the plants which are now growing upon one acre at the government experiment farm. The list is as follows: 25 standard apples; 5 crab apples; 45 peaches; 32 dwarf pears; 10 standard pears; 18 plums; 18 cherries; 9 quinces; 50 dewberries; 150 blackberries; 150 red raspberries; 150 black raspberries; 75 currants; 50 gooseberries; 80 grapes, and 1,000 strawberries. With the exception of the peaches there is not a fruit in this collection that can not be successfully grown throughout New England. Local growers can give the names of the varieties which will prove most successful for each locality, as well as those which will cover the greatest period. In apples, for instance, those which ripen from July to October can be chosen and the late ripening one should again be divided among early winter and late winter sorts in order that the supply of fresh apples may not be interrupted for more than three months at most. It will not be possible to secure such a wide variation in season of maturity in the other fruits. Yet attention to the selection of early and late maturing sorts will materially lengthen the season for strawberries, raspberries, cherries and grapes. From the list of plants already given it is an easy matter to form a rough estimate, at least, of what may be obtained from an acre so planted.

Although there are 1,867 individual plants upon this acre of land it is so planned that practically all the cultivation can be done with horse power. While the strawberries are planted to form matted rows all other plantations are so arranged as to admit of horse cultivation in both directions. Beside affording a supply of fruit for the average family such a fruit plantation will afford the amateur ample opportunity to carry out any novel ideas he may entertain in regard to pruning, training, hybridization, etc. In this day of intense commercialism the amateur art of fruit growing should be encouraged in every legitimate way. It was from the horticulturists of this class that the present commercial generation received not only their knowledge but their inspiration and it is to this class rather than to the commercial growers that we must look for the future improvement in varieties. The amateur has a beneficial influence upon the community for he teaches from the text, *quality*. The education of the purchaser and consumer reacts upon the commercial grower to force him to grow fruits and vegetables of superior quality rather than making *quantity* alone, his goal.

Fruits and vegetables have an æsthetic as well as a commercial value. A sprig of parsley served with mutton or turkey makes a pleasing contrast and whets one's appetite; a salad is never so inviting as when served on a nicely blanched, crisp lettuce leaf, and a table is never better dressed than when garnished with inviting trays of crisp nutty celery. These fresh, delicately flavored products of the garden beside adding beauty to the table give relish to the meal. They are as useful in their sphere as are cut flowers and potted plants in theirs. Fruits and nuts both fresh and preserved are highly esteemed as foods and in addition they have as well a decided æsthetic value. Fruits lend themselves to table decoration as kindly as do cut flowers. The variety in color offered by apples, peaches, plums, grapes, and the other small fruits which can be grown at the north afford a pleasing and appetizing dish for each season. And during autumn when the great wealth of the region's fruit harvest is on a dainty dish laden with luscious apples, peaches, pears, and grapes is an offering worthy of the palate of a prince, aye, I may say, the palate of a *Freeman*.

We pride ourselves on our schools, our colleges, and our political institutions, and seem to forget that these are only products of higher ideals. But man himself is a product of environment and without natural influences which are in themselves elevating and stimulating these institutions of which we are justly proud could not have been attained. The same climate which paints the cheek of the apple and gives perfume to the rose instills into its inhabitants an appreciation for all the higher things of life.

As we consider the possibilities of the country in which we live, the productiveness of the soil, the variety of the vegetation which it is capable of supporting and the utility of these products we are not living up to our opportunity when we fail to provide fruit, flowers, and vegetables for the table and shade and shelter for the home.

CIVIC IMPROVEMENT—WHAT HAS BEEN DONE IN OTHER STATES.

By Mrs. Emma Dow Armstrong, President Maine Federation Women's Clubs, Lewiston, Maine.

This subject upon which I am asked to speak tonight is not a new idea at all any more than is the other topic of which we hear so much, the woman's club movement, which I have the honor to represent. Then we also hear much about the "new woman" herself, but the latter, like the former, is the same sort of woman that her mother and grandmother were before her—the same devoted home-keeper and home-maker, the same unselfish mother of boys and girls, only perhaps with this difference, she keeps in touch with husband and children through her larger opportunity. As to the clubs and the civic improvement work, they are old—women never. In order of precedence comes the village improvement society and then the woman's club not far behind. So my text should be "There is nothing new under the sun," and the misleading word, new, disappears. This civic improvement idea is but the education of men, women and children to appreciate, enjoy and help along the movement toward a cleaner and better kept city or town or village, a more beautiful environment for the home and the city dweller.

Maine's beautiful seacoast, her towns and villages, are the resort of thousands, yea, tens of thousands of the wealthy residents of other states, for many months of the year. As a sure commercial investment, this beautifying of our State is one of the best arguments in its favor. No town or city can afford not to live up to its greatest possibilities in this respect. A beautiful, well-kept town, with clean streets, homes and public places well cared for, well shaded and well watered streets, goes far towards attracting permanent residents.

Civic improvement was the theme of four discourses Sunday in as many churches in Orono and a meeting of the citizens is called for Saturday to form an organization which shall co-operate with the town authorities in seeking the improvements that even the best villages in Maine constantly need. Let the good work go on!

Miss Rebecca S. Clark, the beloved "Sophia May" of juvenile literature, has given the brick building at the end of the bridge to be used for library purposes and as a home for the "Village Improvement" society in Norridgewock.

These are some of the things which the Civic Improvement Leagues are trying to accomplish to arouse a public sentiment which shall demand a better grade of municipal housekeeping. It has an imperceptible effect on the citizen himself. He respects his city or town where his surroundings are elevating and takes more pride in his own personal property. I received a letter from a friend traveling through the length and breadth of the United States who says of the laboring man in these newly beautified towns, that every one of them has the manner and bearing of a college president.

But I was to speak of some things that have been done in other states. I hardly know where to begin, but with the wondrously beautiful old town of Stockbridge, Mass., to which belongs the honor of the first village improvement society, organized fifty years ago, last August. Although this was before the era of women's clubs yet this society owed its origin to a woman, and to the summer visitors, who were so shocked at the unlovely, untidy condition of this favored village, as regards its natural advantages that Miss Mary Hopkins formed this society, to improve local conditions, by better roads in place of the muddy, uneven streets, reclaiming waste places, securing decent sidewalks, eliminating shabby, ill kept fences, weeds and other abominations, many of which abound.

The first year $1,000 was raised and 400 trees planted, streets lighted, drainage made good. All this work was made possible by aid from the town council. The society paid one-half the cost of a new railroad station, half the cost of a little park about it, planting it out to trees and flowers, so that first impressions of a trip to or through Stockbridge should be good ones. Now they have a beautiful library, drinking fountains, parks, streets, monuments to Revolutionary heroes. Cyrus Field gave $10,000 for a park. They erected the second monument in the country to heroes of the Civil war. And so the good example of these cultured, intelligent people of Stockbridge has made the name of their little town famed for its beauty in two continents. Lenox has the wealthiest people in the country as summer residents, because as adjoining town, they share the renown and vie with Stockbridge in making it beautiful. Aside from personal satisfaction in living in the midst of beauty and order the small amount of money invested by this Laurel Hill village improvement society was the best investment ever made, for the value of property has risen fabulously.

In Honesdale, Penn., the citizens joined hands with the avowed purpose of making theirs the model town of Pennsylvania. They converted the river bank into a park, and a frog pond also. They attacked two of the most offensive sights in town, making them the most attractive. This has been done by the woman's club and through their influence scores of other women in the state have taken up the work. They offer prizes for the prettiest back yard, neatest streets. Owners of vacant lots are compelled to keep sidewalks in order and weeds cut down. Their pastime is to plant trees and make flower beds, also direct the work of drainage and sewerage.

The National Cash Register Co. of Dayton, Ohio, put an idea in practice for making the grounds around the shops attractive. They have employed John Olmstead, the landscape gardener, to lay out the factory grounds and grounds of houses owned by the company, and now Dayton is famous all over the country for its beautiful homes of the working people. They have transformed the worst suburb into a blossoming paradise.

They formed an association and are doing splendid educational work through lectures, illustrated by stereopticon slides. They offer prizes for the best kept lawn, the cleanest alleyway, the prettiest back yard. Today, practically all South Park is organized to fight dirt and disease and beautify the town as well as the individual homes. Street vies with street, square with square as to which shall be most beautiful. For obstinate cases, the camera and stereopticon did the work pictured on the canvas. No one wanted to see the unsightly places pointed out as his own. A certain street, peopled by washwomen, etc., was too great a problem. So the superintendent invited them all to a dinner at the rest rooms of the factory, gave them a course dinner, with waitresses and the stereopticon showed up their street afterwards in contrast with other renovated places. It did its work and the washer ladies joined the association to a woman. In this suburb every tall fence is covered with beautiful vines, thus serving a double purpose, shutting out the omnipresent bill poster and beautifying the town. There is not a lamp post or telephone pole but is wreathed in vines. One street is pronounced by authorities, the most beautiful in the world, size and cost of homes considered. Think you that all this outlay of time and money has not paid? It has—and will. Social economists in this country and Europe are copying their plan.

All over the country, from Bar Harbor to California are these societies being organized. Every state has scores of these organizations. The women of Petaluma in California were ashamed of local conditions, but what was everybody's business was nobody's, yet the women organized the Ladies' Improvement club. They have raised and spent $3,000. Their first work was to redeem their plazas, two right in the heart of the town. They planted palms, graveled the walks, grassed the whole, placed seats.

They asked the electric company to paint poles white, use only good straight ones, water hydrants to be painted red. All these things tend to enhance the beauty of the place.

This work of civics is no new departure for women, for 200 years ago, in New York city, a woman had sole charge of street cleaning, the widow of Andreas Down, who drew annually a salary of eleven pounds sterling, but Chicago has the honor of being the first city in the world to appoint women as sanitary inspectors.

Montclair, N. J., has an association with many committees who have accomplished great things, fountains, clean streets, well lighted and paved—their motto is patience, push and persistence. The florists gave 5,000 chrysanthemums and 1,000 salvias, with instructions to the children of the towns of Montclair and Orange and a fete of the flowers is to be held in the autumn, with prizes for the best diplay.

One of the beautiful residence suburbs of Cincinnati, Wyoming, is laid out with its streets in curves, instead of straight lines with parks at frequent intersections. Here an improvement league was formed one evening. The next forenoon over 400 trees were planted, then followed the cement walks. These curving streets are most beautiful and the center is a fine oval park. Harrisburg has long been synonymous with civic work. Its civic club, formed through the efforts of Miss Myra Lloyd Dock, in '98, sent to Europe to get ideas on forestry and civic improvement work by governments, has or had two years since, 150 active members. Non-active members pay twice the fee for active members and men are eligible. Its educational department has 8,000 members. Once a month meetings are held in the school buildings, addressed by its members. As results demonstrate the usefulness of a measure, we cite what they have accomplished. Men are uniformed as were Col. Waring's White Wings, and keep the whole city patrolled, picking up and keeping clean the city streets. Receptacles for rubbish are placed; an ordinance was secured by which spitting is forbidden on pavements on penalty of $5.00. They reclaimed and beautified river banks. A nature library is loaned to rural schools, shrubbery is planted, and summer play grounds are maintained with a teacher in constant attendance. Five members of this club serve with thirty members of the board of trade in a movement to secure a loan for improvement work. Landscape artists are planning changes in ill-kept parks and open spaces.

