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SIXTY-THIRD ANNUAL REPORT

OF THE

MASSACHUSETTS

STATE BOARD OF AGRICULTURE

PART II.

YEAR BOOK.

1915.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1916.

Approved by
The State Board of Publication.

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INTRODUCTION.

"Agriculture of Massachusetts," which has heretofore been published in one volume, is this year being offered to the public in two parts, of which this is the second.

Part I. contains the annual reports of the secretary of the State Board of Agriculture, and of the Nursery Inspector, Apiary Inspector, Dairy Bureau and State Ornithologist, also the financial returns of the agricultural societies and a directory of the agricultural organizations in Massachusetts. Only 1,500 copies of Part I. have been printed, and a very limited supply has been reserved for distribution to the general public. All the above material, however, with the exception of the financial returns of the agricultural societies, may be secured as separates, and those desiring the report of the State Ornithologist, for example, are advised to apply for it as such rather than for the whole of Part I.

Part II. contains an account of the lectures and discussions of the fifty-third annual Public Winter Meeting of the Board, held at Boston on January 4, 5 and 6, 1916; the most important circulars issued by the Board during 1915; and a compilation of the legislation passed during the year affecting agriculture.

EDITOR.

State Board of Agriculture, 1916.

Members ex Officio.

His Excellency SAMUEL W. McCALL.
His Honor CALVIN COOLIDGE.
Hon. ALBERT P. LANGTRY, *Secretary of the Commonwealth.*
KENYON L. BUTTERFIELD, *President, Massachusetts Agricultural College.*
LESTER H. HOWARD, *Commissioner of Animal Industry.*
F. WILLIAM RANE, *State Forester.*
WILFRID WHEELER, *Secretary of the Board.*

Members appointed by the Governor and Council.	Term expires[1]
FRANK P. NEWKIRK of Easthampton,	1916
HENRY M. HOWARD of Newton (P. O. West Newton),	1917
EDWARD E. CHAPMAN of Ludlow,	1918

Members chosen by the Incorporated Societies.

Amesbury and Salisbury (Agricultural and Horticultural),	A. WILLIS BARTLETT of Salisbury,	1917
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Blackstone Valley,	JACOB A. WILLIAMS of Northbridge,	1917
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Essex,	FREDERICK A. RUSSELL of Methuen,	1916
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Hampshire, Franklin and Hampden,	CLARENCE E. HODGKINS of Northampton,	1917
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Hillside,	HAROLD S. PACKARD of Plainfield,	1916
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Hoosac Valley,	NATHAN B. FLOOD of North Adams,	1917
Housatonic,	CHARLES W. FREEHAN of Great Barrington,	1917
Lenox Horticultural,	ALFRED H. WINGETT of Lenox,	1916
Marshfield (Agricultural and Horticultural),	WALTER H. FAUNCE of Kingston,	1917
Martha's Vineyard,	JAMES F. ADAMS of West Tisbury,	1918
Massachusetts Horticultural,	EDWARD B. WILDER of Dorchester,	1917
Massachusetts Society for Promoting Agriculture,	NATHANIEL I. BOWDITCH of Framingham,	1917
Middlesex North,	GEORGE W. TRULL of Tewksbury (P. O. Lowell, R. F. D.),	1916
Middlesex South,	JOHN J. ERWIN of Wayland,	1916
Nantucket,	HERBERT G. WORTH of Nantucket,	1917
Oxford,	JOHN F. FREELAND of Sutton,	1918
Plymouth County,	ERNEST LEACH of Bridgewater,	1916
Quannapowitt,	CALVERT H. PLAYDON, D.V.S., of Reading,	1918
Union (Agricultural and Horticultural),	EDWIN F. GOODWIN of Chester (P. O. Huntington),	1918
West Taunton,	CHARLES I. KING of Taunton,	1916
Weymouth (Agricultural and Horticultural),	HOWARD H. JOY of Weymouth (P. O. South Weymouth),	1917
Worcester,	EDWARD A. WATERS of West Boylston,	1916
Worcester East,	ARTHUR C. HAWKINS of Lancaster,	1917
Worcester North (Agricultural and Driving Association),	HENRY D. CLARK, D.V.S., of Fitchburg,	1917
Worcester Northwest (Agricultural and Mechanical),	ALBERT ELLSWORTH of Athol,	1918
Worcester South,	WILLIAM E. PATRICK of Warren,	1918
Worcester County West,	JAMES A. RICE of Barre,	1916

[1] First Tuesday in December.

PUBLIC WINTER MEETING OF THE BOARD, AT BOSTON, JANUARY 4, 5 AND 6, 1916.

The Board convened for its fifty-third annual Public Winter Meeting at Horticultural Hall, Boston, on January 4, 5 and 6, as the guests of the Massachusetts Horticultural Society. The weather was good during all three days, and a total of over 3,000 people listened to the lectures and inspected the exhibits. The Massachusetts Dairymen's Association, the Massachusetts Milk Inspectors' Association and the New England Alfalfa Growers' Association held their annual meetings in connection with the Board, and the presence and enthusiasm of the members of these associations greatly helped the success of the convention. An apple show, a corn show, a milk, cream and butter show, an exhibit of boys' and girls' agricultural club work, and an exhibit of the prize-winning cottons in the clean milk contest conducted by the Dairy Bureau, together with a large manufacturers' exhibit, filled the main exhibition hall; while the Boston board of health and the Milk and Baby Hygiene Association made interesting exhibits of their work in one of the smaller exhibition halls.

An interesting group of agricultural moving pictures had been assembled for the occasion by the Community Motion Picture Bureau. The films were used to illustrate the lectures, and were much appreciated by the audience.

On Tuesday, January 4, the opening session was called to order at 10.45 A.M. by First Vice-President John Bursley, who introduced Mr. John H. Dillon, chairman of the Boston park commission, to give the address of welcome for the city of Boston.

ADDRESS OF WELCOME BY JOHN H. DILLON, BOSTON PARK COMMISSIONER.

Mr. Chairman, the Executive of our State Agricultural Board and Ladies and Gentlemen: It is certainly a pleasure for me to come here this beautiful winter morning and bid you a hearty welcome to our city on behalf of his honor the mayor. In talking with the chairman of your meeting, it brought back to my mind the days of my boyhood. I remember my first employment in this life was, I believe, with one of the first presidents of this organization, the Honorable Marshall P. Wilder, and I recalled to your chairman's mind how glad we boys were when told that upon the next morning we might prepare to go with the farmer to Dedham, where the exhibition was to be held. How gladly we trudged along the dusty roads to Dedham, following the wagons laden with pears, apples, squash, potatoes and corn, and in those days we had an exhibition that I don't think was ever surpassed in the history of this State or of any other. I remember distinctly going with the nurseryman and farmer from the estate of Marshall P. Wilder, in Dorchester, to the fair ground at Dedham, and exhibiting over 400 varieties of pears, three pears to a plate. Marshall P. Wilder's grounds were the trial grounds of all varieties of grapes. Do you remember the great Mr. Rodgers of Salem, the great grape-producer of this State in those days? Every one of those grapes was given a trial on the grounds of Marshall P. Wilder. Strawberries were tried out there. New varieties were developed there. New varieties of plants were developed in his greenhouses. Every pear was given a fair trial. Apples were given a fair trial. Gooseberries, currants, — everything of that nature was given a fair trial on his estate in Dorchester. That man was certainly doing some good for the entire community, because when a thing received his O.K. it was certainly worth trying by the farmers throughout the State. Such shows were very instructive.

I presume you are anxious to get to your regular routine of business, and I won't detain you any longer except to say that I am exceedingly pleased to be with you. I am glad I came here, and if I have given you any food for thought, I

feel that I am doubly and amply repaid for coming here this morning and making a feeble attempt to take the place of his honor the mayor.

The CHAIRMAN. I think, ladies and gentlemen, at this time we expect a few words from the representative of the Massachusetts Horticultural Society in whose building we are guests. Possibly Mr. W. P. Rich, its secretary, will express the greetings of that society to us.

Mr. RICH. Mr. Chairman and Ladies and Gentlemen: At very short notice our president, Mr. Saltonstall, informed me that he was unable to remain at the meeting. He has prepared a few notes which he asked me to read for him, so I will take his place, as in duty bound to obey the orders of my superior.

ADDRESS OF WELCOME OF MR. R. M. SALTONSTALL, PRESIDENT OF THE MASSACHUSETTS HORTICULTURAL SOCIETY.

Gentlemen of the Massachusetts State Board of Agriculture: It affords me great pleasure to extend to you all the cordial greetings of the Massachusetts Horticultural Society.

This society of ours, as many of you know, is one of the oldest incorporated societies of its kind in the country. It was incorporated in 1829, and is now starting in on the eighty-seventh year of its existence. In 1929 we shall celebrate the one hundredth anniversary of our existence. The charter provides that the society is incorporated "for the purpose of encouraging and improving the science and practice of horticulture, and promoting the amelioration of the various species of trees, fruits, plants and vegetables, and the introduction of new species and varieties." This society is now working for the development of vegetables, fruits and flowers, and is doing all it can to encourage interest and progress in these subjects.

Many interesting events are interwoven with the history of the society, but no one more important event, to the society at least, than the enterprise shown in 1831, two years after the organization, when the society purchased at Mount Auburn,

Cambridge, a tract of land for a rural cemetery and experimental garden. It seems somewhat odd in these days that these two very different objects should have been linked together. It came about from the fact that many of the same gentlemen who were interested in the society were deeply interested in the project for a rural cemetery. Up to that time people were buried either under the churches or in the small congested burying grounds in the city. There were many unpleasant thoughts connected with burial in such places. The purchase was made in 1831, and for four years the garden and the burying ground were kept together, but in 1835 they found it was not a practical arrangement, and the society conveyed the land to the lot owners, who were incorporated by an act of the Legislature. That ended the further efforts of the society to conduct an experimental garden. But under the agreement of separation the society was to receive one-fourth of the proceeds of sales of land after deducting $1,400, the superintendent's salary, and that has proved one of the most constant and satisfactory sources of revenue to this time. I mention this as showing how important it is for a society of this kind to be progressive.

We are glad that our building will serve as the meeting place for your Board for the next three days. We place at your disposal the use of our library, one of the best of its kind in the world.

Many of our members will undoubtedly take this opportunity to listen to your lectures and conferences, most of which are on subjects for which this society is working.

In closing let me take this opportunity to call your attention to our large exhibition which we are planning for next May. We are offering a number of special prizes, and expect a very large display. We are going to try the experiment of having one or two shows each year on a much more extensive scale than the others. Speak of it to your horticultural friends and do all you can to make it a success.

Mr. W. P. Rich. I would like to add that that was the main object of the establishment of this society in 1829. Every record refers to a proposed experimental garden in

which every variety of trees, shrubs, plants and flowers could be tried out, but it seems in a very few years the idea of an experimental garden proved not satisfactory, and ever since then the work has been better done by private enterprise in nursery establishments; but on looking over the early history of the society it is interesting to note the great stress that was laid upon the necessity of an experimental garden. At the time of the establishment of this experimental garden Dr. Jacob Bigelow was very much interested in the establishment of a rural cemetery, something after the fashion of the Père La Chaise in Paris. There were no such cemeteries as that in the country as late as 1829, but the society had not funds enough to buy the land for the garden, and so 60 gentlemen, members of the society, subscribed $100 apiece, and for $6,000 they bought the land now occupied as Mount Auburn Cemetery. A sum exceeding $300,000 has been received by the society from this, its first and earliest investment.

RESPONSE FOR THE BOARD BY JOHN BURSLEY.

Mr. Dillon, representing the city, and Mr. Rich of the Horticultural Society: In behalf of our Board of Agriculture, I assure you that I thank you most heartily for your very kind words. I think we, as hayseeds, appreciate the sentiment, and we certainly appreciate the opportunity to spend a few days in your city, even in the winter season, and I know that every member appreciates the hospitality of the Horticultural Society and the use of this building and its appurtenances. Let me say that our Board of Agriculture, during an existence of sixty-five years, has always enjoyed its visits to the city of Boston, and I believe that this visit will be no exception. I am pleased to see so many of the seats filled at this, the opening session, and I know that some of us must get some ideas which, as farmers, will be of value to us. Gentlemen representing these departments of the city and of the society, I again thank you. At this hour, gentlemen, we are privileged to have with us, as the next speaker, Professor H. R. Lewis, poultry husbandman of the New Jersey Agricultural Experiment Stations, who will deliver a lecture on "Poultry and

Egg Production." This is something of which we need to know more, and something we can profit by here in Massachusetts, for we are annually bringing hundreds of thousands of dollars' worth of poultry products into our State for the consumption of our people, a part of which we should produce here at home.

POULTRY AND EGG PRODUCTION.

HARRY R. LEWIS, POULTRY HUSBANDMAN, NEW JERSEY AGRICULTURAL EXPERIMENT STATIONS.

It is with extreme pleasure that I have been able to meet with you at these sessions and receive some of the spirit of progress and co-operation which is so very apparent everywhere. I feel especially at home among you, for I not only have met many personal friends, but am, myself, a native of southern New England, having been born and reared on a large poultry and general farm in Rhode Island. While the conditions are somewhat different in New England than they are in New Jersey, yet a careful study of both have convinced me of the fact that the principles underlying the successful management of the flocks are the same. Any slight differences which may be necessary are of application, the method of applying the principle varying with the breed kept, climatic and market conditions. We have, as you know, in New Jersey a State which is noted for its large commercial egg farms, where White Leghorns predominate, and where the white-shelled egg for the New York market is the primary consideration. Here in New England, the larger, heavier, general-purpose breeds, useful for both meat and eggs, have by far the leading advantages. New England is especially fortunate in having not only suitable land and admirable climate, but also unlimited markets, and I firmly believe that with more attention to the farm poultry flocks, with better methods of production, the poultry industry of New England could be made one of its leading and most remunerative branches of agricultural effort. In order to accomplish this there are certain fundamental considerations which must be studied, and I would present the following to you for consideration.

I. Keep Pure-bred Birds of a Well-established Breed.

We hear a great deal these days about utility *versus* fancy, which, analyzed, means the production of eggs and meat *versus* shape and plumage pattern. This agitation about the so-called utility possibilities has doubtless been brought about by the results secured at the egg-laying contests throughout the country, and also by some phenomenal records which have been made by some cross-bred birds. As a general statement it may be said that it is a mistake to attempt to produce eggs or poultry continuously from cross-bred stock. Considered over a period of years, birds which are continuously cross bred produce no characteristics which are not supplied by pure-bred individuals. Cross-bred birds show no reliability in breeding where egg production is the primary object. A larger egg production can be secured from typical egg breeds than can be secured from crosses of the egg and dual type. Where meat production is the object, larger returns both in quality and quantity can be secured where the pure-bred meat breeds are used. The use of standard bred birds, of a well-established variety, results in a uniform flock, both as to general appearance, size, shape and color, and the birds bring a more uniform price on the market than the mixed types. They cost no more to keep than a mongrel or a bird of mixed breed, for they consume no more feed nor do they require any more labor to care for them. Where pure-bred birds are kept, often considerable revenue can be secured from stock and eggs sold for breeding purposes. The additional revenue so secured is almost all clear profit. These factors should be given careful consideration before an attempt is made to produce eggs at a profit from a flock which has been promiscuously cross bred.

Constitutional or inherited vigor is, above everything else, necessary in order that the poultry flock shall succeed continuously. It is the experience of the author that where the stock is weak, poor hatches result, high mortality is common, low egg production and sick birds are the rule. On the other hand, where poultry farms have made marked success it can be traced in almost every instance to sturdy, rugged, healthy,

vigorous stock. In discussing the stock there are a number of things to consider. Foremost is the determination of the breed best adapted to produce the type of product required. The birds themselves have frequently been likened to machines, which are required to transform the raw product — feed — into a finished product, — eggs and meat. Without a well-built machine this transformation cannot be carried on at a profit. There are many different types of birds, each designed for the production of a different type of product. The determination of the breed should be the first question decided. Three general classes of birds exist, first, the so-called egg or light breeds, most of which are of Mediterranean origin, of which the Leghorn is the typical example. These birds are kept in large numbers on successful farms where the production of white eggs for the wholesale markets is the primary object. It is an established fact that in New Jersey and New York these white-shelled eggs sell for from 3 to 15 cents more than brown eggs, the average premium being about 5 cents per dozen during the entire year. This difference is not apparent in Boston or southern New England. These light-egg breeds stand the confinement well and admit of herding together in large flocks. They are essentially active and are close feathered. Their rather large fleshy head parts require careful protection against freezing during severe weather in the winter.

The second type of bird may be called the general-purpose, and this includes the Wyandotte, the Rhode Island Reds and the Orpingtons. These breeds are characterized by their ability to lay a goodly number of brown-shelled eggs, and to bring in considerable revenue when sold for market purposes. It is this type of bird which is kept on some of the large commercial farms, but they more especially comprise the popular type on the farm and in the suburban communities. Being largely dual purposed they are the most desirable type for supplying home demands.

The third type of fowl comprises the meat breeds, of which the Brahma and Langshan are examples. These are the largest birds kept in flocks where market poultry products are the

primary object, and especially where capons and roasters constitute the main marketable product. Recognizing these three distinct types, the breed should be selected which personally appeals to the poultryman, and which produces the best type or combination of products for his particular object or markets.

II. Make Special Selected Matings for Breeding Purposes.

The aim of every poultry keeper, if he expects to remain in the business, should be to continuously build up his flock by breeding. Where the poultry and egg production is the primary object, the breeding efforts will be along two distinct lines. The first is to develop the most efficient egg machine which it is possible to breed. This means that his birds must be capable of turning out a maximum number of eggs of good quality during the winter season of high prices. This machine must be maintained at the minimum cost for feed and labor. The second object should be to develop a bird for table purposes, which will attain a sufficient weight in the shortest possible time, the flesh being of high quality and put on with the least expenditure for feed, thus securing the greatest possible margin of profit.

Paralleling these two aims in breeding should be the continuous effort to breed for vigor and stamina. I would that there were words in the English language which would enable one to express the great importance of vigorous stock. During the time that one is breeding for the so-called ability or commercial characteristics he should not lose sight of breed characteristics, and by selection and careful mating should improve his birds in respect to the body conformation which is required of that respective breed; and in order to maintain uniformity and an attractive appearance about the farm he should study to fix more permanently a uniform plumage pattern.

These results cannot be accomplished by promiscuous breeding, but they can be secured by continuous selection and the making of small special matings each year, following out a definite scheme of inbreeding and line breeding. A brief discussion of the most available method follows.

None will deny the fact that variations exist in birds, some good and some bad. The power of selection which the poultryman possesses is a wonderful instrument for improvement. The difference in birds is made possible by variation and by a continual selection of those which possess desirable qualities, and propagating these qualities into future individuals. A higher standard of efficiency in the progeny will thus continuously be secured. Careful attention to breeding accomplishes two definite things, — it increases the production of individuals, thereby making it possible to secure higher individual records, and it stimulates the average of the mass through the elimination of poor producers and the substitution of heavy layers in their place.

In order to be able to select and breed intelligently, the poultryman must know what his flock is doing. He must know the flock average in egg production. And what is of even greater importance, he must be willing to trap-nest a small percentage of his birds in order to learn individual performance. Unless he can determine the very best birds, selection and breeding with the idea of improving the average will accomplish little for lack of a basis of selection.

III. Hatch relatively early.

The time of year for hatching chicks which are to be reared as future pullets, or which are to be sold for broilers, should be carefully considered. A few weeks too early or a few weeks too late may mean the difference between a profitable winter production in the case of pullets, or in the case of broilers it may mean the difference between 30 and 50 cents a pound on the market. Late hatched pullets grow slowly during the summer, owing to the fact that they do not get a good start, and hence do not come into maturity in the proper time in the fall, and do not get under way in egg production before winter shuts down. On the other hand, if they are hatched too early, as, for example, early February and March, they will doubtless molt in the late fall, which will cause a lower production during the balance of the winter. The exact time for hatching will be determined largely by the type of bird kept. The

American general-purpose breeds are characterized by slow growth, and hence must be hatched earlier than the light, active Mediterranean breeds which mature in from one month to six weeks' shorter time. The Leghorn and birds of their type are best hatched about the middle of April. Where it is necessary to bring off more than one hatch, they can be safely brought off from April 1 to May 15. This will give them between five and six months in which to mature, and thus be in laying condition by October. Heavier breeds will usually do better if hatched from the middle of March, and not later than the last of April.

The following are some of the more important advantages coming to the poultryman who tries February hatching: —

1. A considerable egg yield is secured during the late summer and fall, when the yearling hens are on strike, due to molt.

2. The eggs produced during these fall months bring high returns when sold for table purposes, due to scarcity.

3. The pullets may be profitably used to produce hatching eggs the following spring. A good number with strong germs and of good size is assured.