This would be but a poorly-told tale were I to omit mention of work in St. Paul. It has been called "the Transformation of St. Paul." The first work was with the legislature. After bills had been introduced which seemed to be lost and the session was within five days of closing, a committee of three women resurrected the bills, got them through and signed by the governor in three days. The bill, one of them, provides that trees may be planted by the park board and at a cost of $5.00 per tree, not more, and the actual cost is $3.00, and expense to be assessed against property owner. The women worked quietly and carefully on the sanitary and garbage question—they tried to have these matters turned over to the health department. But for months there was war—contractors, pulls, and public opinion were to be fought, but they were victorious and facts and figures won out. The system was changed and money legitimately used in these departments.

I read an account recently of how the work began in Texas. The University of Texas sent a delegate to the American league —his ideas are right to the point. He said: We had Daughters of the Republic and Colonial Dames and all that—we're proud of them—but they didn't seem to help the city forward at all. Then they federated the clubs and got together, doing the best they can with their own peculiar needs.

In Florida they have improvement and cemetery associations. The latter work fell to the women, because it had to be done and the gentlemen did not do it. They also built a new school-house, furnishing it with blackboards, chalk, maps, etc. The settlers are from the North and have Northern ideas. No grass is their complaint. Remembering that "Whoever makes two blades of grass grow where but one grew before—," they planted grass and trees and have as good lawns as in the North. The Cleveland Home Gardening Association is doing good work along various lines—48,868 packages of seeds were sold to school children at a penny a package. In September, the results were shown by exhibitions of flowers in the various school buildings. Parents and friends were invited and these children had their first experience in cultivating the soil. After this 3,000 bulbs were purchased and distributed, after being potted. Each room had four or five and the children took great interest in the plants. This so wrought upon the park commission that they planted a muddy spot in one park with 50,000 bulbs, which was an event in the city annals when they came into blossom. One of Cleveland's daily papers now offers a prize of $60.00 for best garden; second best, $30.00; best porch or window box, $25.00; second, $10.00. Is it any cause for wonder that Cleveland is world renowned for its beauty? I wish time could be taken to tell of the eight miles length of Euclid avenue, with its four rows of arching elms, the well-kept lawns between the trees; the beautiful residences of John Hay, John D. Rockefeller and many other well-know men.

It seems unnecessary to multiply examples of what has been already accomplished by this new civic awakening. The movement in Washington, that already most beautiful city, by the appropriation of $15,000,000 by Congress for the erection of new public buildings, parks, monuments, etc., is only another evidence of the hold this idea has upon all classes and conditions.

There is practically no limit to the channels by which the clubs have shown their interest in the work—not all have the same necessities; not all the same interests. We must choose our work according to locality, needs and possibilities—enough has been cited of what pluck and perseverance can do to encourage the faintest heart, even when we cannot begin at the beginning of things—the laying out of the city or town. To quote from "Modern Civic Art," the "Bible of Believers in the City Beautiful," as Mr. Robinson is called: "As when the heavens rolled away and St. John beheld the New Jerusalem, so a vision of a new London, a new Washington, Chicago or New York breaks with the morning sunshine upon the degradation, discomfort and baseness of modern city life." "There is born a new dream and a new hope. Within these is the impulse of civic art. Cities grow in splendor. There are new standards of beauty and dignity for towns." What inspiration these words give to the hopeful worker. What has been effected in other states and cities can be made applicable to our own—the greatest factor in the work is the education of the citizen to demand for himself the best there is, for as one has said, "The people still rule." The value of beauty as an asset is recognized by even the great commercial institutions as we have seen. It would be like the play Hamlet, with Hamlet left out, to close this talk without allusion to the great work undertaken by St. Louis.

St. Louis has been preparing for a fair in which they hope to interest all nations and it would be a spectacle for them to present to their visitors, the condition of things in which St. Louis found herself. When Prince Henry of Germany made a visit to St. Louis it took $60,000 to put her streets alone in a presentable condition so that the royal prince might look upon them without disgust. So this matter of civic improvement was a matter of pride which easily touched the movers in this world's fair project. It was a very easy matter for them, with this pride about the looks of their city, to be made to see things as they were and to undertake their betterment. The city they thought should be made not only attractive but it should be made a model city so that visitors from this country and other countries could take pattern from the things that had been accomplished in St. Louis. So they took up this matter of civic improvement.

The first thing that was done, when the matter had been talked over among a certain few who had the interests of the city at heart, was the purchase of Charles Robinson's book, "Civic Awakening, or the City Beautiful," and six copies were purchased by a woman belonging to one of the clubs. She had read the book herself and she knew the inspiration that came from it. She took the six copies and put them into the hands of men who had a large influence and men that she thought would be interested in the work. They were so much awakened by it that they passed them on to others until those six books had a very large circulation. Then the next movement was a lecture by the professor who is at the head of the American League for civic improvement in Chicago. He was brought from Chicago and a lecture illustrated by stereopticon was given. After that they had an architect from Philadelphia who gave them a talk and in that way they worked up the public feeling until there was an interest sufficient to start upon the work. Then they sent out circulars. Then they organized their Civic Improvement League, and from that time on there never has been the slightest trouble in getting funds to carry on whatever work they needed. It can no longer be said of St. Louis that she is down at the heel and out at the elbows, as it has been repeatedly said, and also that she was very much averse to reform. Then they interested the newspapers, and that of course was one of the greatest forces that they have had in their project for carrying on this work. It would have been impossible, they all say, except for the interest that the newspaper men have shown in the work, it would have been impossible for them to have done what they have accomplished. The women in St. Louis, after this public awakening became so general, were so wrought up over the work that they went out into their own street and cleaned them themselves, and that was certainly a move in the right direction, for it set a good example. So that by the time the St. Louis fair opens next spring I think that they will be able, as they say and as they promise, to show us the model city of the United States.

Besides this work in other states as I have spoken of it, the request came to me a few minutes ago, to say a little about the work in Lewiston and Auburn, to let the people from out of town know that we have been trying to do something of that sort among ourselves. Last spring there was a meeting called for consideration of the subject. It was a small meeting but it was a helpful one and we had addresses from several persons who were interested in the work, and very soon we organized a Civic Improvement League. The work has been done in a very small way both in Lewiston and Auburn, but still we are hopeful of larger results in the future. Every great reform has its discouraging beginnings and its day of small things. But here, as in other places, we began by trying to educate the children as well as the older people to pick up and keep clean the streets, and to that end we have caused to be placed several—as many as we were able to—receptacles for garbage upon the corners and upon the most popular streets so that they can be kept clean in that way to a large degree. We have placed rest seats at the corners of the streets where people would naturally wait for the electric cars; as far as our money would allow us we have done that. Through the influence of the League in Lewiston the park has been very much improved. We have had a large number of seats put out, which the mayor consented to do at the request of the ladies. There was a large stretch of walk upon one of our principal streets that had long been an eye-sore, and that sidewalk was replaced that had long been a menace to the public on a dark night. We have improved a little park at the head of Pine street, putting out a bed of hardy hydrangeas there that will grow in beauty and be larger and more beautiful every year. At the instigation of the League there was a bed of geraniums placed around the soldiers' monument. I have addressed the teachers myself on one occasion, asking them to interest their pupils in the work and they have done so and have responded very kindly, and also the superintendent of schools. The matter of offering prizes to the school children for the best essay upon clean streets is now before the League, and I presume that will be done, and one of our assistants in Lewiston has offered to give a prize to the grade in the grammar school which will produce the best essay on clean streets. In Auburn the matter I think has been attended to by the chairman of the committee, Mrs. Atwood, and beautiful urns of flowers were placed upon the public library grounds. They have also placed rest seats at different places, and receptacles for waste. And so gradually we are hoping to arouse a public sentiment to demand what we know needs to be done and will have such an influence over the tendency toward carelessness and filth and dirt and disease that lurks wherever there is a chance for it in an illy kept, poorly taken care of, city.

PROF. PHELPS: It seems to me that this subject of civic improvement is one that we should look at from the very broadest standpoint, and the two standpoints which I wish to call to your attention are the pecuniary advantages of civic improvement and the cultural or educational advantages. Now the pecuniary advantages cannot be better illustrated than by the outcome of our relations with Cuba. Previous to the Cuban war our whole southern coast was menaced by that dread disease of yellow fever and the whole foundation of it was the filth and degradation in that little island of Cuba. That was the source of the whole contamination. What was the outcome? As soon as the United States took possession of that little island she sent a commission over there to clean up those cities. Those cities were thoroughly cleaned up and since that time we have heard nothing about the dangers of yellow fever along our southern coast. Now in a similar way results of the same kind may be obtained locally. Wherever filth and dirt exists there are the conditions which favor the growth of disease germs and fungous organisms and all those things which tend to propagate disease, and if you remove those conditions then you are working an improvement that will be of advantage to the whole city or the whole town. And so from a pecuniary standpoint you are doing a great work of public interest.

Then again, from a still more direct pecuniary standpoint, what do our great railroads find? They find, as you have already heard, they find that it is an advantage to them to decorate their lines. They have found it out to that extent that some of the great railroad corporations are employing today landscape gardeners, as they are called, to go along their lines and make improvements about their depots so that it will become more and more attractive to travel and to the public, and in that way it is proving a pecuniary advantage to those corporations. In the same way it will be a pecuniary advantage to any city to make public improvements by building better roads, by having better sidewalks, by having better kept streets, by having more parks along their streets.

But it seems to me that a still broader view should obtain of the whole subject, and that is the improvement from an educational or cultural standpoint. Now take a great exhibition of fruits of this kind. Do not you suppose that whoever comes in here and enjoys the beauty of these flowers and these fruits goes out a better man or a better woman than he was when he came in?—absolutely cannot go out a worse human being. And you will find that in general the highest type of mankind, of farmers let me say, are those who are interested in the cultivation of fruit and flowers. I think I am safe in putting that, with no derogatory influence or intention with regard to all other classes, yet we find among the fruit growers and the foresters as high a type of character as you will find in any class of farmers that can be named.

Now the educational influences of civic improvement are great all along the line. If we can do something to interest our children in the cities in the cultivation of flowers, in the cultivation of fruits and in a greater appreciation of the beauties of nature, we are doing much to elevate them, to carry their minds into grander and nobler spheres and to carry them away from the evil and the degradation which we all know is too common in our cities.

Let us look at this subject, therefore, from the broadest possible standpoint and realize that we are elevating and educating our boys and girls as well as our men and women.

AT THE HORTICULTURAL SCHOOL.

Miss Louise Klein-Miller, who was one of the efficient instructors at the Winthrop Horticultural School in a communcation in "The School Journal" said its object was "to interest the young in the study and enjoyment of plants, flowers and fruits, and both the boys and girls, who will soon take the places of the fruit growers of today, some practical affairs of fruit and flower growing." The different schools were visited by the instructors in the morning, and the general sessions were held in the afternoon and stereoptican lectures in the evening. Suggestions were made by the instructors for improving the school grounds. Miss Miller especially urged the importance of using the beautiful native shrubs, which can be secured without money and without price from pastures, swamps, roadsides and woods, and showed combinations of color and texture of flowers and leaves which produce good results in landscape gardening. A lesson in propagation by cuttings was given using a geranium plant for the illustration. Seeds, bulbs, perennials and shrubs were distributed to the children. Miss Miller's illustrated lecture in village improvement was much enjoyed by a large audience. The principal of the high school told Miss Miller before leaving, "No one can estimate the value and influence of the work that has been done here." All the instructors did excellent work and a few weeks later a village improvement society was organized, and its members find many opportunities for the improvement of the town.

Perhaps the Pomological Society may have been a silent factor later in the introduction of a speaker upon nature studies at the State Teachers' Association. The reports of the enthusiastic reception given to this speaker indicate that our teachers will no longer hesitate to do more of instruction along this line than in the past. Let us have more in the future.

Save along general lines it has not been regarded as any part of our work to teach nature study, at the same time that which relates to the growing of the plant or tree touches the vital part of fruit culture. He who has learned to make the plant or tree grow, has gone far in learning the art or science of growing fruit. Much remains to be learned even then, so it may always be a pleasant duty for the Pomological Society to teach still more of the mysteries of plant life, that the young people as they learn other things may also learn well the lesson of fruit growing.

SCHOOL GARDENS.

By Dick J. Crosby.

Expert on Agricultural Institutions, Office of Experiment Stations, U. S. Department of Agriculture.

The school garden is just now attracting a great deal of attention among educators, and rightly so. As an elementary feature of our rapidly growing system of agricultural education it has as much right to be as have the Sloyd room, cooking laboratory, and sewing room of our manual training courses.

School gardens are modern institutions but they have come to stay. No concerted movement for their establishment dates back more than thirty-five years. Aside from Germany where two or three states gave encouragement to the establishment of school gardens over eighty years ago, Austria and Sweden were leaders in the movement and were practically contemporaneous in giving official encouragement to it. These countries were followed by Belgium, Switzerland, France, and Russia in the official establishment and promotion of school gardens. The German government has not taken up this work in an official way, but through local initiative a great many excellent school gardens are being maintained, among them some of the best we have in the world.

In the United States school gardens were unknown twelve years ago; now they are found in fourteen or fifteen different states, and in perhaps fifty or seventy-five different cities and towns. What was probably the first school garden in the United States was started in 1891 at the George Putnam Grammar School, Boston, by Henry L. Clapp, master of the school. For nine years this garden was devoted exclusively to wild flowers.

ferns and a few hardy cultivated flowers; but in the spring of 1900 a kitchen garden was started on a vacant lot in the rear of the school yard, and has been continued successfully up to the present time.

To the Massachusetts Horticultural Society is due, in a large measure, the success of the George Putnam school garden and the establishment of other similar gardens in New England. In 1891, and every year since, this society has offered annual premiums of fifteen, twelve and ten dollars, respectively, for the

School Gardens on the grounds of the U. S. Department of Agriculture at Washington. These boys and girls kept their gardens free from weeds and watered them only with a rake.

three best school gardens entered for competition. The first prize has been taken every year by the George Putnam school, and I am told that the fifteen dollars thus secured has covered all expenses of the garden. These three annual prizes have been directly instrumental, also, in the establishment of school gardens at Medford, Wenham and other towns in Massachusetts, and the reports of these gardens, published by the society in its Transactions, have influenced the inauguration of similar work in other states, until now we find gardens not only in connection with the common schools, but also in connection with normal schools, technical schools, social settlements and factories in many different parts of the country.

I mention garden work in connection with social settlements and factories. Strictly speaking this is not school garden work but so closely is it allied with it that no clear distinction can be made. Children, in most cases school children, do the work and in nearly every instance it is so conducted as to be educational.

So favorable has been the impression created by the successful experiments made in school garden work in this country that many different institutions and organizations are now either undertaking to promote the work or are seriously considering the problems connected with it. The lack of teachers capable of conducting work of this kind has led to the introduction of school garden work in many of our leading normal schools. State departments of agriculture, State agricultural colleges and the U. S. Department of Agriculture are devising means for promoting the work. The latter is now making arrangements to have school gardens in full operation at the Louisiana Purchase Exposition next year. Last year the American Park and Outdoor Art Association devoted one afternoon session and part of an evening session to the consideration of school gardens, and during the ensuing year two committees of the association were at work preparing reports on different phases of the movement which were presented at the Buffalo convention of that association in July, 1903. On the same evening that these reports were being presented the National Educational Association was devoting an entire session to papers and discussions on school gardens.

Educators everywhere are coming to see that the child must be given something to do as well as to study; they recognize the value of the "laboratory method." The school garden is a laboratory—a nature study laboratory. It does for the children out-of-doors what the chemical laboratory, the carpenter shop and the kitchen laboratory do indoors. It trains the eye and the hand along with the intellect, and at the same time gives pleasurable employment and physical exercise in the open air and sunshine. To many pupils in the city it opens up a whole new world: Nature's life romance, a divine pastoral abounding in amusing little comedies and the most intensely interesting tragedies—the struggles for existence—all this at a time when every impression made upon the child mind leaves an indelible stamp. And not only does it arouse interest in the many phenomena of nature thus brought under the directed observations of the child, but it also gives zest to many otherwise dry exercises that the skilful teacher correlates with it.

Children's gardens, Georgetown, D. C. This garden was once part of a paved court surrounding the stone slave market seen in the background.

KINDS OF SCHOOL GARDENS.

Two fairly distinct types of school gardens are found. In one the ornamental features predominate. The children assist in planting the school grounds with wild flowers and shrubs, or cultivated flowers, ornamental plants and trees, or various combinations of native and introduced plants. Ordinarily, in gardens of this type the æsthetic features are emphasized, though not always to the exclusion of other valuable instruction. The children may learn, to a certain extent, the principles of plant growth, the reasons for pruning and grafting trees, the best methods of combating insect pests and fungous diseases of flowers, shrubs and trees, and many other practical details in maintaining pleasant home surroundings.

In the other type of school garden—the vegetable garden—we find the economic element predominating. Children are frequently allowed to plant flowers in connection with vegetables, but this feature of the work is usually incidental to the instruction in growing useful plants. Usually the garden is divided into small plats, from four to ten feet wide by six to twenty feet long, and one or two pupils are made responsible for the care of each plat. Here they plant lettuce, radishes, beans, potatoes, and other farm and garden vegetables, learn to distinguish them from the weeds that threaten to choke them out, become familiar with their habits of growth and methods of reproduction, discover numerous insect enemies and other pests that require great ingenuity to eradicate, and gradually acquire a nomenclature that adds greatly to the stock of words in their growing vocabulary.

Such gardens do not lend themselves to the realization of landscape effects, but furnish many valuable lessons not to be acquired in the ornamental garden, where, as a rule, all of the pupils work together. Among other things they develop a sense of ownership and awaken a greater personal interest. With this sense of ownership comes a growing regard for the property of others. It has been found in the education of incorrigible boys that allotting to each boy a plat of ground upon which he can raise what he will and enjoy the fruits of his labor has a powerful influence in overcoming the tendency to indulge in petty thieving. Furthermore, the few experiments in school garden work that have been carried on in this country long enough to give tangible results indicate that children who have engaged in work of this kind at school acquire a wholesome respect not only for the individual property of others, but for city property and other corporate property, for the shade trees in the streets and the shrubbery and flowers in parks.

The individual-plat system, also, more than any other, fixes personal responsibility. There is no chance to shirk it. If any plat shows neglect, the teacher knows where to fix the blame. If another shows excellence in design or painstaking effort, the teacher knows where praise should be bestowed. It has been found in schools where this system has been tried that to deprive a neglectful pupil of his plat and give it to someone else has been one of the strongest incentives to continuous and painstaking effort. After a pupil has prepared his ground, sown his seed and bestowed some little care upon the plants that have come up, he very much dislikes to have the fruits of his labor enjoyed by someone else.

THE VALUE OF SCHOOL GARDEN WORK.

School gardens increase the interest of parents in the schools —and there is need of an awakening of parental interest in this direction—active, potential interest, not the passive kind. Statistics for 1900, published by the bureau of education, show that less than seventy per cent of the children of school age in the United States were enrolled in school. Many parents need to be shown that the school is preparing their children, not only for greater usefulness, but also for greater commercial productiveness. This last consideration is a very sordid one, I grant, but it is, nevertheless, one that has great weight with parents who toil with the hands from sun to sun, and save to the last penny for the bare necessities of life, and who have never seen anything but the same kind of toil ahead for their children. Convince these parents that the school is preparing their children for lives of less drudgery, and they will somehow provide means for keeping them in school longer and more regularly.

School gardens arouse an interest among the pupils, and thus promote more regular attendance and longer continuance in school. The average attendance for 1900 was less than sixty-nine per cent of the total enrolment, and only forty-seven per cent of the total school population. In other words, our common schools attained an efficiency of about forty-seven per cent. More than half the children who should have been in school were running the streets or working in factories.

This condition is partly the fault of the parents, but it is also largely due to the lack of interest in school work on the part of the pupils. If the pupil is really anxious to be in school he will usually find a way, and he will also find a strong public sentiment to encourage him. On the other hand, it is very easy for the pupil who has lost interest to invent excuses for staying out of school a day or two, a week, or for dropping out altogether.

And some parents will connive with their children to devise excuses.

The school garden is in the same category as nature study, manual training and domestic science. In fact, it furnishes the most rational basis for nature study work. It furnishes the growing plant in an environment much more natural than the flower pot in the school room, and much more available for city children than the virgin forest or the open field. Nature study excursions are in many localities impracticable, and in all cities they make relatively heavy demands upon the time of the school children. The school garden is near at hand, always available,

Childrens' gardens overlooking the Hudson River in New York City. The chickens are given a daily walk in the garden.

and the time devoted to it need be no greater than is now given to "waking-up exercises" or other diversions intended to relieve the monotony of study. School gardening should be put on the same basis in our schools as manual training and domestic science. To a limited extent it should be required of every pupil in the lower grade, but further than that it should be made optional, just as manual training and domestic science are now optional in many of our best city schools. Not every boy is interested in manual training, not every girl in cooking or sewing, but a large majority of them are interested. The same is true of school gardening. It is also true, frequently, that some pupils who care nothing for the mechanic or domestic arts find gardening intensely interesting.

In this connection it should be kept in mind that school gardens are not intended to make farmers or market gardeners any more than manual training courses are intended to make master mechanics. They are intended rather to awaken an interest in outdoor pursuits and to furnish opportunity for a complete rounded development of the child's faculties. In the more advanced grades is it not as reasonable to allow the scholar to elect gardening (call it elementary agriculture, if you will) as to allow him to elect manual training or a business course; as reasonable to teach boys some of the outdoor features of home-making as to teach girls the indoor features? Scores of our smaller cities depend for their very existence upon the surrounding agricultural industries. Is it not as important that our growing youth shall be given a knowledge of the principles underlying these industries as that they be taught the ways of the counting house and the factory?

The cost of installing school gardens is merely nominal in comparison with the cost of installing equipment for manual training or domestic science. The cost of the land and a few hand tools is about all. The special teacher will be needed just as in the other courses, but the teacher of gardening can, in most cases, take charge of instruction in botany. One of the great needs of the present is a corps of teachers capable of carrying on such work, but the normal schools and agricultural colleges are putting forth strenuous efforts to meet the demand. In the meantime, progressive teachers all over our country are meeting the emergency by training themselves; that is, by undertaking a limited amount of simple garden work and at the same time reading everything available on the subject and spending vacations in summer schools. It will not be long, let us hope, before all of our best schools are giving adequate attention to courses of study that will furnish our children as good opportunity for coming into intimate and cordial relations with Mother Nature as they now have for learning the intricacies of man's numerous inventions.

NATURE STUDY.

By Mrs. V. P. DeCoster, Buckfield, Me.

Within a very few years nature study has come to the front in many of our public schools, as a most important study, and yet the parents who have never had the advantage of such studies have only a general idea that it is to teach the children the names of a few flowers, insects and birds.

In reality, the study is so broad, that it defies definition and only a small number of its benefits can be mentioned. The best definition I have ever read is by Prof. Hodge. "Nature study is learning those things in nature that are best worth knowing, to the end of doing those things that make life most worth the living."