4. Cockerels which can later be used for breeding make good size and strong development early in the season.

5. The chicks will make an excellent growth before the hot, dry weather of summer comes on with its retarding effects.

6. Surplus cockerels will sell for high prices as broilers during the early spring.

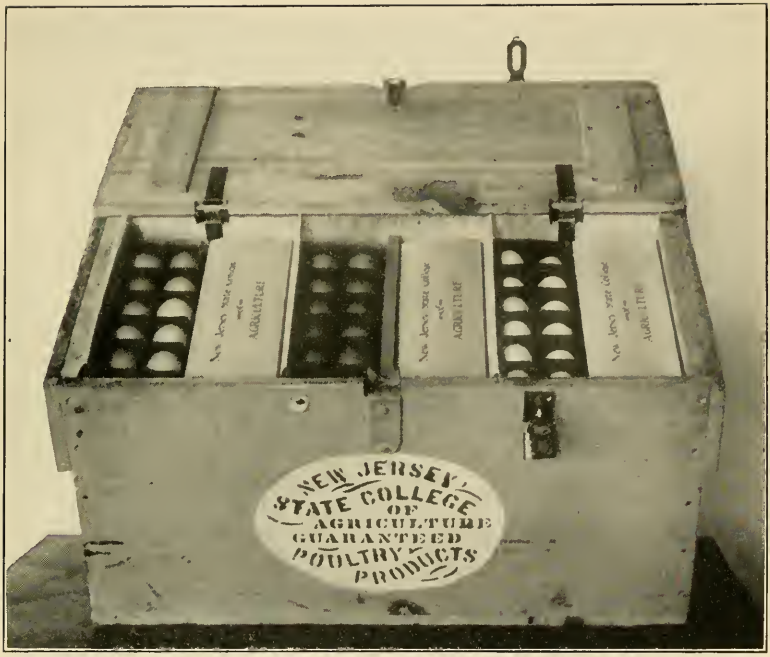
7. The farmer will find early hatching profitable, as he can give them better care at this time than after the rush of spring planting begins.

8. To the commercial poultryman it lengthens his hatching season, and does not compel such intensive concentration as if all the pullets were brought off during one month.

9. The females reach maturity long before the intensely cold weather commences, which means greater vigor and better resistant powers.

10. A greater combined efficiency from all operations if the proper proportion of early hatched birds is kept.

Another factor which affects the time of hatching is the con-



Quality in market eggs means more profit. (Courtesy of the New Jersey Agricultural Experiment Stations.)

dition of the range upon which the chicks are reared and the method of feeding. Youngsters which are provided during the summer with an abundance of range, providing shade and green food and plenty of nutritious food material, will make a more rapid and uniform growth than flocks which are crowded into small bare yards during the same time.

The hatching egg should be carefully selected in order that it may be uniform in shape, size, and, as far as possible, in color; it should also be strictly fresh and of normal shell. If these characteristics are chosen, the tendency is for the progeny to lay a more uniform product.

Experience shows that eggs decrease in their hatching power the longer they are held, and it is never safe to hold hatching eggs over three weeks. When it is necessary to hold them for even a short time they should be placed in a moderately cool temperature, between 40 and 50 degrees being the most desirable. They should also be turned occasionally to keep the air cell from becoming misplaced. If possible, it is well to stand them on the end, leaving the air cell uppermost. The character and quality of the chicks resulting from the hatch will depend in large measure upon the condition of the hatching eggs placed in the machine. Too much care cannot be expended in keeping the eggs in a normal condition.

IV. Practice Constant Selection.

Selection should not only be continuously practiced in mating the breeding flocks, but it should be the plan to eliminate weak or sick birds throughout the brooding, rearing and adult periods whenever they appear. Fowls which show at any time a lack of inherent ability to resist disease are never a profitable animal on the farm.

Constitutional vigor, or, expressed differently, inherent vitality and stamina, is pictured by the perfect health, the activity and the vitality which is seen in strong fowls. Birds showing a lack of these are unsatisfactory, both as producers and reproducers. As we expect more and more of the modern hen in the way of production, fowls often break down, and the effect is especially shown in future progeny. Much of the

low vitality and poor hatching quality in eggs, much of the weakness of the brooder chicks, much of the mortality and disease in adult stock can be traced to lowered vitality in ancestors, due in many cases to the immense requirements for production. The average hen is expected to lay in a year from four to five times her body weight in eggs. This means one egg approximately every third day of the year. In order to perform this feat of production she must consume approximately twenty-five to thirty times her body weight in feed. There is, doubtless, no farm animal which is more efficient as a transformer of the raw material into the finished product than the hen. The successful breeding for vigor means the appreciation of two sets of factors, — first, the lack of vitality, and second, signs in an individual which determine the presence or absence of vigor. Valuable work has been done by a number of our experiment stations in studying these factors.

The successful commercial poultryman and the farm poultry keeper who have studied their birds have learned that forcing, due to heavy feeding, or to intensive conditions, if continued year after year, cannot but, in the end, break down the physical strength of birds so treated. They have also observed that inbreeding for a number of generations, without regard for vigor in succeeding generations, intensifies the characteristics of low vitality which the original parents possessed. The use of pullets for breeding purposes, due to their immaturity, cannot but result in progeny of small size and possessed of less than their full quota of stamina. Forced feeding during the winter and fall, especially of concentrated protein feeds, has the immediate effect of taxing the digestive system, causing the bird to go off its feed and lowering its energy and physical strength. The continued crowding of breeding stock into poorly ventilated quarters, and the giving to them an insufficient amount of exercise, is another direct cause of low vitality. Such conditions will be apparent in the fertility and vitality as possessed by the germ in the hatching egg. Lack of care in hatching and improper range conditions for the growing stock are two other common causes of lack of vigor. Probably the greatest of all causes is the failure of the poultryman to select his breeding stock with great care. Breeding

from nonvigorous birds means nonvigorous progeny, whereas the breeding from vigorous birds means vigorous progeny. When mating up the breeding pen, select male birds which show signs of physical strength and superiority; for example, the bird with a bright prominent eye, with a well-developed blocky body, with an erect carriage, glossy plumage and bright comb and wattles. The vigorous birds are usually active and spirited in their movements. They range extensively in search of forage. They will be seen to scratch energetically in search of feed. In a great many cases they are the last birds on the perch at night and the first birds off the perch in the morning. In the case of the male, the loudness and frequency of the crow is an indication of physical superiority, while the continual cackle and singing of the female has the same indication. It will be evident to any practical poultryman that there is a very definite and fixed relation which exists between the external appearance of fowls and their vitality; hence it should be the aim to systematically select for constitutional vigor at all ages and for all purposes.

V. Induce a Uniform, Rapid Growth.

A possible serious loss to the poultryman is death in the brooder. This loss can be, in large measure, avoided by selecting a suitable brooding system which will maintain proper environmental conditions, and in addition to this, by providing the chicks with a suitable feed ration. For the small poultryman, brooding only 200 or 300 chicks, the small outdoor brooder of 50 or 60 capacity may be satisfactory, but for the commercial poultry farm, or for the farm flock where 300 chicks and upwards are reared, the so-called colony brooder stove will be found very desirable. These are recent products, having been put on the market within the last two years. A great many different types are available. One which is substantially constructed and has a rather large metal reflector which can be raised and lowered, and which is provided with an accurate, simple method of regulating temperature, should be satisfactory. From 300 to 500 chicks (never over 500) can be placed under one of these hovers, and a brood of from

85 to 95 per cent should be secured. The commercial plant doing considerable winter brooding, especially where winter broilers are produced, will find that an intensive brooder house, with a central heating plant and pipe running under the hovers, will have certain advantages. The colony brooders seem to be, at the present time, the most economical solution to the brooding problem. They should be placed in a relatively large house, never smaller than 12 by 14 feet, preferably of two rooms, one room containing the heater or hover, in which a fairly warm temperature is maintained, and an adjacent room in which the chicks can be fed and take their exercise. This colony system of brooding allows the chicks from the beginning considerable range, and cuts down the cost in permanent equipment and labor. It also enables the use of the house continuously throughout the year, for after the chicks have gotten old enough to do without heat, the stove can be removed and the house used for a colony house during the growing period, in which the pullets can be left until they attain maturity. During the winter the houses can be used for a short period for special breeding flocks.

The proper feeding of the artificially brooded chick is important, since the digestive system during the first four weeks is very delicate and easily upset by improper feed. The general practice should be to feed the chick the first few weeks of its growth without forcing, allowing to develop a vigorous constitution with a good body growth, and after that time it can better stand forcing for a rapid meat growth when desired.

When planning the rations for the youngsters, and when determining the method of feeding, it is important to appreciate that the first feeds should be easily seen and should contain much nutriment. It is also well to practice a restricted or retarded early feeding in order that their delicate digestive organs may not be overcrowded. Grit and shell are important essentials in the chick ration, and fresh water should be provided in large amount. Dry cracked grains are safer, for the first few weeks at least, than wet mashes. Wheat bran is an important addition to the feeding practice, as it contains ash, is slightly laxative and is relished by the birds. Ash in the form of phosphoric acid can be secured in the form of dry

ground bone, and is an essential element. During the early part of the feeding period the chicks should be fed little and often, and should be kept busy and hungry between feedings. Sour milk in a loppered condition is very desirable, as it not only furnishes much food material, but the lactic acid present acts as an internal disinfectant. A continuous effort should be made to practice clean feeding, for nothing will upset the digestive system quicker than sour and moldy feed.

Hardening-off Process.

In order to get the chicks in condition for removal to the range it is necessary after the second week to practice a hardening-off process. This should be gradual and consist of lowering the temperature, with the idea of doing away with artificial heat entirely in from three to six weeks, depending upon outside weather conditions. The best practice is to reduce the artificial heat until it can be entirely given up, then gradually to raise the hover until it can be entirely open, and replace with muslin-covered frames, having them hung to the hover wall, gradually raising them in front a little each night until the chicks become used to their absence. It is impracticable to take them from a warm, heated brooder house and put them into a colony house unless they have been accustomed gradually to the change. The idea should be to get them on the range as soon as possible. When they are four weeks of age, the sooner they can be gotten out into the cool temperature in large, well-ventilated quarters, with free range, an abundance of green food and access to the ground, the better they will grow and the hardier and more vigorous will they be at maturity.

This hardening-off process is especially desirable with Leghorns, as their close feathering makes them susceptible to cold weather, and when not properly weaned they pile on top of one another to keep warm. This usually results in the death of many and a loss of vitality to the others.

After the chicks are weaned and placed on the range the aim should be to induce a continuous growth throughout the summer. Any checks or setbacks which they might be subjected to, due to improper feeding or care, will result in irreg-

ular maturity and lack of uniformity. There are two factors, aside from their inherited characteristics, which affect proper maturity. These are environmental conditions and food supply.

Environment plays an important part, as the best bred chicks, possessing all other desirable characteristics, if not given ideal conditions in which to grow will not exercise or develop to the fullest extent. These conditions are as follows: —

1. One should not attempt to grow young stock on restricted range.

2. Shade should be provided in abundance.

3. An abundance of green succulent food material is very necessary.

4. The type and size of the house in which the chicks are placed bears a close relation to their growth. Fresh air is the limiting factor.

The method of feeding the growing stock is not complicated. The practice should consist of having the food before them all the time, so that they can balance their own ration. They will usually take sufficient exercise if given plenty of range; hence the common practice is to feed a well-balanced dry mash in large, self-feeding hoppers, and supplement this mash with a good cracked grain ration. A complete dry mash should be used, it being always before them. In addition to this, a ration consisting of equal parts of cracked corn and whole wheat should be fed twice a day about the range.

This method of feeding will allow the chicks to balance their own rations, and will give the weaker ones a constant supply to which they can have access when they are crowded away at the grain-feeding time by the larger ones. Dry mash in self-feeding hoppers will tend to equalize growth and produce a more uniform flock at maturity, while the feeding of cracked grains entirely will tend to exaggerate and constantly increase any difference in size which may exist. Large self-feeding hoppers, holding from 200 to 300 pounds of mash, can be constructed and placed at frequent intervals around the range. This will facilitate the feeding and make the mash available at all times and to all chicks.

VI. Provide a Suitable Environment.

The design of a poultry house and of its construction determines in large measure the environmental conditions which will surround the bird. The modern poultry house must provide all the features necessary to create ideal conditions, for no matter how well a flock of birds may be bred, if the poultry house is damp, drafty, cool and poorly lighted, disease and a decrease in vigor will surely result.

The following are the principles governing the design and construction of a suitable poultry house: —

(*a*) Dryness is fundamental in the poultry house.
(*b*) Plenty of sunlight needed.
(*c*) Importance of thorough ventilation.
(*d*) Give the birds plenty of floor space.
(*e*) Birds must be protected from an excessive cold temperature.
(*f*) The construction of the house must be rat proof and vermin proof.
(*g*) Economy in construction is a first-hand consideration in designing and building the laying house.

With these few words as to the principles of design, the following discussion of the New Jersey multiple unit laying house will give the details necessary to construct an efficient house possessing the features above mentioned.

The New Jersey Multiple Unit Laying House.

The following plan of a shed-roof house, 20 by 40 feet, is especially suited to New Jersey poultry farms. Where it is desirable to keep larger units than a 40-foot house will accommodate, it is recommended that the length be doubled, making it 20 by 80, with three cross partitions (one every 20 feet), instead of only one, as in the 40-foot house.

The following description of the above plan shows the important features: —

The outside dimensions are 20 by 40 feet, sills to be 4 by 6, and to be bolted to a concrete foundation wall 8 inches wide, which is laid on tamped cinder or crushed stone, the entire depth of the foundation trench being 3 feet.

The shed-roof type of construction is used with 9-foot studding in front and 4½-foot studding in back. All studding and

rafters are 2 by 4 hemlock or yellow pine. A 2 by 6 girder runs the length of the building supporting the rafters on concrete piers. The plates should be of 2 by 4 material doubled and joints broken.

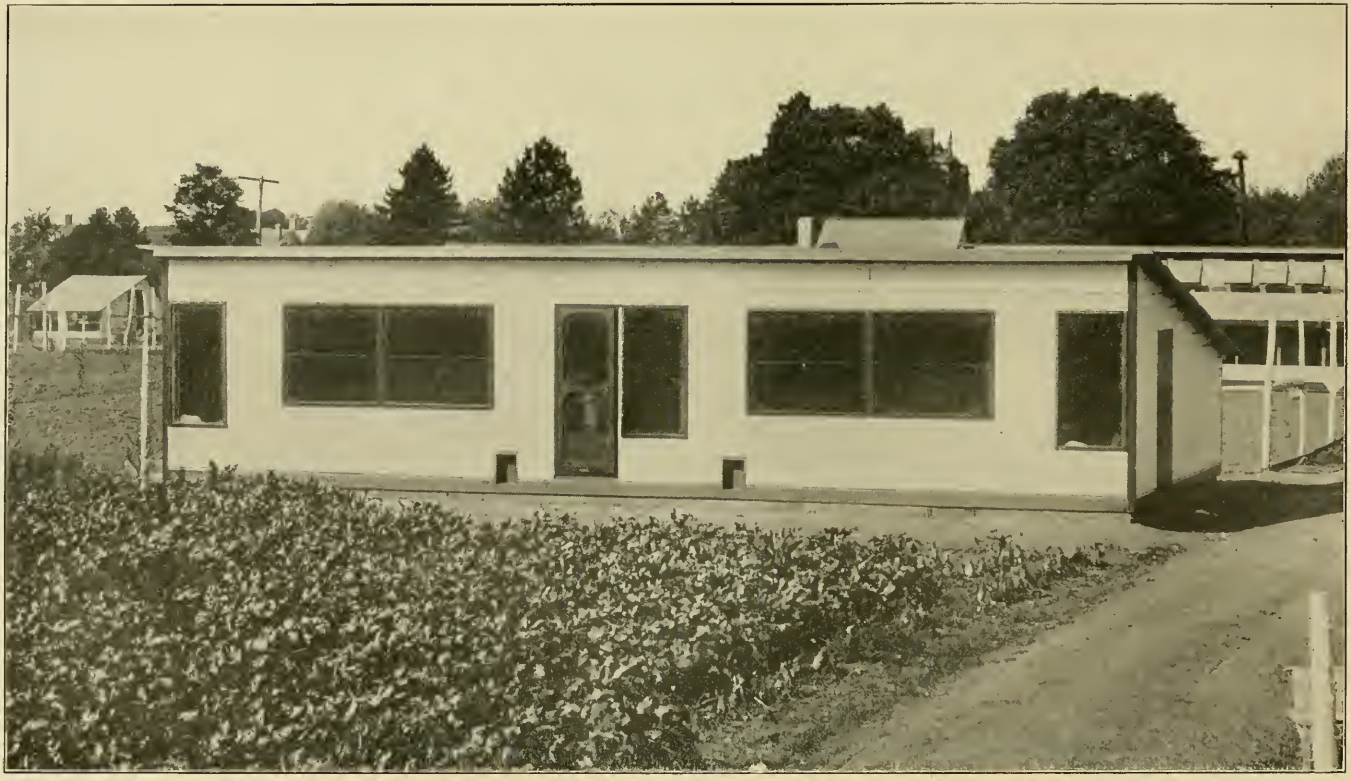
All outside walls and roof should be single boarded, preferably of 8 or 6-inch tongued and grooved yellow pine; white pine can be used, but is much more expensive. The roof and back wall should be covered with a good roofing paper; all joints should be carefully lapped and cemented.

The muslin curtains in the front wall are hinged at the top and can be lifted up. The 3 by 5 glass is hinged at the side and open. One window in each pen should be so constructed that part of the wall will open when desired, thus making a combination door and window. This will greatly facilitate cleaning and filling hoppers, etc., in an extremely long house.

The dropping boards, perches and nests are best arranged on the back wall, the perches being hinged to the wall so that they may be hooked up when cleaning, the nests being darkened by a hinged door in front which may be let down when it is desired to remove the eggs.

The dividing partition between the units is built of boards, and extends from the back wall to within 6 feet of the front wall; the remaining space is left entirely open. This protects the birds from any drafts when on the roosts. When desired, portable light wire partitions may be used to separate the units. A large dry mash hopper should be built into this middle partition. If four or five units are built, it is only necessary to have a hopper in the center of each two units, the other dividing partition being utilized for nesting space. This hopper should be constructed with a wooden cover hinging at the center. There is a slatted elevated platform under the muslin front which provides room for the water fountain and grit and shell hoppers.

When the house is completed, a concrete floor should be laid, and should consist of three distinct layers. First comes a layer of about 6 to 10 inches of cinders or coarse gravel tamped thoroughly to serve for drainage purposes, to keep the soil moisture away from the bottom of the floor. Next comes a rough coat of concrete about 4 inches thick, and over



The New Jersey multiple unit house. (Courtesy of the New Jersey Agricultural Experiment Stations.)

this a finishing coat of two parts of sand to one of cement, troweled smooth and rounded at the corners. Where there is danger of much moisture between the rough and finished coat of cement, level it with a broom before the finish coat is laid.

Such a floor is moisture proof, rat proof, vermin proof and easily and quickly cleaned.

The following is a list of materials which will be required for building a double unit: —

List of Materials required and Approximate Cost.

Lumber: —

Sills, 6 pieces 4 by 6 by 20 feet, hemlock.

Plates, 8 pieces 2 by 4 by 20 feet, hemlock.

Posts, 2 pieces 4 by 4 by 14 feet, hemlock; 2 pieces 4 by 4 by 18 feet, hemlock.

Studding, 9 pieces 2 by 4 by 14 feet, hemlock; 4 pieces 2 by 4 by 14 feet, hemlock.

Rafters, 21 pieces 2 by 4 by 22 feet, hemlock.

Frames for nests and dropping boards, 5 pieces 2 by 3 by 16 feet, hemlock.

Eight-inch tongued and grooved yellow pine boards for roof, dropping boards, walls and nests, 2,200 square feet.

1 by 2 white pine for curtain frames and trim, 200 linear feet.

1 by 4 white pine for nests, 100 linear feet.

One bundle plaster lath for broody coop.

Nails: —

10 pounds 20 penny wire.

50 pounds 10 penny wire.

20 pounds 8 penny wire.

Approximate cost of the above,	$75 54
Roofing paper, 1,060 square feet, or 11 rolls at $3,	$33 00
Four special sash, 3 by 5 feet at $2,	8 00
Muslin, 8 square yards at 20 cents per yard,	1 60
Hardware, as hinges, locks, tacks, hooks, wire, etc.,	4 75
Foundation and floor: —	
Cement, 35 bags at 50 cents,	17 50
Cinders or gravel, 30 yards at $1,	30 00
Sand, 5 yards,	7 50
	$102 35
Total cost, not including labor if cement floor is put in the house and cinders and sand have to be purchased,	[1] $177 89

[1] Costs of material for this house will of course vary in different localities and at different seasons. The above are prices current at New Brunswick, New Jersey, in January, 1916.

This gives a cost per square foot of floor space of $0.22.
A cost per running foot of house of $4.44.
A cost per bird, allowing 4 square feet per bird, of $0.888.
Adding labor to this at one-fourth the cost of material, the total cost is $222.36, or $1.11 per bird.

Environment is one of the great factors in production. The essentials of a suitable environment have been outlined. The importance of these factors cannot be too strongly stated. An appreciation of the fact that it is the healthy, contented, well-fed, singing hen that lays at a profit will do much towards insuring success from the beginning.

VII. Practice an Efficient Feeding Practice.

The following is the New Jersey State dry mash with the supplemental rations which are designed for the complete feeding of laying hens throughout the winter. Such modifications as are necessary for summer feeding for different breeds are also described.

Dry Mash.

Kind of Food.	Amount by Weight (Pounds).	Amount by Measure (Quarts).
Wheat bran,	200	380
Wheat middlings,	200	240
Ground oats,	100	100
Corn meal,	100	95
Gluten feed,	100	80
Alfalfa,	100	200
Meat scrap,	200	176
Total,	1,000	1,271

This mash should be kept before the birds all of the time in large, self-feeding hoppers. During the molting season in the fall it is desirable to substitute oil meal for the gluten meal in the same proportion, to hasten the growth of feathers. As soon as the birds get on the green grass range the alfalfa can be gradually omitted and the meat scrap slightly reduced in amount. The extent to which the above mash can be cut during the summer will depend upon the character and amount of the range which is allowed the birds.