It is impossible to realize the truth and meaning of that until one has studied for herself. During the past century, education has been limited too much to books. The best educators now realize that the most good is derived from facts found out by children in practical ways and from personal observation.

Too many children have been through school with the idea of the little girl who recently brought home a pumpkin seed, and told her mother that the teacher said that although the seed was white, the pumpkin would be yellow.

"And what will the color of the vines be?" asked the mother.

The little girl replied that the teacher had not taught her that.

"But," said her mother, "you know, dear, for we have pumpkin vines in our garden."

"Of course I do, but we ain't expected to know anything until we are taught."

Nature study teaches the child to see and investigate for himself, and to draw his own conclusions.

We sometimes call a child dull because he cannot easily learn arithmetic or spelling or some studies made by man, and yet the child when put out of doors with the remainder of his class and set to solve some problem of nature will be found to have the keenest observation and the most talent to put it to practical use. What are our great inventors except people who have watched and studied and utilized the forces of nature.

Life, everywhere, has been growing too artificial. People now are beginning to turn back to Mother Nature. What brings a host of summer tourists to your beautiful lakes and hills? It is not wholly to escape the heat of the cities, it is a desire to get out into the heart of nature, with peace and quiet.

What would our agriculture be today better than that of our ancestors if there were not people everywhere studying seeds, plants, fruits, insects and animals? The love of flowers and animals is born in every child and should be fostered and encouraged from infancy, otherwise childhood loses its greatest value.

Only a few days ago a neighbor said to me "My little girl brought home a lot of dirty bugs and water in her dinner-pail last night and I didn't know it and spilled it on the table and I told her to throw them away and not bring home any more."

"O, why did you do it?" I said. "Now you have nipped her study in the bud. My little girl brought home some too, they were tadpoles and caddice worms and diving beetles, and I put them into a jar of water so the children could watch them."

It is the very foundation of a farmer's success that he becomes interested in nature study when a boy. When taken up in a school it is wonderful how it will unite the scholars. I have found some boys who seem almost ugly and unapproachable to become so interested that they will do any amount of work and be the most interested in fixing up schoolhouse grounds or searching for rare specimens. At this time of year especially when everything is coming into life children will spend their recesses and noons in exploring all the nearby woods, brooks and fields. It gives them interest, exercise and knowledge; improves their health and moulds their characters. They have no time for quarreling or low thoughts when interested and busy out of doors.

Maine has a wonderful variety of wild flowers unknown to most people except the real flower lovers. It is not wild flowers alone which I would advocate teaching. It's not every farmer's boy or farmer himself who knows that the perfect flower must have both stamens and pistils and that sometimes these essential organs are found in separate blossoms and on separate plants. I know a man who set out a fine strawberry bed which grew handsome plants and blossoms but no fruit and he did not know what was the matter till some one told him they were all staminate blossoms.

Some people wonder why more of the cucumber and squash blossoms do not set, because they do not see there are two kinds of blossoms. Take the children into the garden with you, show them the importance of the corn tassel as it sheds its pollen down upon the silk of the ear, and explain that not a single kernel of corn will grow without the pollen. Explain how the beets and turnips, etc., are storing up food in their roots for another year's growth which we appropriate for ourselves.

How many people know that we would be overrun with plant lice, if it were not for a dainty little green-winged insect called the lace winged fly, whose larvæ are called aphis-lions, and they are truly lions among the aphids.

We are all the time talking about how to destroy the insect pests. And yet very little is said about our insect friends which we have by the thousands. If bees never gave us a drop of honey, they would be of inestimable value in pollination. Even Grandsire Longlegs and Miss Lady Bug are valuable friends. Nature seems to have so arranged matters that whenever any species of insects threatens to overrun the country, some parasite or disease increases in like proportion for their subjection.

Now we can't expect the school teachers to teach our children all these things and it wouldn't do them much good if they did. The object is to once get the children interested and to form the habits of observation and investigation and then furnish them with proper reference books to help them out. A few choice books of good authority are of untold value. Then we must take time to go out to play with them once in a while ourselves.

Let the men eat a cold lunch once in a while, while mother goes on a picnic down to the brook or off in the woods. It will do her as much good as the little ones. Every boy and girl brought up in a farm home, who experiences a happy childhood will have a full appreciation of what the word home means. There is a feeling of peace, security and ownership which the majority of city children know nothing about who live in rented houses, flats and family hotels. It is a feeling which I cannot describe in words and which children think little about until grown up, when they begin to have hopes and aspirations for homes of their own. I once heard a sweet little woman who had lost her husband and was without home or children, say, "When I drive past comfortable farm houses in the evening and see the bright light shining out and imagine the family group within, I always have to cry." There was the lonely heart-ache for a home of her own.

You will notice that many people who go from the farms to the city and acquire a competence, come back and buy the old farm to spend their declining years. They hope again to feel the peace and security which they felt in childhood, playing and working on father's farm. But where there is one man who makes money enough to come back and buy the old farm, there are ninety-nine who would like to do so but never save enough money. Do we as men and women appreciate our advantages, our independence of the rich? our freedom from worry about fuel, food and rent?

Many city people have the same idea of us that a poor young man had whom I overheard a few days before Xmas, when the stores were filled with Xmas gifts. I was riding on an elevated car in Boston and could not help overhearing a conversation between two young working men. One was telling the other about the Xmas trees for sale. "Why," said he, "they ask from fifty cents to a dollar and a half apiece for them here. Those farmers, down in Maine, are just getting rich out of them. They work on their farms in the summer and raise a lot of stuff and when it comes fall all they've got to do is just to go into their woods and cut these Xmas trees and send 'em up here and make from $400 to $500 a carload."

No wonder the poor fellow thought we farmers have an easy time while only a few blocks from there were long lines of people, men, women and children, at the coal yards waiting their turn to get 100 pounds of coal, which was all they would sell one person and that at an exorbitant price. Women with children in their arms and sick ones cold at home waiting for a few pounds of coal. Do you appreciate your wood lot as you drive in over the pure white snow and haul out your life-saving fuel?

O, the beauty, the grandeur, the freedom of life, working among these living, growing things, co-operating with nature, gaining our living from mother earth! If only the man's soul is large enough to overlook the unpleasant parts, to realize that what is drudgery to many is only the necessary part to make them appreciate the beauty. How can anyone love nature and not love God! We can hear Him in the birds and seen Him in the flowers.

I am aware that farm work means hard work, with hands and brains and often soiled clothes and disagreeable labor, but I know also it is work which means health, independence, freedom, self respect, and self support. It does not mean the broken down nerves of a school teacher. It does not mean the dyspepsia of a stenographer. It does not mean the consumption of a clerk or factory girl. It does not mean premature old age and the broken constitutions brought on by hundreds of sedentary occupations. It does not mean being rung in or out of work by factory bells. It does not mean the worry of losing your situation and finding another. It does not mean a menial servitude to others.

But it does mean health, happiness, prosperity, independence, fresh air and free sunshine in God's out-of-doors. It means co-operating with nature, in watching things grow, in developing perfection, in using one's brains. It means sound sleep at night. It means steady nerves. It means a business of your own, without submission to others, and with a constant incentive to study and improvement in your line of business. It means a pride and enjoyment in your business. It means a hospitable home, and to the earnest worker I do believe it means enough money and leisure for some longed for study and travel.

CHRYSANTHEMUMS—THEIR CULTURE AND VARIETIES.

By ABEL F. STEVENS, Woodside Gardens, Wellesley, Mass.

I wish to say that at the many exhibitions at which it has been my privilege to act as a judge I have never laid the awards on a finer exhibit or better grown fruit than I have in this hall.

Before I say a word about these gems of my heart and love, I have a few things to say before I begin, as the Irishman said. From early youth to this day I have always had a love for beauty in nature, and I am so glad that all our institutions throughout our land, our public schools which are the hope of our Nation, are doing so much in nature study. I shall ask your attention for a few moments to a practical paper. I will not read you an essay or give you an oration, but try to impart from my practical experience as a florist and as a grower of fruit some things that if these amuse you and please you that you can go and do likewise and grow them.

Among all the gems of the floral kingdom which lengthens out the year and adds sunshine to our hearts, and which stands without a peer among flowering plants as an effective decorative flower, we willingly ascribe to the chrysanthemum the well earned title of the "Queen of the Autumn," covering a period of fully one-fourth of the year with its magnificent blooms, and for ornamental and home decorations it has not a rival. The rapidity with which it has come into favor, the multiplication and improvement in varieties and the modern system of cultivation are without a precedent in the florist's experience. In fact, the business of selling and the quantity planted by amateurs and professional florists for cut flowers and selling plants has, in the last five years, increased as 1,000 is to 1, until now the chrysanthemum is considered as indispensable as roses or geraniums.

It was introduced into Europe from China in 1790 and it was not till 1795 that the first plant bloomed in Colville's Gardens, King's Road, Chelsea, England. While in our country it was about 1870 before their culture began in earnest and in 1885 the first exhibition of this grand flower alone was held in the

United States. While today every large city from Maine to California holds its annual "chrysanthemum show." America, England and France—each a "national society." In the earlier years of the plant only the Chinese varieties, consisting of the reflexed and incurved large flowered, the anemone and pompons were cultivated—later the wonderful Japanese varieties—with their long tubular or flat-twisted petals were introduced and since by crossing the varieties have become so intermingled that the lines of demarcation have almost become obliterated.

All new varieties of course must be produced by sowing the seed. It has been said that "growing seedlings is the poetry of gardening" and I know of no flower offering greater inducements or more quickly realizing results in growing from seed than the chrysanthemum. Many new seedlings often bring from $100 to $1,000 each.

The bright sunny days of our beautiful autumns are very favorable for maturing the seed. The requisites for success are sunlight, air and a dry atmosphere. The principle objects in hybridizing or cross-breeding are improvement in color, form, size or vigor of plant, and success will depend largely upon a proper selection of the parent stock.

Having a definite object in view select the nearest approach to what is desired. Sow the seed February 1st in boxes of rich, fine soil, give gentle heat and proper degree of moisture. April 1st transplant these seedlings in richer soil, six inches apart and by June 1st pot rapidly growing plants into seven-inch pots, then plunge these pots into the open garden soil. Give plenty of water during July and August and by September 10th lift them out, place these plants in shed to greenhouse to protect from frosts; give plenty of water, light and air until they are through flowering.

PROPAGATION.

In the propagating of named varieties the cuttings should be struck by the first of February and grow them in a cool house near the glass until April 1st, then transferring them into cold frames, giving abundance of air and moisture. May 10th these plants may be set out in open ground. Place them three feet apart each way. Nip in monthly the rapidly growing shoots, to produce stocky growth and proper shape to plants. If they have had good soil and culture they should be three feet in height and the same in diameter by August 15th, when they should be taken up and repotted. Use good rich soil made by well mixing two-thirds old rich pasture sods with one-third old stable manure. Set the plants into ten-inch pots, press the soil firmly and wet plants thoroughly. Let these potted plants stand for three days in partial shade then plunge into open ground till September 10th, when lift and bench the plants, giving ample room and light. Plenty of water, disbudding and training must be attended too—removing fully one-third of all buds set, give air freely, and as the terminal buds set, water with Guano water every three days until plants are in full bloom. If mildew appears on the foliage, evaporate sulphur, place tobacco stems about the pots. Keep the plants well staked up and blooms well tied and you will be rewarded abundance of regal flowers.

BEST VARIETIES.