The mash as given is designed especially for the feeding of Leghorns; when heavier breeds are kept, such as Plymouth Rocks or Wyandottes, especially with yearling or two-year-old hens, the tendency will be for them to take on an excess of fat. Under such conditions it is the best policy to restrict the amount of mash eaten by leaving the hopper open during the afternoon only, thus inducing the birds to work during the morning hours for the cracked grain fed in the litter at the morning feeding.

As a supplemental ration to the dry mash the following grain rations are fed. A scratching ration of whole grain is fed every morning, both winter and summer, about 9 o'clock, in deep litter. Its primary object, aside from its nutritive value, is to induce the birds to take a considerable amount of exercise. About 5 pounds of this scratching ration is fed to each 100 birds on the floor of the house or under some shelter where the litter is dry and where there is protection from cold winds. The scratching ration is made up as follows: —

Scratching Ration.

Kind of Food.	Amount by Weight (Pounds).	Amount by Measure (Quarts).
Wheat,	100	53
Oats,	100	98
Total,	200	151

At 4 to 5 o'clock in the afternoon, depending on the season, a night ration is fed, composed of whole and cracked grains, at the rate of 10 pounds to 100 birds.

Night Ration.

Kind of Food.	Amount by Weight (Pounds).	Amount by Measure (Quarts).
Cracked corn,	200	120
Wheat,	100	53
Oats,	100	98
Buckwheat,	100	66
Total,	500	337

It will be noted that by feeding a night ration as outlined the materials are supplied to keep the bird's body warm during the night. The above ration is designed for Leghorns. When feeding heavier breeds it is desirable to eliminate one-half of the cracked corn and to substitute barley for buckwheat. During the summer months a night ration of equal parts of corn, wheat, oats and barley will supply all the needs for Leghorns. A good rule to follow in feeding the night ration is to give all the birds will eat, and then a little more, so that there will be some left for them to work on in the morning.

One great advantage of the dry-mash method of feeding is the fact that the birds are allowed to balance their individual rations in large measure, according to their particular tastes and requirements. The feeding of some succulent material in addition to the grain rations is very necessary for the best success.

VIII. Market the Products systematically.

Uniformity in all poultry products is essential. Color of egg, shell, size of eggs, size and weight of broilers and roasters are a few instances where uniformity means more returns.

The best of quality is none too good. The best always brings the highest price. Strictly fresh eggs, clean and carefully graded and packed, are always in demand. Infertile eggs for market are always in demand over fertile eggs. We must not be contented with getting a good production, but of equal importance is the necessity of getting good returns due to quality.

Mr. Pierson of Amherst. I would like to ask if you gave your hens all the skim milk they wanted?

Professor Lewis. Yes; if we gave the birds all the skim milk they could eat we would cut our meat scrap down one-half, making the meat scrap 10 instead of 20 per cent. If you can get skim milk, by all means give all you can to the laying hen.

Mr. Pierson. Is it a stimulant?

Professor Lewis. Not quite, but I would feed it if I had it. It has the lactic acid factor, which is a good internal disinfectant. I would prefer sour skim milk to any form of buttermilk I could get.

Mr. Pierson. You don't get as much of lactic acid in the skim milk?

Professor Lewis. No, but you get a high protein content which is very desirable; you get a lot of casein which you do not get in buttermilk.

Mr. H. G. Worth. I would like to ask in feeding mature birds, why you feed cracked corn with your wheat instead of whole corn.

Professor Lewis. Our idea in feeding our grain ration is to get exercise, as much as anything else. If we feed whole corn, a bird grabs a piece of whole corn and has got the equivalent of six or eight pieces of cracked corn, and it will fill our birds' crops up with much less exercise than cracked corn. Its food value is absolutely the same, but we are strong advocates of cracked corn for that one reason if no other. There are times when whole corn is desirable; in the winter, when it is very cold and we want to give the bird things that will fill it up quickly, we feed whole corn possibly, at noon; otherwise we feed cracked corn.

Mr. Worth. Would not feeding the cracked corn be more expensive? Wouldn't there be particles of it that the bird would not get, and would not the bird get sufficient exercise in finding the corn without being fed with cracked corn?

Professor Lewis. We always feed a sifted cracked corn, and there is probably no waste.

Question. In regard to feeding snow, what have you to say in regard to letting poultry eat snow instead of water?

Professor Lewis. It is our practice, and the practice throughout our section, never to let birds out, that we want to get egg production from, after the first snow falls in the fall, or after the ground gets frozen and muddy. Here is the proposition: birds going out and eating snow, or going out on cold, wet days, get chilled, and it is bound to reduce their production. The chilling seems to retard their reproductive functions and sets them back, and I should be strongly opposed to letting birds out where they could get snow in the winter when I was after egg production. With breeders, where I wanted a full amount of vigor, I would let them run out all winter.

Mr. J. W. Sanborn. What do you think is the best litter?

Professor Lewis. We use for litter, wheat or rye straw, primarily because it is coarser and does not grind up like oat straw. We grow quite a lot of our own litter, — buckwheat straw or oat straw, — harvesting it with the grain or throwing it directly in the pen and letting the birds thresh the grain out. I am an advocate of straw litter, supplemented if possible with shavings; that makes it drier and the shavings absorb the moisture from the droppings. I would say straw first and, if possible, a mixture of shavings.

Mr. Sanborn. How deep would it be safe to have it?

Professor Lewis. Eight or 10 inches. We usually start in the fall with it about 4 inches deep and add to it each week a little coarse litter. Keep the litter deep, coarse, dry and clean. If, due to certain conditions of moisture or a large number of birds closely confined, the litter gets dirty or finely ground, we do not hesitate to clean it out and put in fresh litter.

A Member. Do you use dropping boards?

Professor Lewis. Yes; although it takes a little labor to clean them off it maintains absolutely sanitary conditions, reduces any odor which might come from using dropping pits, and gives the birds the entire floor space. There is an important factor, — if we use pits there is too much floor space taken up. The capacity of the house is really determined by the number of square feet of floor space for the birds; therefore we get the perches up above the ground 3 or 4 feet, cleaning them off twice a week and putting on gypsum to keep them in good condition. Then we keep all the droppings and have a good income from those. We sell them in New Brunswick at $8 to $10 a ton to farmers who grow vegetables for the New York and New Jersey markets.

Mr. A. C. Hawkins. Do you advocate open-front houses in New England?

Professor Lewis. I advocate open-front houses in New Jersey and northern New York, and I know they have succeeded in Maine. I know also that your own professor of poultry husbandry at Amherst recommends them. In New Brunswick we had last winter a temperature of 14 degrees below zero, and 200 Leghorns, in an absolutely open-front house, where the house is dry, went through that cold snap without a frozen

comb. Another flock of 100 Rocks and 100 Leghorns, in a house with a solid glass front, where the temperature in the house never went below zero, had their combs frozen and were put entirely out of condition on account of the increased moisture content due to lack of fresh air and ventilation. I believe that birds will stand a very cold temperature, providing the atmospheric conditions are dry. I believe you will find that the freezing of combs is not due so much to cold temperature as it is to cold temperature combined with dampness, or with dampness and poor ventilation, which means that the birds are of low vitality.

Mr. CARVER. Do you advocate feeding wet mash?

Professor LEWIS. No, except in one or two instances; it requires a good deal more labor, care and knowledge on the part of the feeder, and if that care and knowledge is not present it will put the birds out of condition. Dry mash will produce just as many eggs. There are one or two instances where a wet mash may be desirable, — for pullets coming in off the range in the fall and that have not grown very well possibly a little wet mash, just crumbly, with a little ginger or saltpeter in it, may be desirable; and for yearlings that don't come back so well when the molt is over, a little wet mash with a little tonic in it may be desirable. A lot of our most successful poultrymen feed wet mash and get along with it very well. I am not condemning it, but it requires a personal application and knowledge of the birds and their appetite which few of us possess, and commercially or with a farm flock the same results can be secured with much less labor by the feeding of a dry mash.

Mr. E. C. BARBER. If we feed poultry six varieties of grain at one time they will always pick the corn first; is that a sign that it will do them the most good?

Professor LEWIS. No, I don't think so. We put some 30 grains and their by-products before a flock of 200 hens for a year; corn was the favorite and barley next. I think they need it, of course, to maintain themselves and provide heat and energy, but wheat is a more evenly balanced ration for poultry than corn, containing, as it does, considerable protein and not as much carbohydrates or fat. Corn is a very de-

sirable feed; it is of a carbohydrate character but has a very small amount of protein, and you cannot make eggs from corn alone.

QUESTION. Would you tell me what is your opinion of feeding green corn, to chickens eight or ten weeks old, on the cob?

Professor LEWIS. I don't know that I ever fed any of it. I don't know why it would not be all right. It is succulent and palatable, and they would probably relish it as a part of their ration. It could not be substituted for dry mash or grains at all, because green corn is primarily a carrier of water, having 70 or 80 per cent of water present. I think there are other sources which would supply succulents in large quantities more economically.

Mr. HAWKINS. I would like to ask if there are any special characteristics by which we can select the hens that are the best layers by their general type and appearance?

Professor LEWIS. You saved me by putting on "appearance" at the end. There are certain factors which a number of investigators have brought to light recently which tend to be correlated with egg production. We have all said that the heavy producers, in the majority of cases, must have deep, long, wide bodies. I do not mean to say that every bird that has a deep, long, wide body is a heavy producer, but that practically all heavy producers have abundance of room in there, just as a good dairy cow has certain well-defined characteristics. There are other factors aside from that, definitely correlated with egg production. One is the color of the shank. Professor Rice has found that the heavy layers laid the color out of their shanks. A pullet will start out in the fall with bright yellow shanks; the color pigment in her shanks and her ear lobes will be utilized in going into egg production; by spring she will have pale shanks and ear lobes. The Connecticut station has done a lot of work on the color of the ear lobe of the cockerel as related to egg production, and there are other characteristics, such as the prominent eye and deep-seated head, which are indicative of vigor.

It is not such an awful proposition to take ten of the best hens picked by their external appearance and put them in a coop and trap-nest them during December, January and

February. The birds that lay the most eggs during those months are almost invariably the ones that lay the most eggs during the year, and that is the type of bird you want to propagate. I believe it will pay anybody to separate four or five birds like that and get his wife or daughter or somebody to help him with the trap-nesting. It really only makes one extra trip in the morning, because in April, when they are laying heavily, you have got to visit them often. The only way we are going to improve our poultry and get definite improvements is by knowing what the individuals are doing. The poultryman has to come to it just as the dairymen have come to it.

Mr. H. B. WALTER. Do you use a green feed for June and July for hens that are confined?

Professor LEWIS. When we cannot get anything on the surrounding land to feed to them we practice double yardage; we have a yard, say, the size of this room, divided into two parts, and grow peas and oats on the first yard while the birds are feeding on wheat planted the fall before in the second yard. As soon as the oats get up 4 or 5 inches we turn the birds over into that yard and seed this other yard to buckwheat, and as soon as the buckwheat gets 4 or 5 inches tall we turn them over on to that and grow soy beans on the other yard. That gives us an admirable amount of green feed. When the soy beans get up 5 or 6 inches we turn the birds back into that yard and grow wheat. We practice in this way a crop rotation, and it does not take very long. We simply go in there with a fine-tooth cultivator, and all except the first seeding we plant broadcast, and as soon as it is high enough we put the birds in. It takes a very short time to do this, and it supplies those birds with green feed just as though they were on free range, and, what is even better, it maintains in those yards absolutely sanitary conditions. It turns under the droppings and uses their fertility to grow the crops with, and has maintained cleanly conditions, whereas otherwise those yards would have been absolutely bare and an undesirable feeding ground.

QUESTION. About how much yard room have you for 100 hens?

Professor LEWIS. We have there from virtually nothing up to free range. If I were putting up this house such as I

described, I should want a yard for 100 hens at least 100 feet wide and 20 feet long, and practice double yarding as I have mentioned. Of course, I can grow other crops, like rape, which makes a very luxuriant growth. We grow a lot of rape for summer feeding to birds entirely confined. We have two flocks of 100 birds each which have never been out of the house for three years, and have made on an average $2.22 per bird. I am not recommending that, but am giving you an instance of the work we have been doing.

QUESTION. Is there any danger of the rape making the eggs taste?

Professor LEWIS. I have never had it do it, fed in moderate amounts, and we have fed birds right on it. I have heard of instances, however, where people claimed it had.

Mr. PARSONS. Do I understand that you have tried keeping hens confined for three years as against free range?

Professor LEWIS. Yes. The result of the free-range birds at the present time is about $1.98 in profit per year. The mortality has been nearly the same. The hatchability of the eggs of the confined birds has been very much below that of the eggs of the birds in the free range. Personally, my own opinion is this: birds which I was feeding for egg production I would keep more or less confined, except possibly during the summer when they were molting. My breeders I would let run as much as they wanted to and not force them for egg production, just previous to eggs for hatching. We have studied six or seven hundred eggs this last winter, with reference to their hatchability. We found that the dense albumen was apparent in all those cases where the eggs hatched, and there was 10 per cent less water than in the albumen of the eggs that did not hatch. We believe that a lot of poor hatching is due not to faulty incubation or faulty mating methods, but to the innate tendency of the bird to produce a watery albumen. There is not nutriment enough in that albumen to nourish the chick through twenty-one days and get it out of the shell. We are conducting some experiments on this line now, and expect to continue them during the coming year.

QUESTION. Would you condemn introducing an English white Wyandotte cockerel for reproduction?

Professor LEWIS. I hardly know what to say in answer to

that. I would condemn it for this reason: the English white Wyandottes are not, in any sense of the word, white Wyandottes as I see them, — I want to be careful what I am saying, — and you are going to introduce into your strain of Wyandottes something entirely foreign to your particular breed, and I am afraid that the sum total of your results will be a good deal worse than if you let it alone. There are white Wyandottes bred according to the American standard which will lay just as many eggs as the English Wyandottes, and I believe you will get along better by finding in your own flock birds which are good producers and breeding from those. There is a possibility of doing a lot of harm by introducing these foreign types about which you know little, and furthermore, it is perfectly possible that you have in your own flock birds that are as good or better producers than the birds you are buying. I am convinced more and more of it, the more we get our poultrymen to use trap-nests. One of our big poultrymen, Charles Warner, has trap-nested 200 pullets, and he found birds that are absolute drones and birds that are laying over 200 eggs a year. All of you have got good hens, just as good as any hen, possibly, that ever made a record, and the thing is to find them, and after you find them, to use them intelligently, — get cockerels from them and use them in your breeding work. Every one of you here have got birds that are a great deal better than you think; find them, utilize them; that is the way Tom Barron got his birds, — finding out what were the good ones.

Question. Would you use the second crop of hay for feeding?

Professor Lewis. Yes, especially if it has clover or alfalfa in it. We go out into the haymow, sweep up the leaves and steam them for the poultry mash next winter, and if you have a lot of them it is a good practice to steam them and put them in troughs. A lot of those things you can use and find them of material advantage.

Mrs. Goodnough. When you have a pen of good Rhode Island Reds, and have cockerels in that same hatch, would it be detrimental to inbreed for one year?

Professor Lewis. No; if they were extra good birds I certainly should not object to inbreeding for one year. In-

breeding does this, — it intensifies any characteristic the birds possess by eliminating any foreign characteristic that any other strain of birds might possess. If those birds are good birds and have a good color pattern, good body shape and good egg production, and are free from serious defects, — crooked breasts or legs or undesirable features, — it is certainly desirable to breed them together; but if they are low in vitality, if they have knock-knees and things of that kind and you inbreed them, you are going to intensify the bad characteristics. Inbreeding intensifies good as well as bad characteristics, and we can inbreed for a number of years provided we use, in our inbreeding, only selected birds which measure up to a certain standard. We practiced a lot of inbreeding at the New Jersey station and got very desirable birds from it.

Question. Is not early fall laying a sign of a good layer?

Professor Lewis. Within certain limits, yes. I would not want a bird that came to maturity so early that it was dwarfed. When a bird comes to maturity — I mean by that, when it starts laying — it stops growing, and if it comes to maturity too early, it will always lay small eggs and will be more or less of a bantam style; but I would say that with Leghorns, five months, and with Rocks, six and a half months, is about the right time. It is true that birds that start laying in from five to six months are better than birds that don't start laying till they are eight or nine or ten months; it is an indication of continued high production for a bird to start laying about the time it should. April-hatched birds ought to be well along in production before cold weather commences in the fall.

Afternoon Session.

Mr. Wilfrid Wheeler of Concord, secretary of the Board, presided at the afternoon session, which was called to order at 2 o'clock. The first speaker was Mr. Charles McCarthy, chief of the Wisconsin Legislative Reference Library, who spoke on "Standardization of Farm Products."

STANDARDIZATION OF FARM PRODUCTS.

CHARLES MCCARTHY, CHIEF OF LEGISLATIVE REFERENCE BUREAU, MADISON, WISCONSIN.

The appalling waste in our agricultural production has at last opened the eyes of our agricultural teachers in this country. The American passion for efficiency in business has at last made its way into the business of agriculture. We have at last brought ourselves to take notice of abandoned farms, the growth of tenantry and the high cost of living. We have wondered why farmers near Boston or New York with the finest markets are not able to sell their goods. We are now seeking a solution of that question. The solution we will find eventually is the solution we have already found in all other industries, — better business. We have got to do what Henry Ford did with the automobile business. We have got to Henry Fordize agriculture, that's all there is to it. If our minds have long been running in other channels, we will have to change, that is all. And we have got to Henry Fordize agriculture in the whole sense. We have got to have thorough organization; produce thoroughly good and guaranteed goods at the lowest cost; get higher pay for the producer; and get more and more profit-sharing both for the producer and the consumer as time goes on.

When you talk about not being able to compete with dairy products from Canada, New York or the west, what other solution is there but to organize, standardize, get at the cost of production, and then devise ways and means of reducing every little cost?

And you have got to advertise too. If you have good sanitary goods and it costs you to get them, make up your mind you are not going to sell them at what they are worth unless you constantly tell men over and over again how it pays them to get clean and wholesome products, or sound fruit or superior articles.

Now, all of this is not new, — it is not difficult even. It has been worked out time and time again. In one issue of the "Saturday Evening Post" there was an advertisement costing $21,000 from organizations of farmers raising citrous fruit, raisins and walnuts, who have Henry Fordized their products.

The Danes have beaten Henry Ford, for they have not only standardized their product, their processes and their animals, but they have gone further and organized on a purely co-operative basis, thus insuring the profit-sharing and the distribution of wealth to all, so essential to any rural efficiency.

I have read the Boston Chamber of Commerce milk report, and I know well that there are institutions which will not divide up and do not believe in profit-sharing. There is not safety in individual efficiency such as the Ford plan when applied to a rural situation. We want the Ford efficiency, but we cannot depend upon individual generosity. We must have the Danish democratic organization to insure the success of thorough organization.

You will not succeed if you merely Fordize. You must have democracy — the one man, one vote, basis — to go with it.

Massachusetts is not at all unlike Denmark or Holland or Belgium, and the lessons of those countries can well be applied here.

A movement has well begun to fix legislative standards, but those standards to be effective must be followed by the organization of milk dealers or fruit dealers and others to carry out those standards. State inspectors will help somewhat, but it is far better to have your own inspectors and then guarantee the product to the State. This does away with a thing which may become hateful in time, — the multiplicity of inspectors and the element of bureaucracy involved.

The milk dealers of Massachusetts should be organized under the co-operative law for the purpose of maintaining standards, working out the cost of production, advertising, making collective contracts with the big milk handlers, or actually putting up money and buying or building plants.

In this way every grading law or standardization law will bring profit into your pockets, and will not merely feed into the pockets of those who possess a monopoly of the means of

transportation and selling. You will have your own brands and carefully uphold them, and uphold every effort by the State if you realize profit from them.

Farming is business, and every business method must be used to make it successful. No big business can exist to-day without a brand, advertising and standards of production, and without having a steady market. The telegraph and the telephone are necessary, and some central intelligence. Overhead costs must be estimated. Standardization is the basis for all this. By standardization the products can be brought to the market in sufficient quantities, at the time they are wanted, and to the place where they are wanted. By standardization the small farmer or the man on the moderately sized farm, — who, after all, is to be the man in America, or, for that matter, in any other country, upon whom the future of all agricultural industry must depend, — acquires the strength of the large farmer. If we have large farms then we are going to go into extensive cultivation, and, at the failure of that, into tenantry, with all its evils. The only way to maintain the small farmer is by standardization of his produce. He has got to produce material like his neighbor, and he has got to work with his neighbor in buying and selling. He has got to organize so that the business end of it is concentrated and the bookkeeping end of it is concentrated. I shall not go into an analysis of the standardization laws, but this I may say, that there is a tremendous chaos coming at the present time. It is proposed to fix standards by the national government. We have already the Sulzer apple standard. Then different States are getting up standards. Many of these standards go into detail, as your law in Massachusetts does, as to size of apples, etc. A good deal of this is dangerous and unreliable. Some of it is necessary in legislation, but what is necessary and what is unreliable will have to be worked out. Some essentials can be laid down in the law. The rest can be given to a board of agriculture to work out, as administrative rules to be carried out through organizations. But in all cases there should be committees composed of men who would use their actual knowledge of business in determining these rules, so that the rules will not be made theoretical; also, they should be changed from year to

year as the conditions change. Their main enforcement should be through organizations. If different States have such arrangements as this, it will not be difficult for the marketing departments or the boards of agriculture of the different States to meet with the national agricultural department and make uniform rules or national standards. That, however, is a far distant day, it seems to me.