In making up a collection, there are three points to be considered, i. e., 1st, varieties that will furnish flowers throughout the entire season of bloom; 2nd, a desirable assortment of colors; 3rd, plants of a vigorous growth that will produce fine, perfect flowers. The following list includes both early and late flowering varieties, comprizing both the reflexed and incurved petaled sorts covering the best selections from Chinese, Japanese, European and American varieties.

Three Best Varieties.

White—Timothy Eaton, Merza, Wivens.
Yellow—Col. Appleton, Modiste, Golden Wedding.
Pink—Maud Dean, Vivian Morel, Shenandoah.
Lemon—Marion Henderson, Phila, Cheltonia.
Red—Leonides, John Shrimpton, Shilowa.
Bronze—Kate Bromhead, Brutus, Lady Roberts.

POMPON VARIETIES.

Yellow—Savannah, Onita, Alliton.
Red—Douglass, Nota, Casco.
White—Nuspagh, Tam O'Shanter.

"OSTRICH PLUME" VARIETIES.

Wm. Falcoiner, Louis Boelmur, Mrs. Hardy.

Variegated—Leopard, Striata Perfecta, Moseman.

This list is the cream of 1,000 varieties, covering all species, all varieties and all colors.

The beautiful chrysanthemum is ever welcomed in the homes of all flower loving people; it supplies a long felt want; it comes at a time when there is a dearth of flowers, for the summer varieties are past and the winter plants are not in bloom. For house decorations, either in plants or cut blooms, it has few equals, for with proper care they may be kept from three to four weeks in good condition if placed in vases of water, changed every morning and kept in a cool room during the night. With the prestige already attained we shall expect the beautiful chrysanthemum to hold its rank as the favorite autumn flower. Most truly thou art the "Queen of the Autumn."

Prof. MUNSON: There is one question which may require a little explanation on the part of Mr. Stevens as there might be a little misunderstanding in regard to using sulphur when the plants are affected with mildew. Will you please explain just how you use the sulphur in the greenhouse?

Mr. STEVENS: We take an iron kettle and take the flowers of sulphur and just light it in the avenues or the walks of our greenhouses and just about the foliage. I have found nothing whatever in all the fungicides that we have that will destroy the creeping mildew upon the foliage so rapidly and so efficaciously as that of the flowers of sulphur. Only be careful that it does not flame into a blaze so there would be injury from the heat, and keep it where the fumes can rise—close the ventilators and doors for a short time. Occasionally we take a little water, dissolve the sulphur in the water and put it around the foliage. One thing, the varieties I show you, of the sixty-five varieties, there is not one of those that is subject to mildew. In all our growing of seedlings and in hybridizing and the formation of new varieties, that is one object we have kept in view, that is, to produce a handsome strong foliage. As the Good Book teaches without the blade no corn, so no matter how charming the flower may be and the blending of the shades and the colors, unless it has a good vigorous constitution it is not worth propagation in the seedling.

AMONG FRUITS AND FLOWERS.

Prof. A. L. Lane, Good Will Farm, East Fairfield.

Nature holds a wide place in memory and she holds that place very tenaciously. Recall the scenes of your childhood, the meadow, the brook, the deep-tangled wildwood, and every loved spot that your infancy knew, and see how clearly and distinctly they stand out before you in your vision. Literature abounds in the same element; the literature of the Bible which begins with the garden of Eden and ends with that beautiful city where there are trees bearing fruit for the healing of the nations.

My own childhood was fortunate in location. As a boy I had the privilege of occupying a position just a few miles from this city, ten miles from the leading city in the State, on the outskirts of a country village by the side of a beautiful river—Royal's river was a royal river to me and I well remember walking along its banks, especially one particular trip on an autumn day when alone I walked up the banks of the river for nearly three miles and back again on a delightful sunny afternoon, finding hazel nuts and wild grapes and wild crab apples and a variety of fruits along the bank of the river, and all the while the most delightful autumn scenery that one could well imagine. I remember with pleasure now as I look back upon it the hours spent in my childhood in driving the cows to pasture, some mile from home, across this beautiful stream and along a country road until I came to the pasture where the boxberry plums were ripe in the early spring and where blueberries and huckleberries and raspberries and blackberries grew here and there in clumps and where the work of my especial errand had other fruit accompanying it than just the fruit of the work being done itself.

A little later it was my privilege to study botany with an older sister who did the work in the text-book and permitted me to do the work in the field, and the combination was so successful that I received then an impulse toward the love of nature and the study of nature in the open air that has not left me, and nothing is more delightful to me today than a long tramp after some special flower. Let me speak of just one taken recently.

Two successive mornings I spent the time from early breakfast until school walking way into the country about two miles and back again, to be rewarded each time by just a few specimens of the beautiful fringed gentian. At last on the third occasion, I called a small boy to my assistance and received from him directions to cross over into the field where the cedar trees grow and I should find what I sought. And to my great delight and that of the friend who was with me we found an abundance of those beautiful fringed gentians in full bloom, the largest number that I have found at all in this part of the State. The only other time that I have found them at all like it, and that of course far exceeded it, was between Thomaston and Rockland where they grow exceedingly abundantly in the fall and where they have the beautiful blue color that the nearness to the sea intensifies. A large place in literature nature holds as well as in memory. Constant change is the characteristic of all nature's processes.

When does the year begin? Suppose one wished to spend a year with fruits and flowers, at what time of the year should they begin? He may begin at any time of the year. If the question were asked me, When does spring begin? O, I should say without hesitation, it begins some time in September or October; certainly the spring is well on by the early November days that we are now having. You may find in a brief walk, hint after hint of the presence of next spring already. Our newspapers have reported strawberries in full blossom, strawberries ripe, raspberries in full blossom, raspberries ripe, during the present warm fall. To what year do those strawberries that we now gather belong? To what year do the late blossoms belong? I passed my neighbor burying his cultivated strawberries with brush to protect them from the severity of winter, and by the roadside within a few feet I picked strawberry blossoms in full bud. Did they belong to that particular year or were they early foregleams or forerunners of the next year? Certainly, the latter. We can say that the late dandelions which bloom by the roadside and other flowers that come to cheer us as if to bid us good-by are really the heralds of the coming spring, coming beforehand to remind us of the spring that is coming so soon. From the fringed gentians and the witch-hazel blossoms which come, as we all know after the leaves have fallen, and adorn the branches of the trees with their slender yellow petals after the leaves have fallen, so that you can see them as you ride along the road, see them by the roadside, from the fringed gentians the late witch-hazel blossoms it is only a narrow step to the early wild catkins and the later catkins of the coming spring, in fact you may find the alder in full bloom in the fall, even the pollen yellow upon the catkins, so that the interval between fall and spring is, as it were, bridged over by the fact that spring flowers come in the late fall anticipating the following spring, and occasionally, of course, the fall flowers go on later and later until they hold sway close up to the reign of the snow and the sleet. The interval then during which winter holds absolute control is very slight and the reign of winter is broken all the while by the fact that try as it may it cannot exhaust the current of vegetable life that flows on and on until it makes the complete circuit of the year, in hidden root, in bulb, in stem, in bud, wrapped up safely from the winter's harm of the life that all the while is in a state of semi-activity and all the while waiting for the first warm days of spring to call it into full action. We cannot say that for a single moment the life current stops in the vegetable growth about us, but that the year is continuous. It is admitted that the few ferns which remain green through the winter, that the leaves of the boxberry plum plant, the leaves of the checkerberry, the wintergreen—the trailing wintergreen or the checkerberry, that these are living all the while. These do not have the vigorous life of summer but nevertheless it is true that in mid winter nature is full of life, ready to manifest itself at the first favorable opportunity in the spring, so that the year is continuous. The spring flowers come on, the skunk cabbage blooms in the swamps—I am sorry to say not in swamps near Waterville because it does not grow there, but in different parts of our State it pushes up its little red hands as it were in the very midst of the ice in the wet, damp places and unfolds its blossom before the leaves come. Other flowers come; the hepatica comes. I have found it in April when wading through the snow drift, on the south side of the woods—the hepaticas in full blossom and the butterflies flying about from one flower to another. Then the trailing arbutus, the Mayflower, and others follow on and on in rapid succession until the full throb of the plant life is on and the ring that girdles the year of vegetable life has its thickest part set with the floral display of the spring blazing like a rich jewel set in a golden rim. And then it reaches its height and we have the composite flowers of summer, we have the asters, and the golden rods of the early fall and the fringed gentians, and then the witch-hazel blossoms and the forerunners of the spring, and the winter seems to shut in the scene and close it all. And yet there is not a day in the year when the botanist may not go into the woods and find abundant material for study. He may take his snowshoes and let the drifts lead him nearer and nearer even. He may watch the way the birds are being fed by the kind Providence watching over them, even in the dead of winter. Does God take care of the birds? Yes, because I have seen him in the very act of doing it. After a severe snow storm I went down to a little brook in the rear of the house where I was living then, and looked across the stream and saw a flock of birds flying about from place to place and feeding upon the tops of little weeds that stood up just above the snow. The wind had blown the snow away from the place where these herbs were and had piled it up around the roots of the bushes where it was needed to protect the roots of the bushes from the cold. And it left bare the stems of these weeds and from weed to weed and plant to plant the birds were flying and eating their fill as they lighted upon each one and then going to the next one. God had swept the snow away,—otherwise it would have buried these weeds,—and given the birds a chance at his table.

The life that seems dead through the winter springs quickly again into activity in the spring, and what a beautiful type that is of resurrection. The life remains apparently dead, and into quick new life it springs at the call of the sun each spring.

Plants gird the year with perpetual life. Fruits come very near making a complete belt—complete, golden, beautiful belt around the year. If we speak of fruits as they are stored up, they do. "We always have fresh apples in our home," said an intelligent farmer, "the late apples keep until the early apples are ripe in the summer, so we always have a supply of fresh apples in our home." Any one who will intelligently cultivate apples may reach the same result. There may always be a supply of these beautiful specimens of fruit, of such fruit as we have these beautiful specimens here before us, in our homes, with proper selection and proper care. Of course taking this into account, the way in which fruits can be kept, they girdle the year. But even without that, the break in the year's continuity is but very slight. Into the late fall fruits remain still upon the trees, a variety of fruits, a variety of nuts, which are only another form of fruit, until the snow buries them, and in the spring when the snow melts away again, under the oak tree you may pick up and eat, if you choose, the acorns that have lain there, kept snugly under snow all the winter long. The squirrels lay up their supply of nuts not because they need to do it, because they cannot find them in nature but simply because the snow would otherwise bury them beyond their reach, it would be too hard a task for them to dig them from the snow and the ice. If the snow were not there they would have no need of storing up their supply of nuts. And indeed, in mild winters they get the greater part of their food by running about from tree to tree, from the cones of the evergreen trees and the nuts which they find here and there upon the ground. Our winter birds find abundant supply of food. They come down from further north and spend their winters with us. They do not starve. Those beautiful birds which you sometimes call robins, they tell you "The robins are here, I saw them in the apple tree"—well, they saw something there that looks something like a robin, the pine grosbeak, that come in flocks. They spend the winter along the streets of our villages and cities and eat the apples hanging on the trees. They find plenty of food here and there elsewhere, in different ways they find plenty of food. They do not starve. And so the chickadee in our woods sings his little song cheerily all winter long and finds no trouble; nature provides bountifully at her table for all the life that must depend upon her supply, and it is only because of the snow burying it so frequently that there is any distress at all. Of course man could not live without the forethought and provision of laying up for himself in this climate, but even here the year is girded with its circle of fruit as well as with its circle of flowers.

As the spring comes on the activities begin again in nature and the first flowers come, the flowers that you all look for as among the very first, the skunk cabbage, the hepatica, the bluets, the arbutus, and one after another the ladies' slippers, the pink, and the white and the yellow, the pink and white being varieties of the same thing and the yellow a distinct species, and then best of all that great showy ladies' slipper, which is almost as good as a chrysanthemum, standing two or three feet high, found so abundantly in the arbor vitæ swamps above Houlton, and found within a few minutes' ride of Waterville so I have filled a tub to the great surprise of every one who never imagined anything like that could be found within easy reach of Waterville. Then that little dainty orchid, the calypso, or the calypso spectabilis, that also, a rare, dainty, beautiful orchid, grows in the cedar swamps, within a few minutes' drive of the central part of the city of Waterville, and it grows also in the vicinity of Oakland and other places in the State.

So that we have with us, if we will but look for them, abundant plants and flowers to reward all our search and all our study.

I will not detain you with even the abstract of all that I had thought to say, but simply say that I thank you for your attention at this time of the evening, and I believe that any one whose heart is once opened to the sweet influences of nature will find a growing fondness for everything that God has made, and will find his own life enriched, his own thought enriched, his own happiness enriched, will find it a great delight and pleasure to become more and more intimate, as he may by careful study and by actual observation with everything bright and beautiful about him in nature. The very plants will preach to him sermons of life and death and resurrection, will bring him hope and cheer in hours of disappointment and sadness, and will make him glad that he lives in a world so beautiful, glad that the One that made this world so beautiful for us may make another world even more beautiful for us in the life to come, glad that there is to be a resurrection from death, glad that this life does not end all, but that an immortality awaits us all, prophesied so plainly in seed, in bulb, in plant, in the resurrection of all nature in the spring time, another step simply, sowing in sadness and reaping in gladness.

DEFINITENESS IN HORTICULTURE.

By Prof. F. W. Rane, New Hampshire Experiment Station, Durham, N. H.

To make a success in anything, I care not what it is, a person must have a comprehensive idea of it. With this well understood, the subject before us, "Definiteness in Horticulture," may be considered. As farmers we should have a definiteness of purpose which shows itself in our system of rotations, adaptable crops, etc.

With up-to-date methods of farming I am sure horticulture will appeal to us in some of its various forms, and it is only those of us who attain to this degree of proficiency that will make much success. A poor farmer will rarely make a successful horticulturist. Horticulture is more intensive than general farming, and to my mind is the cream of agriculture. It may be that horticulture will remain as of secondary importance as it is today on our farms for some time, but the thing of utmost importance is that whatever is attempted should be with definiteness in view. If in spite of our neglectful methods, fruit growing brings the most profitable crops found on many farms to-day, what, I ask, can we make of it if given more definite consideration? With a wholesome public sentiment in favor of even apple growing, to say nothing about the innumerable other horticultural crops, New England can be made a country unsurpassed.

We can say without hesitation that the apple crop is a sure paying crop everywhere in New England. Of course different sections differ more or less locally as to soil, exposure, etc., but by studying the existing conditions the problem can be easily solved. With the rapid development or evolution of American fruits there are varieties adapted to all conditions of soils and climates. With the introduction of Russian blood we have varieties of apples and cherries that withstand even the severe winters of northern Vermont, New Hampshire and Maine. Already we find such varieties of apples as the Bethel, Arctic, Oldenburg, McIntosh, Wealthy, Pewaukee, Wagener, Scott's Winter, St. Lawrence, etc., coming from these sections in wholesome competition. This is indicative of what can be accomplished when men set about it to overcome obstacles. I attended a local fair at Bethlehem in the midst of the White Mountains a few years ago and to my utter surprise found that the horticultural displays of not only flowers and vegetables were fine, but their fruit represented as many varieties and exceeded in display, anything that I saw that season. I was informed that the Baldwins were grown in a protected place, but the other fruits simply received the ordinary care customary in that climate. When such a display can be grown in the heart of the White Mountains we need not complain of our conditions elsewhere. One man is reported as growing a few acres of strawberries that year, and selling the product at an average price of 12½ cents a cup, which is equivalent to a pint. Surely strawberries are hardy everywhere and it only demonstrates what the possibilities are in cold climates with this crop. Mr. Howe of Lancaster, New Hampshire, is a large apple grower in that region, and says the Bethel apple is to that section what the Baldwin is to southern New England. When I was on a lecture trip with the Maine State Board of Agriculture, one year ago last summer, I found that the Arctic variety of apples is being very largely planted in the northeastern part of the State. I was surprised also to find when on this trip a gardener at some distance north of Bangor growing and shipping all kinds of small fruits for the Boston market. I might go on further to demonstrate that even in our colder sections of New England the possibilities for successful horticulture are even greater than is generally supposed. Here as elsewhere the man at the helm is the larger half of success.

For central and southern New England little need be said upon what we can grow here. This society has listened to such men as Hale of Connecticut, on the peach, and others equally experienced and successful with other horticultural crops. The results of such men assures us of the success of the specialist; now with definiteness of purpose and an understanding of their culture these products can be raised equally successfully in a limited way on the average New England farm.

Can we estimate with any degree of accuracy what can be expected in the various pursuits on the New England farm? This is a question well worthy of our consideration. I thoroughly believe it is our duty and privilege to estimate and figure out our chances for success or failure in all farming undertakings. No one should undertake a business who has not the possibilities at least for what he seeks. To demonstrate, we hear so much to-day about farming not paying, from men who are already engaged in it. I have taken occasion in many instances to examine into many individual cases of this kind and find the conditions for success are impossibilities to begin with. Here is an example, a man whom I know has a 100 acre New England farm, two-thirds of it is forest or natural pasturage, so called; the remainder has been under cultivation at some time or other, but nine acres are all that he tills each year. Now the forest land furnishes him his fuel and not much more under his method of management; the meadow his hay, which about compensates for the labor in harvesting it, while the nine acres under cultivation must produce his salary. He raises an acre or two of potatoes and the remainder, with the exception of a small farm garden, is devoted to ensilage corn. He makes milk for retail trade carrying about ten cows, has a span of horses, and thinks he needs a cheap hired hand. This man is staring providence in the face and attempting an impossibility when he courts success under his conditions. His taxes, horse and cattle foods, hired labor, depreciation in buildings and tools, etc., amount to more than his income. He aught to know he is attempting an impossibility—and finding fault will never overcome his conditions; think of it, only nine acres, which if it produced maximum crops each year would not give him cash net returns over $30 an acre for the crops he is raising, or $270 possible income for the year.

If a man expects to make a success he must form some idea of his real worth, and what he ought to make as a salary for his own satisfaction; then study out what he must do in the way of farming to accomplish the desired results. If I consider myself only a $300 man and I am growing hay for market, if my land is in good heart and I can produce an annual yield of three tons per acre and this sells at, say $15 a ton, it will take only ten acres to satisfy my demands, allowing one ton per acre for expense in harvesting. If I will not be contented with less than $1,000 or $2,500 a year, I must greatly adjust my base of operation.

Here again is where horticulture comes to the New England farmer's assistance, if he courts it. If the nine-acre man had devoted his attention to some horticultural crops, such as an acre or so of currants or combination of any of the following crops as—raspberries, onions, squashes, cabbage, tomatoes, celery, cucumbers, gooseberries, strawberries, peas, sweet corn, etc.; or orchard fruits if well taken care of, his chances for success would be possible.

I know of one man in New Hampshire who netted $200 on currants from one acre four years after the plants were set. An acre of currant bushes set 4 x 5 feet takes 2178 plants.

Mr. Crawford of Ohio, has raised 7,000 quarts of strawberries on a single acre. You and I ought to raise one-half that amount, or 3,500 quarts, which at ten cents, equals $350.

Muskmelons in hills 5 x 6 feet make 1,452 hills to the acre, and the small netted gem kinds will average ten or more to the hill under good culture, or 14,520 melons, which at four cents a piece would bring $580.

Tomatoes are as commonly used as almost any crop grown. Although the tomato is one of the rankest of plants and an assured producer, it is ever in demand in New England. Even with an increased demand for the canned product, which largely is shipped into New England, our local markets continue firm. Not only do we find a market for all ripe fruit, but I find gardeners who are growing the late Buckeye state variety simply for green tomatoes. The green fruit when well graded brings fifty cents a bushel at retail, or forty cents at wholesale. Five hundred bushels per acre of green fruit is a fair estimate which at forty cents equals $200, which can be relied upon. For ripe fruit the price will average seventy-five cents or more for the season. Our Earlianas, one of the newly introduced early varieties, sold during the fore part of the past season at $3.00 a bushel.

Small fruits of all kinds sell well here in New England. I have already referred to the red currant, but raspberries, both the red and black caps, are in good demand, and from my experience usually sell for a third to a half higher price per quart than in the west. Blackberries and gooseberries are often not to be had in some of our fairly good sized towns.

The plum crop should receive more attention generally on our farms. While the black knot, plum curculio, and fruit rot, are somewhat troublesome, they nevertheless should not discourage anyone if the trees are given the necessary care. At the New Hampshire Experiment Station we have fruited Burbanks at the rate of two and one-half bushels on five-year-old trees, and I was interested to note an article from Mr. A. A. Halliday of Windham county, Vermont, in a recent publication, stating that he had secured as high as seven bushels from six-year-old Burbank trees. When we realize that one tree requires an area of only 16 by 16 feet, or at the rate of 170 trees to the acre, surely the returns must be good. Other varieties of plums as Abundance, Lombard, Chabot, etc., are equally good.

We have one man at Wilton, our state, who raises on an average eight tons of grapes a year, and has had success in growing this fruit for the past twenty years. Many think the grape not adapted for many sections of New England, and still others think even if they could grow them, they would be unable to sell them on account of the competition with the quantities of this fruit that comes into New England from other states. I believe both of these notions are erroneous. Adaptable varieties can be grown in most sections if properly handled, and there is always a loyalty to home grown fruits. Mr. Bachelder, the man referred to, tells me that all of his eight tons are sold within a radius of five miles of his place. The Moores Early, Worden, Wyoming and Green Mountain, have all done well at the New Hampshire Experiment Station.

There is little reason why a man with any interest in his calling should not be able to inform himself in regard to the principles of the modern culture of any of our horticultural crops. The days of apprenticeship methods of finding out how to do things is relegated to the past; to-day we have plenty of literature and the main test is putting it into practical application. Culture, however, means much more than we are liable to credit it with. The culture of any plant means ideal conditions for its development for whatever purpose desired.

Too much attention can not be given in studying varieties. These are changing constantly, and it is highly necessary that we take advantage of those that are best adapted to our conditions and the markets.

Executive ability is needed upon the average New England farm, for success, as much as it is anywhere. The average

New England farmer needs to study business methods, and horticulture with its greater intensiveness and variety, will assist very much in testing the business ability of men everywhere should they engage in it. Perishable fruits or vegetables demand active business methods in handling at the right time, while the other farm crops like hay, milk, beef and wood are handled "any old time" as they are staple commodities. Business methods stand for a large share of success in anything, and it must not be lost sight of on the New England farm.

Horticulture on the farm has its place, and should not be neglected. It pays for family use if in no other way. Horticulture on the farm pays for the education of the young. Horticulture on the farm pays, for it keeps the boy there. Horticulture on the farm pays, for it makes the pocket money. Horticulture is education in plant life. For example, grafting, pruning, budding, propagation, rotations, varieties, soils, fertilizers, cultivation, etc.; these and many more can be studied. It is with these and many other advantages that a much broader horizon is attained. Study possibilities and aim high. Horticulture demands time. Peter Henderson recommends that seven men and three horses should be had to run a market gardening industry of ten acres successfully; and that when embarking in such an enterprise a capital of at least $300 per acre is necessary. One thing that ever needs emphasizing is, do not attempt too much.