I served on a commission on uniform legislation for many years, as a member from my State. I know that uniformity looks good in theory, but in practice there is a vast difference between the products of Oregon, those of Massachusetts and those of Florida. Nevertheless, uniformity over districts through regulations laid down by boards meeting together is a possible thing and something which can be worked out.

The different Massachusetts laws now for grading of produce or standardization should have an added phrase to the effect that the standards laid down in the law may be changed by the State Board of Health, if an advisory committee is called in from the agricultural interests of the State. Whatever method is used it is certain that standardization laws are but a step. They must be accompanied by every other means which business industry in general has found efficient, — by brands, advertisement, central office, cost accounting, transportation departments, the telephone and the telegraph, etc., — in short, by the organization of business on an efficient basis.

None of this, however, will avail us if, in the end, the whole organization is not upon a co-operative basis instead of a corporation basis. Sir Horace Plunkett has well shown the difference when he says that "If one man has fifty shares of stock and one cow, and another man has fifty cows and one share of stock, the man who owns the stock will milk the man who milks the cow." If such organization is not on the right basis we will have little trusts bleeding the farmers, leading, perhaps, into big trusts, rather than that prosperity of the farmer which should be the result of efficiency. Some of the worst little trusts that exist in this country — trusts making unheard-of profits — are so-called co-operative organizations or farmers' organizations organized upon the joint-stock basis. The nonstockholder is fooled. He cannot remove his land or

his goods, and must contribute to the 20, 30 or 40 per cent made by some of these so-called co-operative organizations.

Some one has said that the American farmer will organize when he has to do so. I am asking you, then, who have struggled with agriculture in New England, whether you have not very good evidence of the fact that you have got to do it. Every report that I have ever seen from New England convinces me that New England is a portion of the country in which a farmer will not be able to live and enjoy a fairly decent degree of prosperity unless the farmers get together pretty soon and organize and carry out a program similar to that carried out in Holland, Denmark and Germany. That this can be done is evidenced by the wonderful progress in what was one time the most economically disorderly country in the world, — Ireland. A remarkable change has come over the people since Sir Horace Plunkett began his great work there. That it can be done is evidenced in every State in the country now, for a recent bulletin issued by the Department of Agriculture at Washington estimated that at least $1,000,000,000 worth of produce had been sold by organizations of this kind within the last year.

The Chairman (Mr. Wilfrid Wheeler). The meeting is now open for discussion, and I hope there will be some questions that Mr. McCarthy can answer on this question of grades and standards. Our department is already prepared to build this year along some of the lines Mr. McCarthy has mentioned, by having a department of the Board of Agriculture which will have the power to fix grades and standards of agricultural crops here in the State, so that we will be able to co-operate with the United States government and other States in this very thing. As he says, the fact that a grade or standard is established by law may be a mistake; it may be a hard thing to fix by law, and we are working on that very line, and I hope that a law will be passed this year to give the Bureau of Markets of the State Board of Agriculture the power to regulate this question of grades and standards so that it will be in conformity with the other States or with the United States government. If there are any questions, or if there is any discussion you would

like to bring out, I am sure Mr. McCarthy would be glad to answer.

QUESTION. Wouldn't it help things to have everybody put their names on their packages of products?

Mr. MCCARTHY. That would have to be done for the thing to be of any value; that is essential to this whole plan. In the Danish egg, for instance, there is a brand put upon the egg, so you can trace the product back to the organization. So, in all the butter standards that I have seen, there is a sign of some kind, a letter or something, which will show exactly the man or the organization that had that product, so that you can trace the thing back as you would in bookkeeping. That is essential. Then you can put the responsibility upon the man who got up the product. I think that it is absolutely essential that you should do that, but of course you know there is going to be very great opposition to it. The great middlemen who buy this produce want to put their own names and labels on it, and they will cut off your label or will refuse to buy your material if it is labeled. There ought to be, in my opinion, national legislation to protect the man who wants to put a label upon his produce. Some of our material in Wisconsin is labeled, goes down to the Chicago market, and the buyers or packers down there take the label off and then you cannot tell whose material it is. You should be able to trace it right back to where it comes from; that is essential. The Dutch brands look like dollar bills. There is a number up in the corner, and on the butter keg there is a label. You buy these labels from the government; the government then has your record, who you are and who bought them, and can trace every piece of material you buy.

Mr. W. H. ATKINS. Last year was a good peach year. I understand in New Jersey and elsewhere large quantities went to waste. It seems a pity that large crops should go to waste, and your talk along the line of contributing knowledge as to where the buying centers might be is of interest. I know that Holyoke could have used several carloads more of peaches, provided they could have been brought in there and placed before the public at a reasonable price so they could get hold of them, while I understand there were people in New Jersey who could not sell them. I understand there was a man who

offered carloads of them at 15 cents a basket after he got them and could not find a market. Could the government do anything to open up a market? If those cars could have been sent to Holyoke and the consumers could have got them at 50 cents a basket they would have been sold.

Mr. McCarthy. There isn't a doubt that a great deal of the peach crop this year could have been taken care of in the smaller places if there was a wholesaler in that region who knew how to take that stuff and deal in it, or if there was some open market place. Just see how that open market place would act. If you had the open market place you could bill the town. In many of these cities the country papers or little city papers will not take an advertisement of produce that is in the market place, because the advertisers, who are the retailers around there, will not stand for it; but you can always bill the town and say there are so many barrels of apples or peaches in the market, and you can make up your mind that the women are coming there and going to get them at prices worth while to the shipper. I think there probably was an overproduction of peaches this year, considering the means of transportation in this country and the unorganized state of the market, but that overproduction could be easily taken care of if we had some machinery for distributing it through the smaller places. I know that the Sun-kist orange people at the present time have been eliminating the wholesaler in a great many places, and they are getting down to the retailer. If you will notice in many of the cities this year the Sun-kist orange people are advertising in the country papers. A city like Chicago will have a great lot of stuff dumped into it, and sometimes the machinery for distributing this produce into smaller places where there are no good wholesale houses or public markets is not sufficiently worked out. I know an express company man dealing with one of the big food divisions of the express company, who, as an experiment, began to advertise and put into a lot of country towns some of this peach product, and where they would say in one place, "Well, we could dispose of 10 bushels," he told me that he often put in 75 and 100 bushels. So you can see that the distribution of our produce is in a very crude condition; we haven't got it mapped. Why? Louis

Brandeis of Boston said that the railroads of this country wasted $300,000,000 a year. I don't doubt but you could prove that they wasted a great deal more than that in another sense, for the railroads, with their agricultural experts, have been building up, down along their lines, farmers' districts for horticulture, for agriculture, and then allowed wasteful dumping into the big centers. All the traffic managers seemed to care about on some of these railroads was to get the material on to the cars, get the stuff into the big centers and get the freight for it. The railroads in the end suffer for it, because the farmers are more or less discouraged in some portions of the country, and will not produce in the same way another year. Because of the fact that the railroads have not mapped the traffic of this country, or have not combined to take care of the markets in a scientific way, they have no doubt wasted millions and millions of dollars. I said to a railroad man the other day, "One of the best arguments for government ownership that could be made against you men would be the handling of the products of last year."

QUESTION. How would you standardize the milk for Boston?

Mr. MCCARTHY. I am not going into that problem. New York gives you, in some ways, an example of what could be done, but your situation is a difficult and peculiar one. There is one sure thing I can say, that organization in this district would be a far better thing for you than to be in your present unorganized condition. Your only salvation in this district is to work for standardization and then work to reduce your cost of production by collective action. You can standardize almost any kind of produce. I have seen in Holland the standardization of almost every kind of vegetable possible. In nearly all Holland, now, the ordinary vegetables that come in are in some degree standardized. They are sold by lots at auction and the buyers must sit up in a big stand and look at the lot and then bid upon the lot, and the sample must correspond to the entire lot. You would be surprised to see how well you can standardize all sorts of difficult things. There is hardly anything that you can't work out with some kind of standard.

Mr. A. H. WHEAT. You spoke of goods being sold in Holland at auction; what class of people buy them at auction?

Mr. McCarthy. The wholesalers generally buy the material to be sent out of the country, — to England or some place like that; or the co-operative societies buy it. I saw an agent for a big co-operative society buying a lot of goods in one of these auctions in Holland; but generally it is the wholesaler. The process there is very interesting. As I say, there will be a grand stand, and all these buyers who come there have to sit up on the grand stand; they cannot go around to you and bargain with you individually; they must sit up on the grand stand and pay for it. They have a little button in front of them which is connected with a great big dial, and they press the button when the price at which they want to buy shows up on the dial; they take the lot before them on that. They are up there to make a collective bargain with the collective farmer. I have seen that all over Holland. I have seen it in one place where there was a stream of water, — Holland being nearly all water, — and a boat was drawn down the stream of water and had on it the different little lots of potatoes and vegetables and all kinds of produce, and they bid upon these lots as the boat went by in front of them. All they did was to look at the stuff, and any question in dispute was referred to a court of arbitration composed of one representative of the farmers, one of the buyers, and a third man appointed by the municipality. The farmers, of course, had to bring their stuff in according to the sample. It was the wholesalers or big buyers in nearly every instance who bought it in that way from the farmers.

Mr. Wheat. Those are the buyers that sold to the retailers after that, are they?

Mr. McCarthy. Yes, you know over there in those countries a co-operative organization is a wholesale organization, after all; that is, if you were in Denmark you would see the office of the English Co-operative Wholesale Society, which does a business, I think, of $700,000,000 a year, and they buy for all the different little member organizations in a wholesale way.

Mr. Wheat. Does that auction come any nearer to the consumer than our commission or fruit auction does here?

Mr. McCarthy. Well, I could not say, because I am not familiar with the system here, but I imagine that when you

take the Co-operative Wholesale Society of England, buying that way in a large lot for, we will say, a thousand grocery stores, it comes very much nearer than anything we would have here.

Mr. WHEAT. That is, the co-operative association is similar to the Liverpool market, isn't it? If we want onions there we buy them in Liverpool.

Mr. MCCARTHY. In the manufacturing districts over there the people unite and have their own grocery stores and trading stores of all kinds, and these little units are united in a great big wholesale co-operative society. They own the stores themselves so there is no profit in that except the salaries of the officials that the people themselves hire; there is no money that can come out of it in any other sense.

Mr. WHEAT. They are strictly co-operative?

Mr. MCCARTHY. Strictly co-operative, on a one man, one vote, basis. They own their own vessels, have their tea plantations in Ceylon, have organizations in Canada for buying cheese and apples for them, and I think they have some agency in this country. It is a great big organization that the people themselves own, and it has existed sixty years or more and does a business of between $700,000,000 and $800,000,000. Of course when they buy that way the process is very much cheapened. Professor Mezes, of the City College of New York, reckons that the Danes, by selling that way, reduce the cost of selling from 35 to 2½ cents on the dollar.

Mr. WHEAT. They sell in large quantities?

Mr. MCCARTHY. Yes, sell in large quantities and do away with jobbers and middlemen. I met a man in Wisconsin who sold produce, and he told me that he knocked out two middlemen between Wisconsin and New York by coming to New York and guaranteeing the standard of a million pounds of butter. He said he did not go to Chicago at all, but sent the article on to New York and knocked out two or three of these men.

While Mr. McCarthy was speaking in the upper hall, Mrs. Sarah Elizabeth Belt spoke to the woman's section in the lower hall on "Canning in Glass in the Home."

CANNING IN GLASS IN THE HOME.

(FRUITS, VEGETABLES AND MEATS.)

MRS. SARAH ELIZABETH BELT, MELROSE, MASSACHUSETTS.

This is a subject that interests almost every housewife, especially when the prices of food are so high. Did it ever occur to the housewife that the unnecessary waste of fruits, vegetables and meats on the farm and in our gardens could be saved, and be available for use in the middle of winter, if she would take a little more time when the fruits and vegetables are in season and can them? The great objection in previous years has been that the open kettle method of canning was tedious and took up considerable time, but by using the cold pack method of to-day canning has become a pleasure instead of work. By using this method it will be possible to have all kinds of fruits and vegetables, as if right from the garden, in the dead of winter. The housewife will also be able to keep her table supplied with all the delicacies out of season at a very small cost. Arrangements can be made so that while fruit and vegetables are sterilizing other work may be attended to. In this way the plan of work for the day is not upset.

Bacteria, Yeasts and Molds.

Every piece of fruit, vegetable or meat, no matter how fresh, is filled with tiny invisible spores or parasites which cause it to spoil. The air, no matter how clear it may look, is filled with these tiny organisms. These organisms are divided into three classes, — yeast spores, which attack fruit; bacteria, which attack vegetables and meats; molds, which attack jellies and jams. Yeast spores are killed by a lower degree of temperature than bacteria, therefore a short sterilizing is sufficient for killing the yeast in fruit.

Bacteria, however, resist destruction by heat for a long time. Two and even more hours at boiling point (212° F.) is required to render all vegetables and meats proof against spoiling. Molds are generally killed at the temperature of boiling water.

Bacteria are so small that they can only be seen with a microscope, and they reproduce themselves with amazing rapidity.

One bacterium under favorable conditions will reproduce itself about 20,000,000 times in the course of twenty-four hours. Accordingly, certain vegetables spoil more rapidly because they furnish a better medium for bacterial growth.

The reproduction of bacteria is brought about by one of two processes, — the germ either divides itself into two parts, making two bacteria where one existed before, or else reproduces itself by means of spores. These spores are compared to the seeds of an ordinary plant, and they present the chief difficulty in canning vegetables, meats and fish. While the parent bacteria are readily killed at the temperature of boiling water these spores retain their vitality for a long time even at that temperature, and in cooling will germinate, and the newly formed bacteria will begin their destructive work. Therefore it is necessary, in order to completely sterilize a vegetable, meat or fish, to heat it to the boiling point of water and keep it at that temperature for two or more hours.

This boiling of foods and dishes to free them from all germ life is called sterilization. Unless fruits, meats and vegetables are boiled long enough to destroy this germ life they are not sterile and will surely spoil. Once sterilized the food and the inside of the jar must be protected from the air, which as I said before is filled with these tiny microbes. Unless it is absolutely and permanently protected it will surely be attacked by these germs and it will spoil.

Jars.

It is not necessary to protect all sterilized foods from the light, but in order to keep them sterile they must be encased in an air-tight jar. This jar must not only be air-tight at the time of canning, but must remain so until opened. The first requisite for successful canning is a good jar. There are many

kinds of glass jars, — the old and the new improved Mason jar with a screw top, and the jar with a rubber ring and glass top, of which there are several varieties. These tops are held in place by a simple wire spring. Fruits, vegetables and meats often spoil by the use of defective rings. It is poor economy to buy cheap rubbers or to use them a second time. Let me say right here that it is a good plan to test your rubbers before using them, by pulling the rubber out and letting it spring back into shape. If it does not respond readily you will know it is not good.

Another type of jar in common use is the one with the self-sealing metal top lacquered on both sides. These jars require no rubber rings, as the groove in the top contains a composition of the consistency of rubber, which is melted during canning by the heat of the jar. This band takes the place of a rubber ring.

If the jar and the food are not absolutely sterilized this jar warns you of the fact by loosening its cap and unsealing itself. This is due to the fact that the germs cause a gas to form which loosens the cap.

This type of jar seals itself by air pressure. When the food in the jar is hot it is very much expanded, but in cooling it shrinks and causes a vacuum. In shrinking it draws the cap down tight, and by atmospheric pressure (15 pounds to the square inch) holds it tighter and tighter, until when cold it is impossible to pull it off.

Sterilizers.

There are two principal types of sterilizers, — the first is the hot water bath outfit, which consists of an ordinary wash boiler with a rack that sets on the bottom to set your jars on so as to avoid breakage; the other method is the steam pressure canner.

By using the latter sterilizer or canner your fruits are canned by steam pressure instead of hot water. The food is cooked in receptacles placed over water which is heated to a temperature sufficient to make steam, and held there at that temperature the required time. On the cover of the steam canner there is a steam gauge, a safety valve and an exhaust cock.

The steam gauge registers the number of pounds' pressure, also the degrees of temperature.

The safety valve exhausts the excess steam, thereby keeping the required number of pounds' pressure.

The exhaust cock is to release all the pressure from the canner. This last device is absolutely necessary. Great care must be taken in releasing this pressure slowly, as a sudden release has a tendency to draw the water out of the jar and lift the cap.

In taking the jars out, when the sterilization is completed, it is important, in order to avoid breakage, to see that the hot jars do not come in contact with a cool draft of air. Any one that has ever done any canning will know that a sudden change of temperature will break hot glass. Therefore you must have your doors and windows closed while you are taking the jars out of the sterilizer. Be careful and do not set them on the table in the kitchen or shelf in the pantry in a draft, but place them on a towel or a thick pad.

Methods of Packing.

Two methods are used in canning, the open kettle method and the cold pack method. The first method consists of boiling in the open kettle, and then pouring into your jars while hot and then sealing. The second method is that of sterilizing or boiling your fruits, vegetables or meats either whole or sliced in the jar. In using the first method you have to stand over the hot stove and get overheated, while in the second method you use everything practically cold.

Fruits.

Pears.

For pears make the sirup first, so that you can set it aside to cool while you are preparing the fruit for the jars. Now in regard to the proportions of sugar and water for the sirup, some prefer a thick sirup, some a medium and some a thin sirup. For a thick sirup, use $1\frac{1}{2}$ pints of sugar to 1 pint of water; for a medium sirup, equal proportions, 1 pint of sugar to 1 pint of water; and for a thin sirup, 1 pint of sugar to $1\frac{1}{2}$ pints of water. Place your sugar and water in a saucepan upon the

stove, bring it to a boil and let it boil slowly for five minutes, taking off the scum which rises to the top before it boils. While this is cooling select firm and perfect fruit, wash and pour boiling water over it, and let stand for about two minutes; then plunge into cold water and remove skins. Halve or quarter, as you prefer, and pack into the jars (which have been thoroughly cleansed in cold or lukewarm water). Fill to the brim with the cool sirup, place on your rubbers and glass tops, and clamp but do not tighten. If using the jar with the metal cap, first dip the cap in cold water, then place it on the jar, and clamp. If using the hot water bath outfit place the jars on the rack in the boiler and fill to the neck of the jars with cold water. Place on the cover and count your time of sterilizing from the time the water in the boiler begins to boil, keeping it at boiling point for twenty minutes to one-half an hour, according to the ripeness of the fruit. If you are using the steam pressure canner do exactly the same way, and when the jars are ready for the canner lower the crate into the retort after placing the jars in the crate. There should be 2 inches of water in the retort. Place on the cover of the canner and tighten the clamps so there will be absolutely no leakage, and bring the steam up to 5 pounds' pressure, keeping it at that pressure eight to ten minutes, according to the ripeness of the fruit. Right here let me give the reasons for scalding: first, to remove the skins without loss of pulp; second, to eliminate all objectionable acids; third, to start the flow of coloring matter. The reasons for the cold dip are, first, to separate the skins and harden the pulp; second, to stop the flow of coloring matter; and third, to render packing easier.

Apples.

In regard to the canning of apples, I might say there are more apples wasted than any other fruit in the United States. You will probably say to yourselves, or to each other, what is the use of canning apples when you can put them away in cold storage and keep them indefinitely. That is all very well, but the apples that you put away in cold storage are not the apples that are allowed to lie on the ground and go to waste, — they are not the windfall apples. When I say windfall apples I do

not mean the apples that are allowed to lie on the ground for two or three days or more. I mean the apples that have fallen off in the course of twenty-four hours and have not been allowed to lie on the ground, and decompose where they have been bruised by falling. Apples have no equal as an all-around fruit. The best apple for canning is the late fall or the early winter variety. Summer apples are not good for canning purposes, as they almost always turn soft when cooked.

To can apples whole: wash, core and peel, cut out all the decayed spots to keep the apples from discoloring, drop them immediately in a light brine (1 teaspoonful of salt to 1 quart of water), let stand for four or five minutes, and then rinse them off in cold water and pack in jars. Fill to the brim with cold water or sirup. Cap and clamp and sterilize for twenty minutes in the hot water bath outfit, or six minutes in the steam canner under 5 pounds' pressure. These are very nice for apple dumplings. Do exactly the same way for sliced apples, slicing the apples and then packing them in the jars and sterilizing fifteen minutes in the hot water bath outfit and four minutes in the steam canner under 5 pounds' pressure.

Vegetables.

The first step in successful canning of vegetables is the selection and the preparation. Have your vegetables as fresh as possible. They are best gathered in the early morning, and if not convenient to can them immediately do not allow them to wither, but set them aside in a cool, damp place or in a pan of cold water, and keep them crisp until you are ready to use them.

Corn.

Most people think corn is one of the hardest vegetables to can, but I find it one of the easiest to do and keep. The Department of Agriculture at Washington has shown us that the amount of sugar in the sweet varieties diminishes very rapidly after it is pulled from the stalk. The ear loses 50 per cent of its sweetness overnight; therefore to obtain its original flavor it is necessary to can it very soon after it is gathered. Select ears with full grains, husk them, brush off the silk with a stiff

brush kept for that purpose, and blanch in boiling water ten to fifteen minutes. This is done to eliminate all objectionable acids and to start the flow of coloring matter. Plunge into cold water to set the color bodies and render packing easier, and pack in jars alternately, butts and tips. Add 1 teaspoonful of salt to each quart jar, fill to the brim with cold water, place on your rubber rings and your tops, and sterilize for four hours in the hot water bath outfit. If using the steam pressure canner place your jars in the crate, lower them into the retort, which should have 2 inches of water in it, put on the cover and clamp, being sure there is absolutely no leakage, bring the steam up to 15 pounds' pressure and keep it there for sixty minutes.

For corn off the cob cut the corn off after the cold plunge, pack in the jars and proceed the same as with corn on the cob.

String Beans.

Have your beans as fresh from the vines as possible, and be sure all pods are tender. Wash, break in convenient lengths, or leave them whole, as you prefer, blanch in boiling water from three to five minutes, plunge into cold water, pack in jars, fill to the brim with cold water, place on rubbers and caps, and clamp. Sterilize in the hot water bath outfit for three hours, or in the canner fifty minutes at 8 pounds' pressure.

Greens: Spinach, Swiss Chard, Dandelions and Beet Tops.

Wash, blanch in boiling water for five minutes, plunge into cold water, pack into jars solid, fill to the brim with cold water, place on rubbers and tops, clamp, and sterilize in the hot water bath outfit one hour or thirty minutes under 5 pounds' pressure in the canner.

The reason for the shorter sterilization for greens than for beans or corn is that they do not furnish as good a medium for the bacterial growth. Bacteria do not thrive in vegetables containing a large amount of acids, which is why rhubarb will keep without being sterilized. The tomato does not contain so much acid as rhubarb, yet it has sufficient acid to prevent the growth of more troublesome forms of bacteria.

Tomatoes.

To can tomatoes whole, grade for ripeness, size and quality. Scald to loosen the skin, plunge into cold water, remove skins, pack whole. Fill the jars with tomatoes only and add 1 level teaspoonful of salt to each quart. Place on your rubbers and tops and sterilize twenty-two minutes in the hot water bath outfit and ten minutes under 5 pounds' pressure in the steam canner.

To can sliced tomatoes, scald, plunge into cold water, remove the skins and cut up a few tomatoes. Put in a preserving kettle and boil twenty minutes. Remove from the fire and strain. Set this aside to cool, and while cooling select ripe tomatoes. Scald to loosen the skin, plunge into cold water, remove the skins and slice. Pack neatly in the jar and add 1 level teaspoonful of salt to each quart, and then pour in the strained liquid, filling the jar to the brim. Place on rubbers and caps and proceed the same as for whole tomatoes.

Carrots and Beets.

Blanch in boiling water, plunge into cold water, remove skins and pack whole or sliced, just as you prefer. Fill jars to the brim with cold water. Place on your rubbers and caps and sterilize in the hot water bath outfit for one hour and a half, or forty-five minutes under 5 pounds' steam pressure.

MEATS.

Judging from past experiences I find that few women are in the habit of canning meats, thinking it too difficult. Personally, I do not find it difficult if the cold pack method is used. We all know it is very convenient to have canned chicken, canned cornbeef, roast beef, roast lamb and veal or, in fact, any kind of meat on hand, especially in the summer time for use at camps or picnics. We find that meats as well as some vegetables furnish a better medium for bacterial growth; therefore you must give them a thorough sterilization. Meats should be cooked right in the jar, and not exposed to the air after boiling. If they are cooked in the open kettle and poured into the jar

it gives the bacteria a chance to get on the food, and there is danger of spoiling.

To can chicken, cut up as for an ordinary stew or fricassee, leaving in some of the bones. Pack in jars. Add pepper and salt to taste, and fill jars to the brim with cold water. Put on the rubbers and tops, and clamp. Sterilize for three hours in the hot water bath outfit, or sixty minutes under 15 pounds' pressure.

To can fresh beef, wash and cut in cubes. Pack in jars (after they have been wiped with a sterilized cloth kept for that purpose). Add a little fat and a teaspoonful of salt to each pint of meat. Place on rubbers and tops and sterilize in the hot water bath outfit three hours, or sixty minutes under 15 pounds' pressure.

To can all kinds of roast meats, roast the meats in the usual way, and when cold slice and pack in the jars solid. Fill to the brim with the juices or gravies. Place on the rubbers and tops and sterilize in the hot water bath outfit three hours, or sixty minutes under 15 pounds' pressure.

To can roast or fried chicken, turkey, duck or any game, dress and roast thirty minutes in a hot oven. When cool, cut up and pack in jars and fill jars with gravy. Place on the rubbers and tops and sterilize in the hot water bath outfit for three hours, or sixty minutes under 15 pounds' pressure.

Following Mr. McCarthy's address in the main hall, Mr. Junius S. Cates, of the Farm Management Bureau of the United States Department of Agriculture, spoke on "Farm Management: Its Application to Southern New England Conditions."

FARM MANAGEMENT: ITS APPLICATION TO SOUTHERN NEW ENGLAND CONDITIONS.

J. S. CATES, AGRICULTURIST IN CHARGE OF NORTHEASTERN STATES, BUREAU OF FARM MANAGEMENT, UNITED STATES DEPARTMENT OF AGRICULTURE.

Farm management considers farming as a business, and attempts to analyze the various factors having to do with the success or failure of that business as it is found conducted on the individual farm, and in so far as possible to determine the broad outstanding factors for efficiency which admit of general application to the region.

The solution of many of the practical problems of agriculture which have been worked out by various scientific experimenters are found to have already been solved generations previous by large groups of farmers. Particularly is this true of farm organization and management. Every farmer is of necessity more or less of an experimenter. The results of thousands of such experimenters gathered by the investigator, classified and interpreted in their bearing on the community's problems, and on the individual farm's problems, yield not only many fundamental broadly applicable principles of good farm organization, but also show in more or less detail just in what respect a successfully operated farm differs from one which is a failure or only moderately successful.

In previous decades the agricultural investigator largely concerned himself with the study of how to accomplish certain ends; for example, how best to feed a pig or a cow, how best to raise potatoes or fruit. The farm management investigator is concerned with the study of whether to feed a cow or a pig, whether to raise fruit or potatoes; and if an industry be found to be desirable, to what extent it should enter into the farm organization, and with what intensity it should be pursued. All of these problems have in the aggregate been solved by the

farmers. Farm management is merely a scientific method of classifying and interpreting the collective experience of the farming people as to what constitutes efficiency in farming.

Farm management deals with the principles which underlie profitable farming. These principles are not unlike those which underlie the profitable conduct of any business. The difference is merely in the application. The one fundamental principle underlying all successful business undertaking is that the cost must be less than the selling price. In the operation of this principle, agriculture is no exception. Farming, however, is such a complex business, and the different enterprises making up the farm unit are so intricately related, that it is often well-nigh impossible to determine the true cost or the true selling price of a farm product. However, the relation of any factor in farming to the profit of the farm as a whole, by the study of a large group of farms, can be fairly accurately determined. This relation of the individual enterprise to the profits of the whole is perhaps the best guide to successful farming and to an understanding of the principles upon which good farm organization is based.

One of the first and most important factors having to do with profitable farming, as in all other lines of business, is the size of the enterprise. There are several measures of size of a farming enterprise. Perhaps in general farming of the same type the area of the farm furnishes the most significant measure of size. Of course, size in acres cannot be used in comparing a truck farm or a farm of any intensive type with a general farm. Despite the much talked of idea of "a little farm well tilled," actual records from thousands of farms covering pretty well the whole United States go to show that little farms do not often make big profits, and that as a rule the profits from farming vary directly with the size of the business. It might, however, be pointed out in this connection that the opportunities for loss vary also in the same way.

In the study of the agriculture of Chester County, Pennsylvania, of 115 farms of the group of 60 acres and under, averaging 40 acres, only 8 per cent made labor incomes of $1,000 or more, and the average for the group was $404. Of the group ranging in size from 161 to 393 acres, averaging 203

acres, 68 per cent made $1,000 or more, the average for the whole group being $1,575.

In a similar study made in the extensive farm region of the upper Mississippi valley States, the 160-acre farm groups gave an income over five times that of the 40-acre group. Results closely paralleling these are secured wherever such studies are made of comparable types of farming. It is not surprising that this is true when we consider some of the handicaps under which the small farm is operated. For instance, in the group of large farms in the Chester County area the value of machinery equipment per acre of crops was only about one-half that of the small-farm group, and the crop acres per horse was nearly double, as was also the crop acres per man. Furthermore, a small farm is rarely ever adequately supplied with equipment.

A recent study of machinery equipment on over 1,100 farms in western New York State showed that when, for instance, a sulky plow was used to cover 15 acres annually, the cost per day of use for the machine alone was 83 cents. When this same plow was used to cover 55 acres annually the cost was reduced to 57 cents per day. A grain drill when used to cover 20 acres annually cost per day used $2.97. When used to cover 117 acres annually the cost per day dropped to $1.04. A grain binder when used to cover 15 acres per year cost per day used the surprising sum of $8.15. When used to cover 85 acres per year the cost per day used was $2.41.

Another striking disadvantage of a small farm is that the restricted acreage does not permit of a sufficient diversification in the farm enterprises to furnish a good, even, all the year round employment of labor. As a result, the labor employed by the year is often idle for long periods. Whether this labor be hired, or be the services of the farmer himself and his family, the results are all the same. Rather than be idle for a long period this labor might well be employed in some industry which yields even but slight profit. In the larger sized farms this factor can easily be provided for. The minimum size of a farm for efficiency should be such as will furnish opportunity for adequate employment for both labor, machinery equipment and work stock.

It is not always possible for a farmer to enlarge his business by investing more capital until it shall have reached the optimum size. He can, however, quite often rent additional land. In many parts of the United States the figure paid for land rental, either in cash or in part of the crops, amounts to considerably less than a normal interest charge. A study of three groups of tenant farms located in Indiana, Illinois and Iowa showed that the tenants paid on the average a rental equivalent to only 3.5 per cent of the value of the farm. A farmer with restricted means, therefore, under such circumstances need not worry about the inability to purchase when he can rent more cheaply than own.

The diversity of enterprises making up the farm unit shows an important relation to profit. The successful farm usually has from three to five important sources of income. There are some extraordinary circumstances under which a farmer may find it more profitable to raise only a single crop, and even to buy feed to supply his live stock, than to engage in diversified farming. These conditions are exceptional, however, and such a farm is always subject to disaster through the failing of that single crop, as well as through failure of market conditions. And, furthermore, no single cropping system offers the opportunity for continuous employment throughout the year, while with diversified agriculture the leaks caused by idle seasons can be largely overcome.

Live stock on a farm usually helps greatly in furnishing continuous employment. Live stock is primarily a method the farmer employs of marketing his produce, and the live-stock yield must be equivalent to the market price of the feed or a loss is occasioned; but if live stock yields even a small margin over current prices of feed, yet the labor employed in caring for the stock would be otherwise idle, then the industry becomes highly desirable and contributes to the profit of the farm.

The factor of profitable farming which has probably heretofore received more attention than any other has been what might be termed efficiency, that is, the yield of crops and production per animal. As a rule, crop yields for a community are considerably below what would be the most profitable, and production per animal is decidedly below what has been shown

to be the most profitable. In case of crop yields, however, investigations have shown that the biggest yield is not, by any means, always the most profitable yield. As a rule, the most profitable yield of crops for the community ranges from 15 to 30 per cent above the average of the good farmers of that community. If the yield rises much above this figure the profits of the farmer's business are usually found to decrease. It is possible to suffer from too big crop yields. Quite a few American farmers have reached this point. The optimum yield for greatest profit, of course, varies widely with different soils and economic conditions.

Studies of one large group of Pennsylvania farms showed that when the yield of crops reached a point about 35 per cent above the average for the region there was a sharp decrease in profits. The price of products as related to the relative costs of yields of different magnitudes seems to be the governing factor in determining the most profitable yield. Survey studies indicate that very few farmers are producing as large crop yields as existing economic conditions warrant.

Farm practice, in the aggregate, always responds to changed prices of commodities, but this response by the individual farmer, in the majority of cases, is made far more slowly than the greatest profit would indicate.

To illustrate how the yield is determined by prevailing price of a product, the case of corn in North Carolina may be cited. In the decade previous to the last the average price per bushel of corn in that State was about 55 cents. The yield per acre was around 13 bushels. During the past decade the price has ranged around 85 cents a bushel, and the yield has increased to about 20 bushels per acre. The explanation of this probably lies in the fact that under the higher prevailing price it became profitable to use more fertilizer and legumes and give better tillage to the crop than under the low scale of prices. No doubt the average yield is yet far below what would be the most profitable under existing conditions.

Survey studies have never disclosed, however, a group of farms on which the yield per cow had reached a point above which profits decreased. There does seem to be a point in yield per cow above which increased yield is not accompanied

by much further economy of feed. Recent studies of feed cost as related to milk yield, made on four farms located, respectively, in Michigan, Wisconsin, Pennsylvania and North Carolina, running for five years and involving careful, complete, yearly records of 443 cow years, indicate that this point is reached at a yield of between 6,000 and 7,000 pounds of milk.

The cost of feed per 100 pounds of milk decreases rapidly until about 6,000 pounds' yield, after which the decline in cost is very slight. The lesson from this study is that it is of much greater importance to increase the milk yield up to between 6,000 and 7,000 pounds than it is to attempt to get the yield above this figure, as far as the economy of the use of feed is concerned. It is easier to increase the quantity of milk when it is low than when it is high. It is also easier to increase low crop yields than it is to raise already high ones. Furthermore, in both cases increasing a low yield is the most profitable thing to do. In dairying, a high standard of production per cow is usually the keynote of success. According to the recent Pennsylvania study of 289 dairy farms, 48 of these farms showed a yield per cow of less than $50. The labor income of these farms was 45 per cent below the general average. Twenty-eight farmers of the group had incomes per cow of more than $120, and their labor income was 75 per cent above the average.

Perhaps the most conspicuous cause of success in farming is prompt and fitting change in type of farming in response to economic pressure, as indicated by the market price of products as related to cost. The American farmers who are most successful usually sense the operation of economic forces far ahead of their neighbors. A large number of farmers change an old established system only when forced by dire necessity. Not only is there the greatest opportunity to any individual farmer through quickly modifying his organization in response to changed markets, but such readjustment is of great value to the whole community, for such action in time becomes corrective of the changed condition from which it sprang. Let us assume, for instance, that there is a community engaged largely in live-stock production, and that through some cause feed prices advance to such a point that there is more money

in selling the raw product than in feeding. Under such conditions a large number of far-seeing farmers will quickly curtail their live-stock industry and become sellers of raw products. This, in turn, has a tendency to reduce feed prices and to increase the price of live-stock products, thus bringing about the old balance.

The farming business which is of efficient size, and which is made up of diverse units, put together in such a way as to operate smoothly and well, with full employment of both labor and horse and machinery equipment, provided supervision is adequate and the enterprises making up the farm are selected wisely and are efficient, complies closely with the outstanding factors of profit.

In order properly to understand the application of the foregoing principles of farm management to the agriculture of southern New England, a brief review of the economic history of the agriculture of the region is in order.

New England agriculture was established at a time of hand work. The family farm necessarily had to be small, that is, within the limits of what they could do by hand. This was also before the days of big factories. There being no large cities there was very little market for farm products. The farmers therefore very naturally fell into the habit of utilizing the long winters in manufacturing small articles for home consumption and for sale. Under these conditions the New England farmer prospered. Such conditions continued until settlement west of the Allegheny Mountains began and transportation developed. When the Erie Canal was completed the New England farmer began to feel the press of competition from the west. A little later the railroads extended into the west, and then the New England farmer found himself hard pressed.

Just about this time the reaper, the mower and the steel mouldboard plow were invented. The western farm was large, fertile, level, free from stones, and admirably adapted to the use of machinery. One of these western farmers could produce under such conditions three or four times as much beef or pork or mutton or hay as could the New England farmer on his little farm. The New England farmer was not in a posi-

tion to utilize these improved methods to full advantage. These western farmers made food cheap, and that made it possible for the cities to grow.

The New England farmer naturally drifted into manufacturing when agriculture became unprofitable, and this region became the manufacturing center of the country.

The growth of the cities based on this manufacturing did two things for the farmer, — first, it took his children away to work in the factory; and second, it made a market for fruit and vegetables, poultry and dairy products and hay; all of which, with the exception of hay, are the products of intensive farming, and are either bulky or perishable, and thereby adapted to production on farms near the point of consumption.

The New Englander had to give up the production of beef, pork, mutton and grain. There was not room for many farmers to go into the production of vegetables and potatoes. Forty acres of potatoes and 30 acres of vegetables are sufficient to feed a thousand people. Neither was there room for all of them to go into the poultry business. But with the rapid growth of the cities it was not long before there was room for all of them to go into the cheese, butter and milk business. So the New England farmer went into dairying, the only intensive form of agriculture available to everybody, while as many as could find a market engaged in producing fruit, vegetables, poultry, etc. In a few localities having special soils such industries as tobacco and onion culture developed; but the rapid development of the west, with its cheap feed, brought competition in the production of butter and cheese. With his bigger farm and cheaper feed the western farmer beat the New Englander at his own game, and along about 1870 to 1880 was another period of hard times; but the farmers' prosperity again returned when the growth of the city was sufficient to take the dairy products in the form of market milk.

In recent years, however, the southern New England farmer has suffered a three-cornered pressure on his major enterprise, — dairying: first, high prices for feedstuffs; second, high prices for labor, in competition with city wages; and third, through rapidly developed shipping facilities, competition in market milk with remote regions undreamed of a generation ago. To

these conditions farm management practice of southern New England is not now in full adjustment.

In the economy of such conditions low-producing cows have no place; all dairy herds should be closely culled, though seldom disposed of entirely. Labor distribution becomes of paramount importance. Owing to the fact that the dairy herd demands for its care more men than can be used in growing the crops to feed, more cash crops should be grown. Under the changed economic conditions the old doctrine — that everything grown on the farm should be fed there — is fallacious, and quite often costs the farmer a pretty sum. Chemical fertilizers, when price of the crops grown warrant a liberal application, fully maintain soil fertility. Especially is this true if the crop grown leaves in the soil a considerable residue of organic matter. In southern New England it is always possible to follow a rotation which includes one or more such crops.

The price of a crop in the eastern and southeastern States largely determines whether it depletes or upbuilds a soil. When cotton was around 7 cents a pound its continuous culture in the southeastern States exhausted the soil rapidly. With cotton at 12 and 15 cents, its continuous culture in the eastern part of the cotton belt rapidly builds up fertility. The reason is that the heavy fertilizer application warranted under the higher price produced such a heavy growth of plant as to rapidly increase the organic content of the soil. Present prices of hay in southern New England warrant a fertilizer application which will increase fertility far more than did the old system of producing low yields yet feeding on the farm and returning all the manure that was not wasted.

Many of the farms of southern New England are entirely too small for most efficient operation under the scheme of fewer cows, better cows and more crops for sale. The old proverb about a little farm well tilled was good in this region many years ago, but does not fit into the economy of the competitive system of dairy farming in southern New England to-day.

Southern New England farms in the aggregate are slowly responding to this economic pressure, and are readjusting their

farm organization to meet new conditions. A clear conception of just what changes should be made will tend to more rapidly bring about that economic balance necessary to greatest prosperity.

Mr. Atkins. I would like to inquire if Mr. Cates thinks if the men on the 40-acre farms were picked up and placed on the 200-acre farms their income would be largely increased?

Mr. Cates. I do not think it would immediately; they would have to learn the business gradually.

Mr. Atkins. My point is this: isn't it usually true that a man with a large farm is a man of large ability?

Mr. Cates. Well, he is a man with more money too; but there is always the way for the fellow on a small farm to rent and thereby increase the size of his business.

Evening Session.

At the evening session Secretary Wheeler introduced Mr. H. G. Worth of Nantucket as the presiding officer. Mr. Worth introduced Dr. Harvey W. Wiley of Washington, District of Columbia, who spoke on the subject of "Health on the Farm."

HEALTH ON THE FARM.

H. W. WILEY, M.D., FORMER CHIEF, BUREAU OF CHEMISTRY, UNITED STATES DEPARTMENT OF AGRICULTURE.

When we speak of agricultural subjects we usually do not think of health, sickness or death. Theoretically the farmer should live longer according to his numbers than any other profession. He lives largely out of doors; he has simple foods to eat; he is engaged in a profession which gives exercise to both body and mind; he is isolated to a certain extent from the dangers of contagious disease; he has, in everything except perhaps his housing, better sanitary conditions than the urbanite. The question is one of interest: Does farm life tend to promote health and to prolong life, or the contrary?

I assume that farmers are as much interested in living as other people. The instinct for life is the dominant instinct. If we look at it in the proper sense, and from the proper point of view, we must acknowledge that life is the most precious possession we have. Being the most precious possession it demands more than an ordinary share of attention. Does it receive it? The answer must be in the negative. Agricultural discussions often are based upon the best method of preserving the life and health of farm animals, but rarely do they include the life and health of the farmer and his family.

In accepting the invitation of the Board to give this address I assumed that you were not anxious to have my experience as a farmer. I am proud of the fact that I was born and brought up on a farm, and I am proud of the fact, also, that during all of my active life I have been directly and indirectly interested in farming. Of late years I have become a farmer again, and I hope that it may be my good fortune to end my days in the manner in which I began them, namely, on the farm. I consider, therefore, the discussion of the relation of

the farm to health as one of peculiar significance, both in regard to its importance and especially in the fact that it has been neglected.