It has not been thought advisable nor is it possible to go into other than a general discussion of the subject of "Definiteness in Horticulture" in the short time allotted me. Such subjects as details in small fruit growing and various other vegetable and fruit crops, not to say anything about general floriculture and innumerable other questions of horticultural interests can not be touched upon; they in themselves would each require much time and afford material worthy of much consideration.

In closing, I simply desire to say that under modern husbandry and methods, I believe that we at present little realize the possibilities of horticulture in its various branches until a definiteness of purpose is put into it.

APPLES AND ROSES.

By Julia Harris May.

What shall I write,
O wise Pomologists, for you tonight?
You who have watched the reddening apples fall,
I that have done no harvesting at all.
You that have nurtured apples, pears and plums,
I that have spent my life in "doing sums
Or writing verses,
What new thing can I
Write for your pleasure?
I can only try
From old, old books, or folios, to cull
Something of fruit, or flowers beautiful.
In musty drawers, or mouldy desks, maybe,
An ancient myth shall make a rhyme for me.
Then listen! Look! Upon your arms I throw
A poem, gathered from the long ago.
Yes, long ago,
Longer than oldest calendars can show,
There lived a maiden, radiant and fair,
Her name Pomona; golden was her hair;
Pink was her cheek and stately was her mein;
Warm was her heart, and luscious was her lip.
Vertumnus longed its honey-dew to sip.
But, as he neared her, clad in robes of green
She fled before him.
Sometimes, to his sight,
She showed herself, a nymph of shining light,
And then she vanished,—
Other lovers sought
To woo the maiden, but she loved them not.
"If I might win her," wise Vertumnus cried,
"Though by deceit, I should be satisfied."
And so, one day, he took the ugly form
Of an old woman.—Through a blinding storm,
He sought Pomona; told a woeful tale
Of women, sad, and poor, and wan, and pale;
Of maidens, lovelorn, and unfortunate;
He touched her heart. (She was compassionate.)
And then, transformed into a blooming youth,
Told his own tale, of Love, and Hope, and Truth,
Till she loved also; and, she went with him
To Hymen's grove, and, 'neath the shadows dim,

They swore eternal faith, and daily he
Plucked golden apples from Pomona's tree;
Yet often wondered, joy that was so sweet,
Came to his life, through byways of deceit.

Another story of an apple, I
Bring from the legends of the long gone by;
You know it well.—Upon the wedding night
Of Peleus, and of Thetis, from Heaven's height,
Eris, the god of Discord, boldly threw
A golden apple to the gods.—They knew
No hidden meaning, till wise Peleus read
Upon the apple, and interpreted,
"Detur pulchriori"
"To the most fair"—
"Whose shall it be?"
Minerva claimed it there.
Juno and Venus both demand the prize,
Though none deserves it in the other's eyes.
Which goddess should the golden apple own
Was left to Priam's son.—Delights unknown
Each promised Paris. Juno promised wealth;
Minerva, glory; Venus, Love and health;
And Grecia's fairest maiden for a wife.
So Venus conquered, and the dreadful strife
Among the angry goddesses began,
'Till Helen, who had beauty greater than
All other mortals, (Menelaus' dame)
The wife of Paris treacherously became—
Achilles rages.—War and strife increase
Between the land of Troy, and land of Greece;
And, from an apple and a woman rose
A war, whose story through the ages flows.

We read these legends, and the rapt soul hears,
Mingled with fables, songs of other years.
O golden apples of our early youth,
Ye hung above us, night and day, forsooth.
We reached you; touched you; but we did not take;
Ye vanished, for the dragon was awake.
Or, while we looked and longed, some Hercules
Had seized our apples of Hesperides.—
O crimson glories of our later prime,
The Summer Sweetings of our August time!
We seek ye, longing, but some other holds
The apple of our joy, beneath his folds.
We seek ye more and more, from day to day,

And long to climb the tree another way.
Dear red-cheeked apples from home trees that fall,
Ye are far better to my heart, than all
The golden myths of the Hesperides.
I love the orchards with their loaded trees,
I love the glory of the Autumn woods;
I love November, with its solitudes;
I love the fireside light, in cold December,
When, looking gayly at the blazing ember,
We listen, listen, to the sleigh bells' sound,
And tell old tales, and pass the apples round.

Not of the fruit alone our lips shall sing;
With springtime songs our hearts are echoing.
We sing remembered blooms of early May.
We dream of blossoms, strewn along our way
In days of yore. Their fragrant breath we take
And sing of roses for the mother's sake.
Yes, though the flowers wither, still we know,
Within the fruit, the future petals grow;
And we are sure, where'er we go,
Even while the tear drops start,
The vanished rose we used to know,
Is blooming in the heart.

Hark. Summer's step is southward bent.
Her footfall, faint we hear.—
The air holds not the lilac's scent—
No robin thrills the ear—
The leaves are dying, as we go.
But we sing, as they depart,
"Though the buds be covered with frost and snow,
There are roses in the heart."
The rain is chilling the brown old Earth,
Stripped of her Summer dress.
There is warmth and love by the fireside hearth,
But without, is cheerlessness;
For the trees are bare, and the cold winds blow,
Yet I sing, without fear or art,
"Though the gardens are covered with frost and snow,
Roses may bloom in the heart."

The red-lipped apples fill the bins;
The purple grapes are gone;
The pears are picked; the sky begins
To make its yearly moan;
But, in the cellar, apples wait
My longing lips to suit,
And, if the springtime should be late,
The heart has golden fruit.

The mountains were blue in the August days,
But now, they are tipped with white;
And a cloud, just above the summit, stays;
The snow will be falling to-night—
But we sit by the fire-light's ruddy glow,
And sing, "Let the Summer depart—
Though the Earth be covered with drifts of snow,
Roses may bloom in the heart."

Thicker and faster the snowflakes fall;
Higher the pale drifts rise;
The bushes are covered, and white drifts all
Lift their white arms to the skies;
December is coming, but, far below,
Sweet buds are ready to start;
And the Summer her backward way shall know
By the roses in the heart.

Then, while the snowflakes for the rose leaves fall,
And old Novembers through the windows call,
With memories in my heart, a fragrant throng,
I raise my voice to sing a harvest song.
Not of the Gardens of Hesperides,
The golden apples upon golden trees,
Not of the apple, royal Paris gave
To Venus for her beauty, would I have
My Harvest Hymn.—
                Not those that Mother Eve
Gave to her husband, without Heaven's leave.—
"She took it first" (old Adam's lame excuse,)
I would not offer for your modern use.
"The Devil gave me, and so I did eat"
(Eve's foolish reason,) why should I repeat?
Not such theology to you I bring,
Nor, from old legends, lift my songward wing,
Not these I sing.
I sing of orchards on the hills of Maine,
Bearing, each year, their golden balls again;
Of crimson fruit, that August breezes fan,
The blushing Baldwin, and the Astrachan.
The purple grapes, that twine on sunny slopes;
The golden pumpkins; and the canteloupes—

I sing the Summer Sweeting, none so good—
Delicious memories of my maidenhood—
I shake the tree, and, on my head, comes down,
A shower of apples.—From the grasses brown,

I fill my basket, and my treasures bear,
Where happy mates, its autumn sweetness share—
I sing and sing, and, as I sing, I eat
Another apple, toothsome, soft and sweet—
Upon the laden boughs we gaily swing,
The topmost apples, from its branch to bring.—

I sing the story of the paring bee,
The paring and the quartering I see;
The coring, and the stringing; and I seem
To gaze far back, into a childhood dream—
I sing the perfect string, hung firm and high;
(I cannot sing of the dried apple pie.)
I sing the pretty girls, "the Mission's" peril—
The "Copenhagen," and the "Hunt the Squirrel."

I hear Amanda, as she counts the seeds,
Blushing and laughing, for, she plainly reads
Her fate in numbers—
"One's my heart's desire—
Four I take, and never forsake,
And five, I throw in the fire—
Six—he loves"—
What shouts arise!
Oh see those tossing curls!
"Nine, they both love."
Ah, those eyes—
Those happy boys and girls!

I sing Snow apples, full of crimson juice,
Barreled away for late December use.
I sing the Greening, large, and full, and round,
From month to month, better and better found.
I think of apple sauce, and apple pies,
And dumplings, and turnovers greet my eyes,—
And rich mince pies, and every fruitful thing,
Of these I sing.—

I see another apple, hanging high,
And sing the glory of the Northern Spy.
I listen to the buzzing of the bees—
And pick the white-winged blossoms from the trees,
And wait and wait, until the apples fall,
And sing my song,
"These are the best of all"—

Then sing the Harvest song, the song of fruit—
The merry jesting, and the glad dispute—
The anthem of Thanksgiving, let us sing,

While all we love are homeward gathering—
Yes, sing my song, and lift with me a prayer:
"God keep us all—We thank Thee for Thy care,
We thank Thee for the fruitage and the flower,
The Roses and the Apples—Give us power
To do the right, avoid the wrong, and bring
Our praise to Thee upon November's wing."

Thus did I write,
Oh wise Fruit-growers—but I long to-night
To throw the prosy verses all away,
And sing the poem I have seen to-day.
If I had seen
Those glorious apples, golden, crimson, green,
If I had seen those grand Chrysanthemums,
(Oh how their beauty to my vision comes)
The double-white, the feathery pink, the red,
The grand prize blossom; and, interpreted,
I might have written poetry, instead
Of empty rhymes.—
And, when the song was done,
Have had a shorter and a better one.
They are the poem, shown to me,
But why should I rehearse
Their loveliness?—
In them, you see
God's own resplendent verse.

SECRETARY'S PORTFOLIO.

GEORGE B. SAWYER.

After a residence of more than forty years in Wiscasset, George B. Sawyer, Esq., died at his home September 19, 1903. "Wiscasset," says the Sheepscot Echo, "loses a citizen who has been prominent in its business and official life and who was well known throughout the State."

George B. Sawyer was born in Henniker, N. H., February 28, 1834, son of Jacob and Laura (Bartlett) Sawyer. His ancestry on the maternal side is said to be traced from Sir Adam Barttelot, who entered England with William the Conqueror.

George B. Sawyer acquired his early education in the public schools of Manchester, N. H. His preliminary training for active life included employment in printing offices, and in after life he often referred to that experience as having been of great benefit to him in an educational way. At the age of twenty-one he began the study of law with the Hon. John N. Goodwin, of South Berwick, Maine, and was admitted to the bar in York county in his twenty-fifth year. In the same year he was admitted to practice in the United States District Court, at Portsmouth, and at a later date in the United States Court of Claims at Washington, D. C.

Mr. Sawyer first located himself for practice in his profession at Salmon Falls, N. H., and in the fall of 1859 he removed to Waldoboro, in this county, where he practiced in partnership with the late Gov. S. S. Marble until April, 1862, when he was appointed to the office of clerk of courts for Lincoln county, and came to reside in Wiscasset. He continued in that office until January, 1878. On retiring from office Mr. Sawyer resumed the practice of law, in which he continued until his decease.

He held other public offices: During the administrations of Presidents Garfield, Arthur and Harrison he was the collector of customs for the district of Wiscasset serving in that office in all over eight years; he served for several years as one of the selectmen of Wiscasset, at a time when his business training and abilities were of great service to the town. In 1881 Mr. Sawyer was a member of the Maine State Valuation Commission, and acted as clerk of that body. He was long a prominent official of the Lincoln County Bar Association, and was a member of the Maine State Bar Association. He was one of the founders of the Wiscasset Savings Bank in 1866, and served as a trustee of that institution for more than thirty years and as its president from 1885 to 1898.