The answer to the question, does farm life promote health and prolong life, can be obtained solely from reliable data. It is extremely difficult to secure reliable data representing all parts of the country. The registration of vital statistics is resented in many communities, and is difficult to enforce in others where nominally it exists. If we look at a map of our country which indicates the localities where registration of vital statistics is required, we find that in 1880 Massachusetts and New Jersey were the only States in which there was any system of the registration of vital statistics at all. In 1890 the area included, in addition to Massachusetts and New Jersey, all of the New England States except Maine, the whole of New York and Delaware. In 1900 there had been a still further extension of the registration system until it included, in addition to the States named above, Indiana and Michigan. In 1913, when the last map was published, we find a remarkable increase in the registration area. In addition to the States mentioned hitherto we have now included Pennsylvania, Virginia, Kentucky, Ohio, Missouri, Wisconsin, Minnesota, Montana, Washington, Colorado, Utah and California. This embraces almost one-third of the total area of the United States and approximately two-thirds of its population.

The total population of the registration area at the end of the calendar year 1913 was 63,298,718, and the death rate of the whole area was 14.1 per thousand. This rate, with the exception of that for the preceding year, which was lower, namely, 13.9 per thousand, is the lowest recorded since the registration area was established. In 1880 the death rate, in so far as it could be determined by reliable statistics, amounted to 19.8 per thousand. It has since then gradually declined, with occasional lapses, until the present time. Either the introduction of the system of registration of vital statistics has incited people to greater care of their health and lives, or else the effects of the propaganda which has been made for better sanitation and for pure food and drink and for better control of contagious and epidemic diseases have contributed

wholly to this desirable result. During the calendar year of 1913, 890,848 deaths occurred in the registration area of the United States, of which 54.9 per cent were males and 45.1 per cent were females.

For the purpose of distinguishing between urban and rural populations the data of the census include all cities of 10,000 and over in one classification as urban, and all towns under 10,000 of population are included in the rural estimates. The figures, therefore, which I am about to give do not relate exclusively to life on the farm, but to life on the farm and in towns of less than 10,000 population. I do not know of any data accessible which will give the comparative death rates of persons living exclusively on farms and those living in villages, towns and cities. For the four years including 1910 and 1913 the total death rate is as follows: —

Area.	Death Rate from All Causes[1] per 1,000 Population.					
	1913.	1912.	1911.	1910	Annual Average.	
					1906 to 1910.	1901 to 1905.
The registration area,	14.1	13.9	14.2	15.0	15.1	16.2
Registration States,[2]	13.9	13.6	13.9	14.7	15.0	15.9
Cities in registration States,[2]	15.0	14.7	15.1	15.9	16.3	17.4
Rural part of registration States,	12.7	12.4	12.7	13.4	13.4	14.1
Registration cities in other States,	16.3	16.6	16.9	16.9	15.9	16.6
All registration cities,[2]	15.2	15.0	15.3	16.1	16.2	17.0

[1] Exclusive of stillbirths. [2] Includes District of Columbia.

It will be seen from this table that uniformly the death rate for the rural population is smaller than for the registration as a whole, and especially the registration in cities. Illustrating this by the data of 1913 we find that the death rate for the total registration area was 14.1 per thousand. The death rate in all the registration States, including the District of Columbia, was 13.9 per thousand. The death rate for cities in registration States was 15 per thousand. The death rate in the rural part

of registration States was 12.7 per thousand. These data, extending over a period of four years, clearly show that the farmer and the dweller in the small city or town has a better chance for life than the inhabitant of large cities.

In a comparison of the States themselves the data show that the highest death rate in the registration States was that for New Hampshire, namely, 17.1 per thousand, followed by North Carolina, with 16.8 per thousand, and Maryland with 16.2 per thousand. The lowest death rate in the registration States was that of Washington, namely, 8.5 per thousand. The next lowest were those of Minnesota, 10.4 per thousand, and Utah, 11 per thousand. We must not fall into the error of supposing that the gross death rate is a measure of the real health of the community. In new States where large numbers of grown-up immigrants are collected the death rates are lower than in the older States where there is a preponderance of children. It is a sad fact to realize that the greatest death rate is among the youngest of our race, namely, infants under one year of age.

In regard to Massachusetts, with which State we are now particularly interested, it is shown that the death rate for 1913 was 15 per thousand, which same rate obtained in 1912, while in 1911 it was 15.3 per thousand, and in 1910, 16 per thousand. Going now to the States where registration was established prior to 1900, namely, Kentucky, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island and Vermont, we have an opportunity of comparing the respective death rates of the rural and urban populations over areas which have long practiced the system of registration. The data which have been collected on this point are found in the following table: —

Area.	Death Rate from All Causes[1] per 1,000 Population.					
	1913.	1912.	1911.	1910.	Annual Average.	
					1906 to 1910.	1901 to 1905.
Registration States[2] (1900),	14.7	14.6	14.9	15.6	15.5	15.9
Cities,[2]	15.1	14.9	15.4	16.2	16.4	17.4
Rural,	14.1	13.9	14.3	14.7	14.2	14.1

[1] Exclusive of stillbirths. [2] Includes District of Columbia.

Note.—The registration States in 1900 were Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island and Vermont.

It will be illuminating at the present time to compare with the foregoing some of the death rates of the large cities. I will give just a few of them, as I cannot burden this paper with very extensive data. For 1913 the city having the highest death rate was Memphis, namely, 20.8 per thousand. Among the white people of Memphis the rate was 15.9, and among the colored, 28.2. Following close on the heels of Memphis were Richmond, Virginia, with a death rate of 20.4 per thousand, and New Orleans, Louisiana, with a death rate of 19.9 per thousand, with about the same discrepancy between the white and colored deaths as has been given for Memphis, Tennessee. Of the great cities having a low death rate New York takes the lead, in consideration of its enormous population, with a total death rate of 14.3 per thousand, which is almost the same as that of the average death rate of the registration area, namely, 14.1. Other cities with a low death rate are: St. Paul, with 11 per thousand; Minneapolis, with 11.6 per thousand; Portland, Oregon, with 9.5 per thousand; Seattle, with 8.4 per thousand; Spokane, with 8.9 per thousand; Milwaukee, with 12.7 per thousand. Boston occupies a medium position, with a death rate of 16.4 per thousand.

It is seen that the death rate as a rule increases as you go farther south and decreases as you go northwest and west. It is interesting to know that the average death rate in the United States is just about the same as for England, Wales and

Sweden. Australia and New Zealand have a decidedly lower death rate, while Germany, France, Italy and Austria have a much higher death rate, and Spain, Hungary and Chile a still higher mortality. In Chile, in 1912, the death rate was 28 per thousand, while in Spain it was over 22 per thousand, and in Hungary almost 25 per thousand. Our country as a whole, therefore, belongs to the healthier communities. It is interesting to know that in Bulgaria, which has been featured as one of the most healthy countries in the world, the figures, in so far as they are available, show a death rate very much higher than in the United States, rising in 1901–05 to 22.5 per thousand.

The question presents itself at this point as to whether there are any diseases which are peculiarly fatal in the rural districts as distinct from cities. This we can answer in a general way by taking the figures for some of the more fatal diseases. The deaths from typhoid fever in the registration States for 1913 amounted to 10,393; of these, 4,697 occurred in cities and 5,696 in rural districts. These figures do not have their full significance unless compared with the respective numbers of people living in the urban and rural districts.[1] Thus it is seen that in proportion to the number of inhabitants, typhoid fever is far more fatal in the country than it is in the city. In Massachusetts, however, the number of deaths from typhoid fever in the cities was 238, while in the rural districts it was only 41 (169).[2]

In regard to tuberculosis, the total number of deaths in the registration States was 84,346, of which 47,549 were in cities and 36,797 in rural districts. In Massachusetts the total number of deaths in cities was 3,864, and in rural districts 1,253 (4,636).

Diphtheria and croup caused in the registration States 10,604 deaths, of which 6,324 were in cities and 4,280 in rural districts. In Massachusetts diphtheria and croup caused 548 deaths in cities and 79 (292) deaths in rural districts.

The total number of deaths caused by measles in the registration States for 1913 was 7,553, of which 3,962 occurred in

[1] Urban population in 1913, 29,244,160; rural population in 1913, 29,068,435.

[2] The urban population of Massachusetts is 2,764,797, and the rural population is 783,908. To compare rural with urban deaths multiply rural by 3.7. The results are indicated by the numbers in parentheses.

cities and 3,591 in rural districts. These data show a marked contrast between diphtheria and croup and measles, measles being almost as fatal in the country as in the city, while diphtheria and croup are far more fatal in the city than in the country.

Cancer and other malignant tumors caused a total number of deaths in the registration States of 45,833, of which 25,672 were in cities and 20,161 in the rural districts. In Massachusetts cancer caused a total number of deaths in cities of 2,728, and in rural districts of 869 (3,215). The prevalence of cancer, therefore, among the rural communities of Massachusetts is more general than in the cities.

Organic diseases of the heart caused a total number of deaths in the registration States of 80,651, of which 43,350 occurred in cities and 37,301 in rural districts. In Massachusetts organic diseases of the heart caused in the cities 4,813 deaths, and in the country 1,683 (6,227) deaths. In Massachusetts it is noticed that organic diseases of the heart are more common in rural districts than in cities.

Pneumonia caused in the registration States 46,955 deaths, of which 27,413 were in cities and 19,542 in rural districts. In Massachusetts pneumonia caused 2,648 deaths in cities and 564 (2,086) deaths in rural districts.

Diarrhœa and enteritis caused among children under two years of age in the registration States 42,092 deaths, of which 24,731 were in cities and 17,361 in rural districts. In Massachusetts diarrhœa and enteritis caused among children under two years of age 2,605 deaths in cities and 472 (1,746) deaths in rural districts.

Congenital debility caused in the registration States 40,076 deaths, of which 21,862 were in cities and 18,214 in rural districts. In Massachusetts congenital debility caused a total of 2,002 deaths in cities and 477 (1,765) in rural districts.

Old age caused a total of 13,010 deaths in the registration States, of which 4,408 were in cities and 8,602 in rural districts. In Massachusetts old age caused 304 deaths in cities and 209 (773) deaths in rural districts.

These last data are the most informing, and in some respects encouraging, of all. As far as the data for 1913 are concerned

it is seen that the rural districts take the lead in deaths from typhoid fever and from old age. The first series of deaths are preventable. The last series are inevitable. If we had the ideal condition of life in all parts of the world all deaths would be due to old age. Of course we never can arrive at this ideal, but the more nearly we approach it the more certainly are we living the ideal life.

It is only fair to call attention to the fact that the death rates for typhoid fever in 1913 do not adequately represent the data for a number of years. While it is true that there is a general tendency for typhoid fever to be more fatal in proportion to the number of people in the country than it is in the city, there are some notable exceptions. For instance, in the typhoid fever mortality for 1912 the death rate for the registration cities in non-registration States was the highest of all. In other words, it exceeded the death rate from typhoid fever in the rural communities. It will be interesting in this connection to see which of the registration States has best control of the typhoid fever death rate.

The relative number of deaths in the various States, and the death rates per 100,000 from typhoid fever, for 1913, are shown in the following table: —

States.	Urban.		Rural.	
	Number of Deaths.	Death Rate.	Number of Deaths.	Death Rate.
California,	246	16.6	178	15.1
Colorado,	55	16.6	95	17.2
Connecticut,	104	12.9	29	7.8
Indiana,	249	28.2	444	23.6
Kentucky,	114	27.1	884	46.2
Maine,	30	17.3	61	10.4
Maryland,	185	29.5	258	36.6
Massachusetts,	238	8.6	41	5.2
Michigan,	290	25.4	249	13.9
Minnesota,	101	14.1	134	9.1
Missouri,	270	22.3	550	25.7
Montana,	34	32.0	61	19.5
New Hampshire,	22	12.1	30	11.8

States.	Urban.		Rural.	
	Number of Deaths.	Death Rate.	Number of Deaths.	Death Rate.
New Jersey,	181	10.2	84	8.7
New York,	723	9.9	276	11.6
North Carolina,	112	65.4	116	51.4
Ohio,	538	22.9	653	25.0
Pennsylvania,	785	20.2	685	16.2
Rhode Island,	40	8.5	8	7.3
Utah,	28	20.8	62	22.9
Vermont,	2	4.3	26	8.3
Virginia,	117	28.1	592	34.6
Washington,	50	7.8	89	12.6
Wisconsin,	126	15.5	91	5.7

The above data show that 10 States have a higher typhoid rate in the rural population than in the urban districts, and that 24 States have a higher typhoid rate in the urban than in the rural districts. Six States show almost the same rate. The total number, however, show that the death rate from typhoid fever in the rural districts of the United States is markedly higher than in the urban districts. As respects Massachusetts, you are to be congratulated upon the very low death rate, both in the city and in the country, but the country rate is markedly lower than the city rate.

Total Population in Registration Area in 1912 and 1913.

The total population in the registration area as estimated by the United States Census for 1912 and 1913, the number of deaths in that area, and the death rate per 1,000 of population are shown in the following table: —

Area and Color.	Population estimated as of July 1.		Number of Deaths.		Death Rate per 1,000 Population.	
	1913.	1912.	1913.	1912.	1913.	1912.
The registration area (total),	63,298,718	60,427,247	800,848	838,251	14.1	13.9
White,	60,076,006	57,848,385	820,214	779,135	13.7	13.5
Colored,	3,222,712	2,578,862	70,634	59,116	21.9	22.9

The proportions of the population existing in the cities and in the rural districts for the years given are shown in the following table: —

Area and Color.	Population estimated as of July 1.		Number of Deaths.		Death Rate per 1,000 Population.	
	1913.	1912.	1913.	1912.	1913.	1912.
Cities in registration States (total),	29,244,160	28,129,824	439,478	414,778	15.0	14.7
White,	28,043,900	27,098,037	410,307	390,285	14.6	14.4
Colored,	1,200,260	1,031,787	29,171	24,493	24.3	23.7
Rural part of registration States (total),	29,068,435	27,122,299	370,115	337,665	12.7	12.4
White,	27,678,400	26,286,733	345,513	322,852	12.5	12.3
Colored,	1,390,035	835,566	24,602	14,813	17.7	17.7

From the above two tables we are able to determine in large masses of persons the relative death rates between cities and urban communities. Incidentally it will be noticed that the total population in these two areas is almost identical, being only slightly larger, namely, 29,244,160, in the cities than in the rural districts, namely, 29,068,435, the above being the relative numbers for 1913. An inspection of these tables shows that in rural communities both white and colored citizens have a longer expectation of life than in cities. The contrast is made more striking if we include cities having registration in States where registration is not observed. These cities have a larger death rate than the registration cities in registration States, namely, for the year 1912, 16.6 per cent per thousand, and for 1913, 16.3 per thousand. If we consider all registration cities together the respective death rates for the years 1912 and 1913 are 15 and 15.2 per thousand.

Inasmuch as the populations of the urban and rural divisions are almost the same, a comparison of the total number of deaths in the respective areas is more informing even than the death rate. In tabular form these data are as follows: —

	1912.	1913.
Deaths in registration cities,	500,586	520,733
Deaths in rural communities,	337,665	370,115

These data show that the country is a much more favorable place to live in than the city. In regard to the various States this information, in order not to take up too much room, will be given for 1913 only.

State.	Urban Population.	Number of Deaths.	Rate per 1,000.	Rural Population.	Number of Deaths.	Rate per 1,000.
California,	1,485,455	22,616	15.2	1,182,061	15,890	13.5
Colorado,	330,353	4,483	13.6	552,923	5,714	10.3
Connecticut,	807,925	12,366	15.3	373,868	5,353	14.3
Indiana,	881,762	13,438	15.2	1,879,030	23,261	12.4
Kentucky,	431,113	7,146	17.0	1,915,164	23,500	12.3
Maine,	173,060	3,168	18.3	584,876	8,397	14.4
Maryland,	626,171	11,612	18.5	704,038	9,881	14.0
Massachusetts,	2,764,797	41,184	14.9	783,908	12,102	15.4
Michigan,	1,139,763	17,811	15.6	1,796,855	23,005	12.8
Minnesota,	713,913	8,266	11.6	1,467,164	14,521	9.9
Missouri,	1,213,179	18,147	15.0	2,140,804	23,414	10.9
Montana,	106,177	1,787	16.8	312,997	3,246	10.4
New Hampshire,	181,792	3,235	17.8	254,948	4,224	16.6
New Jersey,	1,782,707	25,881	14.5	966,779	13,556	14.0
New York,	7,339,736	108,818	14.8	2,373,218	36,704	15.5
Ohio,	2,350,474	35,602	15.1	2,614,695	32,891	12.6
Pennsylvania,	3,887,216	60,846	15.7	4,220,726	57,148	13.5
Rhode Island,	469,539	7,131	15.2	110,126	1,566	14.2
Utah,	134,303	1,608	12.0	270,432	2,836	10.5
Vermont,	46,747	806	17.2	313,210	4,882	15.6
Virginia,	416,718	7,906	19.0	1,712,285	21,741	12.7
Washington,	638,360	5,704	8.9	706,326	5,693	8.1
Wisconsin,	813,463	10,592	13.0	1,606,435	17,124	10.7

The above table gives data of great significance. It is seen, first, that as a nation the health of the country is better than that of the city. This is reflected in all the State statistics except Massachusetts and New York. In these States the death rates are higher in the country than in the city. While these data extend over only one year, they are supported in almost every instance by the data of the preceding year. In the case of Massachusetts the death rate in the cities for

1912 was 14.8, while in the country it was 15.4. In New York the death rate for the cities for 1912 was 14.9, and for the rural districts 15.3. Unfortunately the census reports do not give a relative comparison of the death rates. Taking the whole country together the death rates for the cities in registration States for 1909 to 1912, respectively, were 15.6, 16.3, 15.4 and 14.9, and for the rural districts in the same States for the same years, respectively, were 13.9, 14.7, 14.3 and 13.9. For 1911 the death rate in the cities of New York was 15.46 and in the country 15.79, and for Massachusetts the city death rate was 15.28 and in the country districts 15.55. In these cases the country rate is still a little higher than it is in the city.

It would not be possible for me to undertake to explain why it is that in New York and Massachusetts, particularly, the city is a healthier place to live in than the country. One thought suggests itself to me with considerable emphasis, namely, that the cities of New York and Massachusetts are taking better care of their citizens than the country is. I do not know any reason of climate or food supply or local infection which would tend to diminish the length of life in the rural districts of Massachusetts and New York. It is for the sanitarians and public health officials of these States to inquire into this matter. There is no harm, however, in expressing the thought which is uppermost in my mind at the present time in regard to this point, namely, that the sanitary conditions of living in the farmers' homes of Massachusetts and New York are not what they should be. I am inclined to believe that it is due more to lack of sanitary conveniences and appliances than it is to the effect of the climate or of a deficient diet, and yet I have no data on which to base this opinion. Why inhabitants of rural districts should live longer in practically all the States of the Union than they do in the cities, and just the contrary condition should exist in the two leading States of the country, leading in education and in wealth in one State and in wealth and population in the other, is beyond my power to explain.

The record held by Minnesota and Washington and Utah in regard to the prolongation of the lives of their citizens is

a proud one which we should emulate. I have heard the exceptional health of Minnesota accredited to the fact that the winters are steady, with low temperatures and no thawing. The people of these States also prepare properly for the winter to protect themselves from the cold, while at the same time they certainly seem to have a good diet and plenty of air to breathe in view of their freedom from disease. The State of Washington has a much milder climate and yet the health of the people is even better. Massachusetts is certainly as disagreeable in winter as Minnesota, and often quite as cold, and yet with its changing climate, with its frequent, penetrating east winds, it can hardly be considered as favorable from the point of view of climatic conditions as the steady, dry, cold winter of Minnesota.

Relative Death Rates due to the More Deadly Diseases.

In further search for the comparative ravages on urban and rural life I will give the mortality data of some of the more common and deadly diseases.

Diseases of the Nervous System.

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	141.6	144.2
Colorado,	89.9	102.5
Connecticut,	149.4	187.5
Indiana,	134.8	134.6
Kentucky,	164.6	103.9
Maine,	189.0	180.0
Maryland,	194.0	172.0
Massachusetts,	144.9	197.2
Michigan,	166.4	157.3
Minnesota,	80.0	95.6
Missouri,	115.8	97.0
Montana,	115.8	85.0
New Hampshire,	218.4	212.2
New Jersey,	126.1	187.9
New York,	104.9	205.8
North Carolina,	182.7	123.2
Ohio,	142.3	154.1
Pennsylvania,	123.1	147.6
Rhode Island,	150.4	151.6
Utah,	102.8	87.3
Vermont,	164.7	186.1
Virginia,	198.5	120.5
Washington,	78.6	86.8
Wisconsin,	121.8	124.2

From the above table it will be seen that in 13 States the death rate for nervous diseases is higher in rural districts than it is in the cities, and in 11 States it is lower. The general average shows that nervous diseases are more prevalent in the country than in cities. In respect to Massachusetts, particularly, the urban death rate for nervous diseases in 1913, as given in the table, is 144.9, and in the rural districts 197.2. For 1912 the figures are almost the same, namely, in the cities 141.2 and in the rural districts 204. Diseases of the nervous system embrace inflammation of the brain (encephalitis), meningitis, locomotor ataxia, diseases of the spinal cord, infantile paralysis, apoplexy, softening of the brain, paralysis, insanity, epilepsy, convulsions, chorea, neuralgia, diseases of the eye and diseases of the ear.

Diseases of the Circulatory System.

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	257.6	201.2
Colorado,	160.4	102.7
Connecticut,	207.7	231.6
Indiana,	188.1	181.8
Kentucky,	202.3	93.6
Maine,	259.4	236.6
Maryland,	231.7	149.1
Massachusetts,	245.0	305.0
Michigan,	189.2	205.3
Minnesota,	135.5	119.6
Missouri,	108.3	110.0
Montana,	167.6	103.5
New Hampshire,	247.5	280.8
New Jersey,	184.9	204.5
New York,	204.4	264.6
North Carolina,	187.9	120.6
Ohio,	198.0	197.6
Pennsylvania,	187.5	145.9
Rhode Island,	209.4	229.7
Utah,	157.9	111.7
Vermont,	213.9	310.7
Virginia,	208.1	168.7
Washington,	120.9	98.3
Wisconsin,	146.7	151.1

From the above table it will be seen that in 10 States the death rate for diseases of the circulatory system is higher in rural districts than it is in the cities, and in 14 States it is lower. The general average shows that diseases of the circu-

latory system are more prevalent in the cities than in the country districts. In regard to Massachusetts we find here again a very great excess of deaths from diseases of the circulatory system in the rural districts. The number as given above in the table for 1913 is 245, and the number for 1912 is 246.2, while the respective numbers in the rural districts for the two years are 305.2 and 321.1. Again we see that in the rural districts of Massachusetts diseases of the circulatory system are more prevalent according to the number of population than in the cities.

In regard to tuberculosis the respective death rates for 1913 and 1912 in the cities are 139.8 and 141.2, and in the rural districts 159.8 and 169.7. In New Hampshire, for 1913, the death rate from tuberculosis in the cities was 122.7, and in the rural districts 118.5, while in 1912 the death rate in the cities was 102.6, and in the country 119.4. In New Jersey, for 1913, the death rate in the cities was 150.2, and in the country 159.3, while in 1912 the death rate in the cities was 157.9, and in the country 150.1. In Connecticut the death rate for 1913 was 137.1 and for 1912 was 138.4 in the urban districts, while in the rural districts for the two years the death rates were 146 and 152.3, respectively. From the above table it will be seen that in 4 States of the Union the death rate from tuberculosis among the rural population is higher than in the cities. In 2 States for the two years compared — namely, 1913 and 1912 — the rates are practically the same. In all the other States the death rates from tuberculosis in the cities are greater than in the country.

The death rate from cancer is decidedly greater in the rural districts than in the cities. The data for 1913 and 1912, respectively, for Massachusetts, are in the cities 98.7 and 96.7, and in rural districts 110.9 and 100.5. In New Hampshire the death rates for cancer and other malignant tumors, for the years 1913 and 1912, respectively, in the cities are 97.7 and 94.8, and in the country districts 114.9 and 116.2. In New Jersey the death rates for 1913 and 1912 from cancerous diseases in the urban districts are 77.5 and 77.6, and in the rural

districts 80.2 and 74.7. In New York the death rates from cancer and other malignant tumors for the years 1913 and 1912, respectively, are in the cities 85.9 and 83.8, and in the rural districts 93.7 and 93.3. In Rhode Island the death rates from cancer for 1913 and 1912, respectively, in the cities are 89.9 and 93.3, and in the rural districts for the same years 108.1 and 74.6. In Vermont the death rates from cancer and other malignant tumors for the years 1913 and 1912, respectively, are 117.7 and 104.1 in the cities, and in the rural districts 110.8 and 111.3. In Massachusetts again it is seen that the ravages of cancer and other malignant tumors are greater in the rural districts than in the cities. The same is true of New Hampshire and New York. In New Jersey, North Carolina, Rhode Island and Vermont for the two years it averaged about the same. In all the other States the death rates from cancer and similar diseases were less in rural districts than in cities.

Diseases of the Respiratory System.

[These include all the diseases of the nose, larynx, thyroid body, bronchitis, pneumonia, pleurisy asthma and all other diseases of the respiratory tract with the exception of tuberculosis.]

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	145.5	129.6
Colorado,	144.4	151.2
Connecticut,	206.5	150.1
Indiana,	149.2	108.1
Kentucky,	161.6	106.3
Maine,	260.0	159.0
Maryland,	245.6	133.1
Massachusetts,	198.6[1]	156.3[2]
Michigan,	185.3	107.7
Minnesota,	121.6	95.7
Missouri,	168.3	127.8
Montana,	216.6	122.0
New Hampshire,	207.9	183.6
New Jersey,	204.0	149.9
New York,	214.9	163.2
North Carolina,	177.4	129.9
Ohio,	162.7	116.3
Pennsylvania,	216.3	171.0
Rhode Island,	184.4	153.5
Utah,	125.1[3]	140.1[4]
Vermont,	209.6	184.2
Virginia,	216.7	117.0
Washington,	77.9	64.0
Wisconsin,	153.9	113.8

[1] For 1912, 195.2.
[2] For 1912, 164.3.
[3] For 1912, 141.2.
[4] For 1912, 130.4.

For respiratory diseases other than tuberculosis it is seen that the country districts are more favorably situated than the urban districts, with the exception of Utah, in which it appears that the urban and rural rates for the two years are about the same.

It is interesting to know whether or not the people who live in rural districts are less or more subject to digestive troubles. Theoretically the simple, plain food of the country should produce a more favorable condition in regard to diseases of the digestive system than the foods which are consumed in cities. The data of the census will settle this point in the affirmative. Country cooking, country food and country digestion are all better than in the city.

Diseases of the Digestive System.

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	140.5	129.1
Colorado,	117.8	111.0
Connecticut,	170.3	141.5
Indiana,	206.0	137.6
Kentucky,	167.9	137.5
Maine,	210.3	137.1
Maryland,	200.9	167.0
Massachusetts,	172.4[1]	137.7[2]
Michigan,	193.5	145.9
Minnesota,	130.3	103.7
Missouri,	183.6	122.4
Montana,	137.4	105.4
New Hampshire,	256.9	164.7
New Jersey,	185.6	138.3
New York,	161.1	141.9
North Carolina,	236.3	211.9
Ohio,	191.2	130.0
Pennsylvania,	214.0	187.7
Rhode Island,	164.0	145.3
Utah,	157.1	115.4
Vermont,	224.6	131.2
Virginia,	240.5	203.2
Washington,	83.2	67.2
Wisconsin,	176.0	108.7

[1] For 1912, 179.7.

[2] For 1912, 126.

It is interesting to see the relative numbers of suicides in urban and rural communities. The data for the different States for 1913 are as follows: —

Suicides.

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	36.6	25.0
Colorado,	31.8	14.8
Connecticut,	14.5	17.4
Indiana,	25.6	11.4
Kentucky,	18.3	6.4
Maine,	17.9	12.0
Maryland,	19.8	11.4
Massachusetts,	12.6[1]	16.3[2]
Michigan,	17.7	11.5
Minnesota,	19.0	11.5
Missouri,	32.5	9.0
Montana,	44.3	21.7
New Hampshire,	18.2	16.5
New Jersey,	17.3	14.8
New York,	16.0	15.8
North Carolina,	8.8	6.2
Ohio,	17.3	12.7
Pennsylvania,	16.0	10.7
Rhode Island,	15.3	12.7
Utah,	30.5	12.9
Vermont,	17.1	16.0
Virginia,	16.3	4.4
Washington,	21.1	15.7
Wisconsin,	15.5	12.1

[1] For 1912, 13.4.

[2] For 1912, 13.

The only State in 1913 where the number of suicides in the rural population was greater than that of the urban is Connecticut. In Massachusetts the rates for 1912 in the country and in the city were practically the same, while in 1913 the death rate was slightly greater in rural districts than in cities.

Accidental Deaths.

States.	Death Rates per 100,000 of Population for 1913.	
	Cities.	Rural Districts.
California,	91.2	125.4
Colorado,	52.1	99.7
Connecticut,	87.6	92.3
Indiana,	108.2	75.8
Kentucky,	93.8	61.9
Maine,	89.6	62.7
Maryland,	82.6	68.5
Massachusetts,	77.0[1]	81.0[2]
Michigan,	91.9	84.0
Minnesota,	79.3	76.5
Missouri,	81.9	54.0
Montana,	135.6	134.2
New Hampshire,	81.4	70.2
New Jersey,	84.0	85.0
New York,	77.6	92.2
North Carolina,	81.1	67.4
Ohio,	120.7	85.4
Pennsylvania,	97.7	101.9
Rhode Island,	80.7	82.6
Utah,	91.6	86.2
Vermont,	89.8	77.9
Virginia,	97.2	66.5
Washington,	65.8	104.2
Wisconsin,	80.8	64.1

[1] For 1912, 78.2. [2] For 1912, 74.2.

The data show in 8 States a higher accidental death rate in the country. In California and Washington, especially, the rural accidental death rate is high. In Massachusetts the urban and rural rates are nearly the same, with the cities a shade safer.

Dr. John N. Hurty, health officer of the State of Indiana, contributed a valuable paper to the Pan-American Scientific Congress on December 30, 1915. Dr. Hurty has examined,

personally or through skilled agents, 9,753 farmhouses in Indiana, and scored them on a scale of 10 points, each point counting 10. The following remarkable result was obtained.

They were scored on the following points: —

1. Site.
2. Sanitary condition of premises.
3. Character of the house.
4. Character of the cellar.
5. Ventilation.
6. Water supply.
7. Sewage disposal.
8. Barn, barnyard, pigpens, chicken coops, et cetera.
9. Disposal of manure.
10. Health.

The average score for the 9,753 houses was only 45.4. The highest score was 90 per cent and the lowest was 24 per cent. The score which passed the house as sanitary was 75. Dr. Hurty, in commenting on this condition of affairs, said: —

> The prevailing "stomach trouble" among farmers, which surely frequently comes from poor food, tells plainly that the farmers' dietary is frequently poor.
>
> The open and usually noisome privy, the frequently polluted well, the manure and the flies, make plain why typhoid prevails upon the farm to a degree greater than in the cities. Consumption should be practically absent from rural homes, and it will depart when the farmer opens his windows and gets rid of his stomach trouble.
>
> The farmer needs to be better informed of the conditions productive of health, and, as said by the farmer's wife who was quoted, he should be compelled by law to build hygienically and keep his farm clean, if he does not voluntarily do it.

In further elucidation of this problem it is interesting to know that while it is perfectly certain that the sanitary control of the rural districts and the conditions of life therein are inferior to the similar conditions in cities, yet as a whole people live longer in the country. In this connection, therefore, it might well be suggested that if we could introduce into country life all the perfections and improvements of sanitary science which now most cities enjoy, the record for long life

in the country would be considerably extended. It is the duty of those who have in their hands the direction of agricultural improvements to give this thought particular attention. I therefore desire to emphasize these points before this Board, which has in its hands the direction of the agricultural interests of this State. May I not ask you in the near future to look into this condition of rural health which is so threatening and see if the cause of the greater prevalence of disease and a shorter lease of life in the country in this State may not be discovered and removed? In my opinion you would confer a greater blessing on the agricultural communities by a work of this kind than you could possibly by increasing their crops or improving their marketing conditions. The health and comfort of the farmer and of his wife and children should be the first consideration of boards of agriculture.

The improvement of sanitary conditions, thus making the home more attractive, will do much to keep the farmer's boy and the farmer's girl away from the town. If they can live in greater comfort at home, have facilities for education, have social centers for amusement and entertainment, the lure of the city will not be so strong, and more of our sons and daughters will remain in our country homes. My plea to-day, therefore, is for an improvement in the living conditions, especially from a sanitary and medical point of view, of our agricultural citizens. They should know the principles of health, what sanitary science can do for them, and the best and most economical ways of securing its services. They should be taught the theory and practice of nutrition, and especially the foods which are most useful for infants and children, that the farmer's boy and the farmer's girl may grow up with strong bodies as well as vigorous minds, free from disease and the perils which threaten so often the health of the home. Especially, in view of the fact that typhoid fever seems to be the most prevalent of those deadly diseases which decimate the country home, the methods of safeguarding against its ravages should be made known to all. The people of rural Massachusetts, especially, should be warned by the present unsatisfactory condition, and take early steps to improve the health

of the rural communities. The Massachusetts farmer should resent dying before his time. He should demand an opportunity to live as long as his agricultural brothers in Indiana and in Washington.

Second Day.

During the morning session of the second day the Massachusetts Milk Inspectors' Association held its annual meeting in the library of the Horticultural Society, and was addressed by Dr. Harvey W. Wiley, who had spoken at the evening session of the previous day. Dr. Wiley's subject was "Milk Inspection from the Producers' Point of View."

MILK INSPECTION FROM THE PRODUCER'S POINT OF VIEW.

HARVEY W. WILEY, M.D., WASHINGTON, DISTRICT OF COLUMBIA.

Having looked at the problem of milk inspection for a third of a century from the consumer's point of view, and particularly from the point of view of the official in charge of the execution of food laws, I am appearing in quite a new guise in considering this subject from the point of view of the producer. I have now for nearly two years been a producer of milk, on a small scale, for commercial purposes. The size of the production, however, does not affect the question. During this time my attention has been particularly called to the effect of milk inspection upon the producer. I take it for granted that every producer of milk desires to send to market an article which is wholesome, which does not threaten the life or health of children, and which is as clean as can reasonably be expected. I claim to belong to that class of producers. I think, also, if there be any of another kind of producer still extant, that he may listen with some benefit to what I have to say. I suppose there are producers of milk who send to market products of diseased animals, containing filth and dirt which might well be excluded. In charity I assume that most of such producers are ignorant of the nature of the problem. There can be very few who deliberately send a product to market knowing that it is practically unfit for consumption, and in addition to this that it may threaten the health and even the life of the children who consume it.

Beginning at the foundation, in the selection of a herd I make it an invariable rule not to place in my herd any diseased animal, in so far as ordinary precautions can exclude such, nor any animal that would react to the tuberculin test. I am aware that no human test of this nature can be abso-

lutely correct. There are some animals that are badly afflicted with tuberculosis which do not react to the test, and there may be some animals which do not have any taint of the disease which do react. Allowing for this uncertainty, which, I am told by competent veterinarians who have had experience, affects from 3 to 5 per cent of the animals inspected, we must give to inspection the full value of making it possible to have a tuberculous free herd.

From the point of view of the producer I think it is to our highest interest to secure herds of this kind. Most of the diseases of a bovine character are easily ascertainable by external symptoms. This is particularly true of such diseases as that known as the foot and mouth disease. On the other hand, the tuberculous cow may give no external evidence whatever of infection. In fact, she may appear to be as healthy as any cow in the herd, and yet the disease has taken hold of some of her vital organs and if left to itself will doubtless progress to a dangerous degree.

It may be interesting to know what has happened to my herd in nearly two years, and as a result of three tests by the officials of the Bureau of Animal Industry. Naturally, I expected to have a herd free of reactors. Imagine my astonishment, therefore, when, at the first inspection, 5 out of a total of about 50 tested animals reacted; in other words, 10 per cent. There are two possible reasons for this result, — first, that some negligence or impurity of the serum had made the test which was given the animal unreliable (in this case the animals were suffering from tuberculosis at the time of purchase, and the certificates were misleading); second, that the animals had acquired the germ of tuberculosis at the time of purchase, but the disease had not gone far enough to produce a reaction. I eliminate as wholly improbable the possibility of plugging, which is sometimes, I am told, practiced to deceive the purchasers of bovine animals.

At the second inspection, which took place at the end of about nine months, four additional animals reacted, and three were quarantined as suspicious. At the end of two months these three animals were again tested, and two reacted and were condemned and one was found free of reaction. The total

number of animals inspected at the second inspection was 87. To recapitulate, of 87 animals which I have had tested for tuberculosis 11 have been condemned. One segregated as a suspect was found, on a retest, to be free of disease. It is only proper to say that of the total number of 87 which were inspected, a large number were heifers that had been born on the place or purchased as young heifers, and were tested for the first time. None of these heifers reacted, so the total reactors were among about 60 purchased animals, which makes the percentage of reactors still larger. Another interesting point is that of the total number, 11, condemned out of the purchased herd of about 60, 7 were from a purchase of 10 animals at one place and only 4 were found among the other animals purchased, about 50 in number. On laying these facts before a competent veterinarian he said there was no doubt of the fact that there was a general tuberculosis among this herd which was not sufficiently developed to give a reaction at the time of inspection and sale, and which reacted in only 5 of the animals at the first inspection after they had been on my own farm for about three months. This fact shows the great circumspection which a dairyman should exercise in the purchase of animals subject to the tuberculin test. He may get hold of animals, where there has been perfect good faith between buyer and seller, which speedily develop the disease, and thus become practically a total loss.

My experience, of course, is of such a character as to lead me to be more firmly convinced than I ever was before of the fact that when men honestly endeavor to secure animals free from a disease of this kind and fail, it is not quite in harmony with the principles of justice to expect them to bear the whole loss. The elimination of tuberculous animals from a herd is for the benefit of the community as well as of the owner, and the community should bear a part of the expense. I think that if it could be arranged so that the State or the nation could pay three-fourths of the value of the animals slaughtered, an equitable plan of adjustment would be secured. In other words, the owner of the animal would suffer one-fourth of the loss, and the community, for whose benefit the inspection was made, would pay for three-fourths of the loss. During the

whole time of my service with the government I was strongly of the opinion that the farmer should not bear the loss of diseases of this kind caused by official act. It is bad enough to bear the losses from hog cholera and other incidental diseases, but when animals are destroyed by order of the nation or the State, for the protection of the public at large, the case is quite different, and the producer has the right to expect a reasonable compensation.

One of the great problems which the producer is soon to face, and which he is now facing in many cases, is that of refrigeration. In view of the fact that a high temperature, that is, above 50° F., promotes the rapid deterioration of milk and an enormous growth of the bacterial flora, it is reasonable on the part of the consumer to require that milk should be delivered at a low temperature. Not only should milk be delivered at a low temperature, but it should be reduced to a low temperature immediately after it is withdrawn from the udder. In other words, the milk producer must be provided with some method of refrigeration. In the north, where abundant ice crops are produced, it is not difficult for the dairyman to handle this problem in the way of providing an ice supply. In my locality, where the winters are usually so mild that ice is not formed in sufficient quantity for preserving, and where the summers are hotter and longer, the problem is one of great significance.

At first I tried to solve it by using the water of a mountain spring, the temperature of which is normally about 55°, but which in summer, by piping and otherwise, rises to about 60°. As soon as the milk is secured it is cooled by passing over a cooler through which this spring water is flowing. The milk is thus secured at a temperature, even in summer, of about 60° as a rule. This, however, is not sufficient for the purposes of the consumer. It will be necessary, in the south, to provide some artificial refrigeration by means of which the temperature of the milk can be greatly reduced below 60°. In fact, it ought to be reduced to 40°, and can be with a good system of refrigeration. If milk is reduced to 40° and then shipped in a double can, the space between the two cans being

filled with dry air, it can be sent many hours on a journey without any threatening rise of temperature.

I have secured a number of bids from manufacturers for installing a refrigerator of this kind, which is to be run with steam power. For a small dairy such as mine, where the production of milk is not likely to go over 200 or 250 gallons a day, even when the herd is filled to its maximum, I find that the installation of an effective refrigeration of this kind will cost at least a thousand dollars, and the additional amount of expense for fuel for running the compresser three or four hours a day will amount to a considerable sum. Unless the producer can get a better price for clean, cold milk from disease-free cows he is going to be engaged in charitable work. Ordinary market milk from common herds, drawn in the ordinary way, brings, in the Washington market in the summer, about 16 cents a gallon, out of which the producer must pay $2\frac{1}{2}$ cents per gallon freight. The sale of pure, clean, cold milk at $13\frac{1}{2}$ cents a gallon is not possible if the dairy is run on business principles, as it should be. From the point of view of the consumer the public should be taught to pay the extra price for milk of this kind. Otherwise only producers who are wealthy will be able to remain in the field. There is a milk sold in Washington, certified and at a low temperature, at 20 cents a quart to the consumer, while the milk that brings the producer $13\frac{1}{2}$ cents a gallon net is sold to the consumer in the summer at about 8 to 9 cents a quart.

It is not the part of this paper to discuss the profits of the middleman. What I am discussing is the necessity for the producer to get a larger amount for his milk. If the producer in our part of the country could look forward to a year's market averaging 20 cents net per gallon, he might possibly be able to make both ends meet and produce clean and cold milk. There should be, therefore, a campaign of education, as well as some method of identification which will lead the consuming public to pay a reasonable price for good milk. I consider the problem of proper refrigeration one of the most important to the producer in the southern part of our country. How can I emphasize, more than has already been done, the neces-

sity of cleanliness? That milk cows should be clean goes without saying. That their udders should be washed and dried is an accepted proposition. That the hands and clothing of the milker should be clean every one admits. That the utensils holding the milk should be sterilized after every use is acknowledged by all. That every possible means of excluding dust and dirt should be used no one denies. In spite of all this knowledge, however, on the part of the producer, and in spite of a reasonable effort on the part of many producers to secure conditions of this kind, it is not always possible to see them fulfilled. As a producer I should say that he should do all these things, or else look to another line of agricultural activity for his support.

I think you will gather from what I have said above that I have not changed my views in regard to the milk problem since I became a producer. I have only changed my point of view. I want the producer of milk to be regarded as a friend and not an enemy of the community. I want to see the stigma which attaches to the milk trade removed. I want to live to see the day when the man who makes beer cannot truthfully go before an audience, as he can now, and offer a sterilized, clean product, and compare it with the ordinary milk which the consumer buys, with no praise for the milk. I want to see a sentiment in this country which will compel the keeping of disease-free cows in a sanitary way, and at the same time a generous support of the men who do this, so that they may come out at least without financial loss in their efforts to serve the community. Milk is the most important of our foods because of its necessity for the infant and the child. We must protect humanity in its tender years. We must have pure, clean, wholesome milk. We producers must make this kind of milk. You who are consumers must pay for this kind of milk.