Mr. Sawyer, more than all these matters, was a man who enjoyed serving public interests. After the Civil War was over and the farmers were awakening to the possibilities of agriculture in the State, Mr. Sawyer was ready to lend a hand to the forward movement. He realized the importance of fruit growing, knew by his own observation that the climate was favorable. Thus it was in 1873 when the Maine State Pomological Society was organized he was found among the original members of that society, and with our president as its first presiding officer he became its first secretary and treasurer. In his report for the first year, referring to the Hon. S. L. Goodale: "It is to be regretted that at the organization of this society he was unwilling to accept the office of secretary for which he was so well fitted. That which to him would have been an easy labor, and to the public a valuable service, is to a novice a laborious duty."

Mr. Sawyer thus gave some idea of his own estimate of the work he had taken upon himself. Many times I have glanced over the pages of this report and those edited by Mr. Sawyer during his secretaryship, and I am well nigh appalled at the work he put into them, for every one bears the mark of his diligence and research, for at that time less was known of fruit culture and the data were available only to those who searched it out. His observation, confirmed by the experiments he conducted on his own grounds, convinced him of the possibilities of fruit culture in Maine. He sought knowledge of fruits from the books he bought, from the people he met and from the fruits he grew. Freely he imparted the knowledge thus gained. To my mind he was an ideal secretary, and the vast work he performed for the public here stands as a lasting monument to his memory. Let us rejoice at the good fortune of the society in securing such faithful service in its early life.

Mr. Sawyer continued as secretary and treasurer until 1885 when he resigned and was succeeded by the Hon. S. L Boardman. A long term of office during which he had the full confidence of all his associates. I sometimes fear in the rush of this busy world we too often forget the work of those who have gone before, and for one I take pleasure in making this public recognition of Mr. Sawyer's invaluable service to the society and the people of the State.

He was active in all local matters that concerned the welfare of the town in which he lived. For many years he was a director of the Wiscasset and Quebec Railroad. From its formation he was a member of the Republican party and took an active interest in all its councils. He was a prominent Mason and a loyal citizen.

Mr. Sawyer was married in 1859 to Miss Annie A. Lord of South Berwick, by whom, and by their daughters, Annie L. Sawyer, Edith A. Sawyer and Helen F. Sawyer, he is survived.

EDWARD K. WHITNEY.

Edward K. Whitney was born in Harrison, Me., September 9, 1824. He started in life as a brickmaker, but moved to the farm to live with his wife's father, Marquis D. Caswell, in November, 1853; this was the farm now known as "Hillside Farm."

As early as 1855 his interest in orcharding began when he commenced to graft the orchard set out by Mr. Caswell in 1819. He continued to graft trees every year until he left the place in 1894, or a period of forty-one years; he also, for quite a part of the time, maintained his own nursery.

The number of trees is unknown, but this year, the present proprietor, Mr. Wm. Breed, sells over 1,000 barrels of winter apples alone. He also had a large pear orchard, second only in number and output to his apples and was said to be the first man in Maine to sell native peaches in the Lewiston market and raised figs sufficiently to prove that they could be ripened in this climate.

He was in failing health the last three years on the farm and his death occurred February 14, 1897.

Mr. Whitney became a life member of the Pomological Society in 1882. Although he was not able to meet with us much he always seemed to have us in mind whenever he had any particularly nice specimens of fruit. At our Farmington meeting he sent over some beautiful specimens of Baldwins that attracted much attention. In the locality where he lived he did much by word and precept to improve the quality of fruit and to increase its production.

HENRY L. LELAND.

Henry L. Leland was born in Sangerville May 14, 1836. His home was always in his native town. He died June 26, 1903.

Mr. Leland was well known as a writer and lecturer upon agricultural subjects. Hs was for several years a prominent member of the Maine Board of Agriculture and his services as an institute worker were of a high order. He was a regular correspondent to the Maine Farmer and several other papers. His articles were always timely and helpful. As a citizen he was interested in all town affairs especially all that pertained to education. As a member of the grange, and in his daily life, he strove to interest the young in the work of the farm and to realize the necessity of living temperate, earnest lives. Those who knew him best knew the love he had for all beauties of nature and this love found outward expression in beautifying the home grounds with shade trees also the roadsides not of his own farm only but of adjoining ones as well.

Each tree in the orchard of nearly seven acres which he set was raised from the seed and grafted by his own hand—a fact in which he took great pride. He was deeply interested in the Maine Pomological Society being familiar with and active in its work from its first inception. The annual meeting at Dexter was one of especial interest and he often said the whole tenor of that meeting seemed to be "Raise only those varieties that are in themselves good and so maintain and add to the reputation of Maine fruit,"—a point he always urged.

"Along thy steps fair orchard hill,
Climbing high and higher still,
The fruit trees reach in lines of green,
Like burnished warp of emerald sheen,
Through which Pomona's lavish grace
Woof of richest fruits have traced."

In addition to the above which is kindly contributed by Mr. Leland's son, Will E. Leland, the secretary will say that he was much respected by the members of the society, and at the time of his death was one of the vice-presidents of the society. His work for the industry in Piscataquis county especially was very great.

LEMUEL GURNEY.

Lemuel Gurney, one of the best known citizens of Hebron, died at his home in that town Sunday, February 8, 1903, at nearly seventy-seven years of age, after an illness of several weeks from a heart trouble. Mr. Gurney was born in West Minot. In his early years he worked for a while at shoe manufacturing in Natick, Mass., but more than fifty years ago he returned to Maine and settled on the farm in Hebron where he has since lived. He has added considerably to the original acreage of his farm, and by making a specialty of fruit raising has given his farm quite a reputation as a fruit farm. His maple syrup and sugar were of a quality which gave them a fame beyond the limits of the State, and his only difficulty in disposing of these products was to know which orders to fill. He was a regular exhibitor at county and State fairs, and no long-familiar figure will be more missed at those fairs than that of Mr. Gurney.

Mr. Gurney was twice married. His first wife, Calista C. Barrows, died in 1881. In 1892 he married for his second wife Mrs. Lavina J. Haskell, who survives him. He leaves an adopted son, but has never had any children of his own. He was a regular attendant at the Baptist church, though not a member. He was an active worker in the grange.

Mr. Gurney's most prominent characteristics were his honesty and uprightness of character and his unfailing pleasantness of disposition and kindness of heart, known to all who had any acquaintance with him. No great deeds has he ever done, but the memory of this honest, unpretentious, kindly citizen makes a fame perhaps as well worth having as that belonging to many whose names are high on the scroll.

The above sketch appeared in the Hebron Academy Semister shortly after the death of Mr. Gurney. The secretary wishes to add that he was a life member of our society and an exhibitor of fruit for many years. He was a frequent attendant at our annual meetings and heartily enjoyed them. He was a very genial, companionable man to meet, and his pleasant smile and agreeable words will be long remembered.

THE CIVIC IMPROVEMENT LEAGUE.

This branch of organized work carried on by the ladies of the State has been set forth in the address of Mrs. Emma Dow Armstrong of Lewiston, which may be found in the body of the Transactions. Mrs. Cora E. Nye, president of the Lewiston League has kindly furnished The Portfolio with the following regarding the work being done in Lewiston. It is full of suggestions to others and there is need of this kind of work all over Maine.

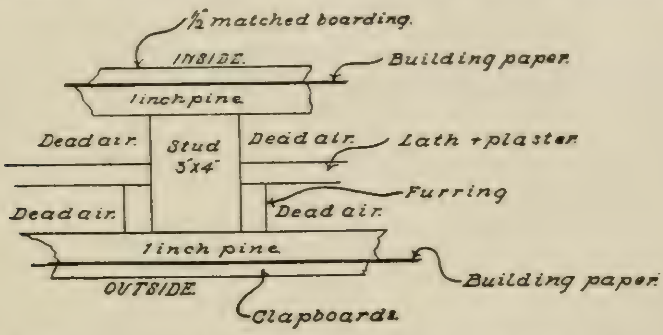
The Civic Improvement League of Lewiston has been instrumental in procuring about a dozen cans for rubbish and much of the waste paper which formerly blew about the streets is now deposited in them. Between two and three dozen settees have been placed upon the park and several at street corners, where they accommodate a large number of people while waiting for the cars. A beautiful bed of hydyrangeas has been planted on Nichols park, a bed of geraniums has been set at the foot of the soldiers' monument on City park. A fine piece of sidewalk has been built, or laid, on a prominent street which was much needed, the streets have been kept much cleaner than formerly and a great deal of pains has been taken to kill out the weeds, burdocks especially, which grow along the sides of the streets. The Davis Corner school building has been renovated at the earnest and active instigation of members of the league. Protestations against the filthy habit of expectorating on the sidewalks and in public buildings have been made emphatic, and a warfare is being waged against uncovered loads of dressing being hauled through the streets. The league has a committee who are working to secure playgrounds for children and young people and in the future we hope for a public gymnasium and free baths. Next season a larger appropriation for parks will be asked for from the city fathers as we desire to see plants and shrubs growing in abundance where now there is a lack. The river banks are a source of annoyance to every one who longs for a city beautiful and in time we hope for great improvement in that quarter as we hope for improvements all along the way too numerous to mention.

I wish to thank you heartily for the evening devoted to civic improvement at your Auburn meeting. Your display of fruits and flowers was wonderfully fine, you must have reason to be glad at the success of your meeting, and I wish that each meeting in the future may give you greater satisfaction than any in the past.

STORAGE HOUSE SPECIFICATIONS.

(See Illustration of House on Page 40.)

Through the courtesy of the Orange Judd Company of New York, we are able to publish this and the following illustration from Professor Waugh's "Fruit Harvesting, Storing, Marketing." The illustration shows the apple storage house of Mr. T. L. Kenney of South Hero, Vt., and the description is from Prof. Waugh's book above mentioned. It was built in 1888. It is 30x40 feet. The main story is 8 feet 4 inches high in the clear; the basement is 7 feet 4 inches high, and the loft, or second story, is 7 feet high. The large room on the main floor is used primarily as a sorting and packing room, but can also be used for storage when the basement is filled. It will hold 1,000 barrels, piling the barrels three tiers high, which is as convenient as any way. The basement is the main storage room. The apples are let down to this from the main floor by an elevator. This basement also has an outside door at the end opposite the one shown in the prospective. Barrels may thus be unloaded or loaded without being carried through the main floor. This basement room has no floor except for some loose boards laid down to keep the barrels off the earth. It has several small ventilating windows near the top, and the door is closed with a heavy, double-planked door, which is kept shut after cold weather sets in. This room also has a capacity of 1,000 barrels. The upper story is used as a storage for empty barrels, coopers' stock, etc. The main door opens upon the first floor. The sill is about 3 feet 6 inches from the ground; but the door is approached by a driveway, shown in the illustration. The windows are of glass and covered outside with heavy board shutters. The drawing shows the manner of finish. The outside finish consists of three



layers, as follows: (1) a layer of 1-inch matched pine, (2) a layer of building paper, (3) a layer of clapboards, well painted. The inside finish is also of three layers: (1) a layer of 1-inch matched pine, (2) a layer of building paper, (3) a layer of half-inch matched boarding, heavily painted. The painting is important. Between the outside cover and the inside finish, and between the studding, there is another layer consisting of lath and plaster. The position of these various layers will be understood by reference to the drawing. This leaves two dead-air spaces in the walls, one on each side of the layer of lath and plaster. This house cost $1,500.

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