While Dr. Wiley was speaking to the milk inspectors, Mr. F. W. Rane, presiding officer in the main hall, introduced Mr. H. F. Hall of Camden, New Jersey, who spoke on "Utilization of Surplus Farm Products."

UTILIZATION OF SURPLUS FARM PRODUCTS.

H. F. HALL, AGRICULTURAL EXPERT FOR CAMPBELL'S SOUP COMPANY, CAMDEN, NEW JERSEY.

The matter of holding or preserving perishable farm products during a season of plenty and low prices to be used during times of scarcity and higher prices is a question of very great economic importance not only to the farmer but to the consuming public as well. Large quantities of food are annually allowed to waste because the market price will not cover cost of harvesting and marketing. By many it is claimed that cheaper and more direct methods of distribution, thereby enabling the consumer to secure his supplies at such a price as to encourage greater consumption by him directly as a substitute for the higher priced commodities, together with the tendency of the consumer to buy during gluts and do his own canning, would solve the problem. This would doubtless have a great influence but for the present-day tendency of the consumer to order his food supplies in cans rather than to buy the raw material and go to the trouble of home canning. In fact, the present-day method of the consumer to have his goods delivered in a "ready-to-eat package" is doubtless one of the principal factors underlying the cause of continued gluts.

The buying public no longer seeks the farmer's wagon to buy at first cost and carry home in a hand basket the vegetables and fruits needed for home consumption. For this reason, public retail markets in most of our large cities have proven a failure, and while the consumer often complains of high cost of living, he perhaps forgets that his method of ordering goods delivered in small quantities and taking thirty days for payment has an important bearing upon the cost price. This would indicate that an efficiency movement is needed to impress upon the housekeeper the importance of better methods

of supplying the home table. Our experiment stations and various agricultural and horticultural societies have devoted their energies for many years to the subject of increasing production, but old methods of marketing and distributing crops have gone on undisturbed. In what way is the farmer benefited by large crops if they are allowed to rot on the ground for the want of a distributing and selling system that will turn back to the grower a fair profit after transportation and selling charges have been deducted?

If our farmers were thoroughly organized they could by advertising relieve a congested market by informing the public of the facts, urging them to buy, and recommending ways of cooking and using the surplus crop as a substitute for higher priced commodities, and the advantage of home canning to hold for future use.

During the past season New Jersey fruit growers were buried with an enormous crop of peaches, and prices promised to be below cost of picking and marketing. The horticultural societies caused to have posted on farmers' wagons and in other conspicuous places colored posters, urging the public to buy and use peaches on account of the low prices at which they could be bought. By those in a position to know, it was claimed that this work played a very important part in moving, at a fair price, the surplus crop of peaches.

The home hamper as a means of the grower's supplying the consumer direct is a method of interest only to the small grower, and does not promise to become a matter of general importance in affecting this question.

When located near a large city the grower often finds it to his advantage to hold his surplus produce in cold storage, but when located some distance from a market he will usually find the commercial cannery, in case one is located near him, his best buyer. The particular objections to artificial refrigeration are storage charges, shrinkage and cost of handling. These charges combined often run so high as to make the venture an unprofitable one.

Very few preserving establishments are found in New England, the principal ones being the corn canneries in Maine. Such establishments could doubtless be induced to locate in

Massachusetts if the farmers in any particular locality would guarantee the required acreage of any of the important farm crops now used in commercial canning.

The total number of canneries in the United States is about 4,000. Amount paid by canneries for raw material is over $100,000,000 annually. Total value of finished product is $157,000,000 annually. In this industry Massachusetts has played a very small part. Some of its canned products include pears, quinces, raspberries, strawberries, tomatoes, pumpkins, squash, rhubarb and spinach.

A well-ordered general canning concern is usually a great help to any community, provided the growers produce a variety of vegetables and fruits at such seasons and in such quantities as to keep the cannery operating at least five or six months during each year. The canner must have the continued cooperation of the farmers through good and bad seasons, as most canners find it necessary to sell their product before it is put in the can. In fact, a future sale is often made by the canner of a crop long before the farmer is ready to begin harvesting it. It is, therefore, apparent that the canner cannot depend upon the surplus products during times of glut for his supply.

Most canners contract in advance a sufficient acreage of different crops to meet their needs. Prices paid are usually somewhat lower than the average market price on graded and well-packed goods, but are much higher than prices during times of glutted markets. By contracting in advance the farmer is sure of a fair price for his goods, and eliminates that element of chance from his work.

Another important feature is that there is less work in preparing vegetables and fruit to be delivered to a cannery than is the case when prepared for market. This is very apparent in such crops as beans and peas, which instead of being hand picked may be cut like grass, and delivered to the factory where a vining machine does the work of shelling and separating. Labor-saving methods of handling farm crops are worthy of careful consideration as the farm labor problem becomes more serious.

The following crops are extensively used in canning and can

be grown successfully in Massachusetts: string beans, beets, sugar corn, peas, pumpkins, cabbage for sauerkraut, rhubarb, spinach, tomatoes, mushrooms, squash, hominy, dandelions, cauliflower, cucumber pickles, pickling onions, apples, blackberries, blueberries, cherries, peaches, pears, plums, raspberries and strawberries.

The following are the usual prices paid by the canners for goods delivered at their factories: cabbage for sauerkraut, $10 per ton. Sugar corn, from 2 to 2¾ cents per pound for corn cut from the cob, or $15 to $20 per ton for the ear in husk; cobs are usually returned to the farmer and have a value of about $3 per ton for fertilizing purposes; gross returns of this crop to the grower, $50 to $100 per acre. String beans, price 1¼ to 1¾ cents per pound; gross returns of this crop to the grower, $75 to $125 per acre. Beets, $13 to $15 per ton; average yield, 4 to 8 tons per acre. Dandelions, $10 per ton. Pumpkins, $5 to $6 per ton; average yield, 8 to 12 tons per acre. Rhubarb, average price $10 per ton. Spinach, $10 to $20 per ton; average yield, 5 to 7 tons per acre. Squash, $10 per ton; average yield, 5 to 10 tons per acre. Tomatoes, $9 to $10 per ton; average yield, 8 to 10 tons per acre. Apples, 75 cents to $1.50 per barrel; second grades can be used for this purpose if free from wormy stock.

Farmers' co-operative canning associations have been formed in many sections of the country, but unfortunately have seldom proved a success, usually due to a lack of close co-operation among the members and a tendency to sell their crops through other sources during high prices.

Home canning has been tried by many farmers as a means of disposing of their surplus crops, but thus far has met with rather indifferent success, owing to the cost of operation and the variable quality of products when canned. The home-canning outfit can be used to advantage in caring for surplus vegetables and fruits that would otherwise go to waste. Such operations are entirely practical for the home supply and perhaps a small local trade, but the idea of large profits from such an enterprise when these products are sold in the open markets is usually misleading.

The labor cost of canning on the farm is much greater per unit than is the cost in the factory where large automatic machinery is used for the various operations, unless the farmer can do his canning work at odd times, when his labor is not otherwise advantageously employed. The quality will not average as high or as uniform when canned in the home, owing to the lack of modern means for proper sterilization and testing.

The process of drying has been employed to a certain extent in this country in the case of fruits, and in Germany with some vegetables, notably the potato, from which potato flour is made. Our government is now experimenting with the potato for this purpose, and it is possible that in the near future potato flour will be made on a commercial scale in this country.

Denatured alcohol can be made from all farm products containing sugar, but this work has not met with any great degree of success as yet, as the price that could be paid for farm products when used for this purpose would be in many cases below the actual cost of harvesting and delivering to the distillery.

The potato, on account of the large amount of starch it contains, is the most desirable farm crop for alcohol making. At the present prices of denatured alcohol the distiller would be able to pay the farmer about 12 to 15 cents per bushel for potatoes. This industry, therefore, affords the farmer very little relief in the way of a market for his surplus or crops of No. 2 quality unless the price of alcohol increases materially.

Mr. Donald McRae of State Farm. I should like to ask the speaker if he knows the process that potatoes go through in making potato flour? Whether the potatoes are just evaporated and ground, or whether they are cooked first and then evaporated and ground?

Mr. Hall. I am unable to answer your question. The Department of Agriculture at Washington is at present interested in this work, and is now prepared to send out samples of this material. They have not as yet published any details concerning the most approved methods of the process. We know

that this work has been carried on in Germany for some time, and that its future depends upon the price at which potatoes may be bought, as well as upon the price of cereals from which flour is usually made.

Afternoon Session.

At the afternoon session at 1.30, Secretary Wheeler introduced Mr. Henry M. Howard of West Newton as presiding officer. Mr. Howard introduced Mr. S. H. McCrory of the United States Department of Agriculture, who spoke on "Some Suggestions for the Organization and Financing of Drainage Projects."

SOME SUGGESTIONS FOR THE ORGANIZATION AND FINANCING OF DRAINAGE PROJECTS.

SAMUEL H. McCRORY, CHIEF OF DRAINAGE INVESTIGATIONS, OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING, UNITED STATES DEPARTMENT OF AGRICULTURE.

Introduction.

Within the boundaries of the Commonwealth of Massachusetts there are approximately 100,000 acres of fresh-water swamp lands. In addition to these lands there are undoubtedly considerable areas of agricultural lands that are periodically damaged by overflow, but which could be much improved for agricultural purposes by better drainage. These lands are not found in large tracts, but are scattered over the State in small areas which vary in size from a few acres to several thousand. When drained, the swamp lands are usually very fertile and capable of yielding large crops. Most of the swamp soils are particularly well adapted for trucking crops, and in many localities are used chiefly for this purpose. The proximity of Massachusetts swamp lands to excellent markets, and the excellent transportation facilities which traverse the State, should make the drainage of these lands especially profitable. In addition to the fresh-water swamps there are approximately 80,000 acres of tidal marsh which would make valuable agricultural land, though their reclamation would be somewhat more expensive.

Reasons for Draining.

Usually there are two reasons for undertaking drainage improvements, — one is to improve agricultural conditions; the other, to improve sanitary and other conditions tending toward the promotion of the public welfare.

In their unimproved condition swamp lands are not usually

a revenue-producing asset, though the soil itself generally possesses considerable inherent fertility. Drainage is the means of making this fertility available for crop production, thus transforming an unproducing asset into a profitable revenue producer.

If you will pardon a personal illustration, one of the first drainage projects with which I was connected was the drainage of a large marsh in western Iowa. When the first surveys were made of this project it was an almost impassable morass. The first year following the installation of a thorough drainage system a corn crop approximating 70 bushels to the acre was grown without the use of any fertilizer. Undrained lands of equal fertility adjoining the tract that had been drained produced nothing.

Swamp lands, very similar to those in Massachusetts, have been drained and placed under cultivation in the State of New York. Near New Paltz, New York, fine crops of truck are grown on lands which a few years ago were worthless swamps. In Ohio, Indiana, Illinois and Iowa lands which were passed by by the early settlers as being worthless swamps have by drainage been transformed into the famous corn belt of the United States, and these lands, disregarded by the pioneer, are now selling at from $150 to $300 or more per acre.

Ignoring the monetary returns from drainage, higher motives sometimes impel us to incur expenditures to correct conditions which constitute a public nuisance and a menace to the public health. In the second place, then, we frequently find that drainage is undertaken to improve sanitary and other general conditions tending toward the promotion of the public welfare. The improvement of health, due to drainage in many localities, has been marked. When the States in the Ohio valley were first settled, inhabitants generally suffered from malaria. Ignorant of the cause of this disease, the settlers took it as a matter of course. As the swamps in these States were drained it was observed that malaria was less prevalent. To-day malaria is seldom found except in those sections which have not been properly drained. The same has been found true in the lower Mississippi valley. When the alluvial lands adjacent to the Mississippi River were first opened for settlement, malaria was

extremely prevalent, frequently terminating fatally. As the timber was removed and the land drained there has been a steady decrease in the number of cases of malaria. With the thorough drainage of sections of these lands malaria has been practically eradicated. While the drainage of the swamps in Massachusetts might not materially benefit the public health, it certainly would add much to the pleasure and comfort of the population by the eradication of the mosquito. This would be particularly true of the tidal marshes. During the past few years your State has been widely advertised as a delightful place to spend the summer, especially those sections bordering on the bay. The complete eradication of the mosquito would undoubtedly add materially to the attractiveness of your beautiful State. In some of the eastern States drainage has been undertaken for the sole purpose of eradicating the mosquito.

Incidental to the drainage of lands for agricultural purpose, it sometimes happens that these lands become highly desirable for industrial purposes. The Newark meadows in New Jersey are an example of a development of this character. These lands have been a plague spot to the State for years, and considerable sums of money have been expended in attempting to eradicate the mosquito. At the present time much of this land is being reclaimed, not for agricultural uses as originally intended, but to afford sites for industrial enterprises. Reclamation of land for either agricultural, sanitary or industrial purposes is a direct benefit to the State on account of the increased value of the property after it is drained, and also as affording a means of livelihood for increased population.

Organization.

In undertaking a work which has for its objects the improvement of your agricultural lands and the general welfare of the State, it must be evident that an efficient organization is as essential to the conduct along sound economic lines of such a project as to the establishment of your commercial or industrial enterprises on a sound business basis. The first attempts at drainage were usually made by the individual landowner. These attempts soon revealed the need for co-operation by

landowners. The history of drainage projects undertaken by co-operation has been that before the project was fairly launched certain difficulties presented themselves for solution on which the landowners could not agree. The location of the improvement and the proportion of costs to be borne by each landowner were almost always a source of dissension. Even if all the landowners were agreed on all questions, the costs of the improvements were such that it was frequently impossible for them to finance the project. Under the co-operative plan it was impossible to carry large projects to successful completion. These difficulties emphasized the need of a method of organization which would permit the majority to act through a board, which would prevent the opposing minority from defeating the promotion of a legitimate project, and which would provide a means of financing the large as easily as the small enterprise. The superseding of the partnership in the commercial world by the corporation suggested the desirability of some form of corporate organization to replace the unsatisfactory co-operative organization. In the construction of drainage works it frequently happens that the improvements must cross lands belonging to persons who oppose the project. Under the Constitutions of the individual States and the United States private property cannot be taken without due process of law. To satisfy these constitutional guarantees of private property rights it was necessary to pass State laws clothing drainage organizations with corporate powers, including that of eminent domain. As the power of eminent domain is granted only to corporations performing a public or semipublic function, drainage organizations have been defined by courts as quasi public corporations. Being a corporation, the landowners act through properly constituted boards whose duties and authority are prescribed by the drainage law. This results in common action, and submerges the interests of the individual in the welfare of the community.

Essential Provisions of a Drainage Law.

The necessity of promoting a drainage organization in conformity with the State and Federal Constitutions has already been intimated. The history of early drainage legislation shows

that little attention apparently was given to these constitutional requirements, and therefore the laws were frequently declared invalid. Through the many decisions rendered by both the State and Federal courts the principles entering into sound drainage legislation have become quite well defined, and we now find statutes in many of the States which permit the prosecution of drainage projects along sound economic lines. Generally speaking five essential provisions enter into every drainage law, viz.: 1, proper jurisdiction; 2, full notice and ample hearing; 3, right of appeal; 4, assessment of costs according to benefits conferred; 5, provision for sound administration, power of eminent domain and right to issue bonds. It is not to be understood that the five essentials just enumerated form the outline of a drainage law, though about them center all the provisions which should be embodied in a law, but they are so vitally important that a failure to give proper consideration to any of them may result in the law being unworkable, and even being declared invalid by the courts.

By "proper jurisdiction" we mean the placing of the proceedings in connection with the organization of a drainage district before a proper public official. In some States this jurisdiction is lodged in the board of county supervisors; in others in the county court; and in still others in circuit courts. To expedite organization care should be taken to lodge jurisdiction in an official body or court which meets frequently, so that unnecessary delays may be avoided.

"Full notice and ample hearing" must be given to every one whose lands will be affected by the construction of the improvements. Great caution must be exercised in serving notice, so that all legal requirements may be observed. Coupled with full notice of what it is proposed to do and ample opportunity for hearing before the official having jurisdiction must be the "right of appeal" to a higher court as permitted by the State Constitution. This does not mean that the right of appeal to the highest tribunal in the State must always be granted, for in many jurisdictions the Legislature has the right to say in what court certain proceedings shall be final, and to avoid endless litigation such a provision is highly desirable if not in conflict with constitutional rights. The point to be observed

in connection with notice, hearings and the right of appeal is that care should be taken to see that the provisions of the law relating to these phases must not violate rights guaranteed to the individual by the State or Federal Constitutions.

The "assessment of costs" has been a fruitful field of litigation, but the principle that costs should be assessed in proportion to the benefits conferred has been repeatedly enunciated and sustained by the highest courts, including the United States Supreme Court. The law should require that the assessments be confirmed by the court or official having jurisdiction of drainage proceedings. The amount assessed against each tract of land, highway, railroad or public utility should be a first and paramount lien, taking precedence over all other encumbrance except State, county, township or municipal taxes.

The fifth essential, making provision for "sound administration, power of eminent domain and right to issue bonds," provides the machinery for putting into effect the four principles already discussed. The necessity for the power of eminent domain has previously been explained. Provision for sound administration should make it possible to put the management of the district into the hands of those best qualified to manage and administer its affairs. The interests of individuals should not be permitted to control, to the detriment of the district as a whole. The importance of sound administration will be realized when an effort is made to sell bonds, if that method of financing the district is followed. The right to issue bonds is essential because it furnishes legal authority to finance the largest district as well as the smallest, even though there may be comparatively little money within the district available for the promotion of drainage work.

Financing of Districts.

After an organization is effected and all legal difficulties removed, there remains an all-important work to be done to give a real existence to the corporation, viz., securing money with which to finance it. In the case of the individual landowner, he acts as his own financier; in the case of the co-operative drainage organization, the members of the organization raise

the necessary money by personal contribution. As already indicated, the need for large sums in promoting the drainage of large areas, and the impracticability of raising such sums by the co-operative organizations, was one of the reasons which suggested the idea of creating a drainage district with corporate powers, including the right to issue bonds in order to distribute the cost over a number of years. These bonds should be serial in type, interest payable semiannually, with first installment of principal falling due not later than the end of the fifth year, and final installment not beyond the twentieth year from date of issue. In connection with either the assessment clause or the bonding clause of the law, provision should be made for the early sale of the lands in case of failure of any landowner to meet taxes promptly. This clause should receive careful attention, since it lends much to the salability of bonds at a good price. In other words, in connection with that clause of the law which relates to bonding, every precaution should be taken to insure prompt payment of interest and principal at maturity, as certainty of payment of both interest and principal will assist materially in the sale of bonds to investors, and the price a bond house will pay to the district is largely affected by the ready market it anticipates for the bonds.

State Aid.

Since the drainage of swamp and wet lands means increased agricultural production, improved sanitary conditions, and increased tax values the question naturally suggests itself, should the State assist in the promotion of drainage. Heretofore drainage reclamation has kept pace with the legitimate demand for land, and there has been no lack of private money to finance meritorious projects. The marketability of bonds might be enhanced, however, if the drainage law contained a provision similar to that of the Minnesota law, which authorizes the county board of each county wherein any drainage district is proposed to issue county bonds in such amount as may be necessary to defray the expenses of constructing the improvements, leaving the county to reimburse itself by collecting the assessments made against the individual landowners. Such a provision should insure prompt payment of both principal and

interest, even though there may be some delinquencies or defaults on the part of taxpayers. A provision such as that embodied in the Missouri district court law, making drainage bonds legal investments for trust funds, school, county and State funds and surplus of savings banks, would enlarge the market for such securities. Since drainage in Massachusetts will add materially to the general welfare of the State, it would seem that the State or its political subdivisions could afford to participate in the work by extending financial aid. Just how much assistance should be given, and on what basis, are matters of detail to be decided by those in charge of public affairs.

Because I have laid stress on features which tend to enlarge the marketability of drainage bonds, it should not be inferred that difficulty is encountered in marketing good securities of this character, for within the past year one of the large financial houses of Boston, despite the fact that drainage bonds were not generally known in the New England States, disposed of over $1,000,000 of bonds of a large drainage district in one of the middle western States in a few months. But the point is that every precaution should be exercised to make drainage bonds rank on a par with the best securities in the market, for the stronger the security and the wider the market the better will be the price realized by the district and the cheaper can its financing be accomplished.

Conclusion.

I have outlined briefly some of the fundamental principles governing the organization and financing of drainage districts. Those who may be charged with the preparation of a law on drainage should make a careful, comprehensive study of the needs of the State, and of the laws of other States which have proved successful. Too much caution cannot be exercised in drafting such a law so that it may be in harmony with the State and Federal Constitutions and the trend of decisions on the subject.

The Chairman. This question is open for discussion on this paper. I think Mr. McCrory has given a pretty good demonstration of what the laws are in different States, — how they

have gone to work on the drainage proposition, and we know that in this State we have found a large area that could be drained. We think it could be drained to advantage, but as to getting the law to just fit the case, we have not yet gotten what we wanted, and we would like to get more light from him. I think the proposition that we have 180,000 acres of tidewater land that could be benefited by this drainage and brought into either agricultural or industrial use is quite an argument in favor of perfecting a law and going ahead and doing this work. I would like to hear questions from any one. You have got an opportunity now to question a man who seems to be thoroughly well posted on this line of work.

QUESTION. I would like to ask how long it takes to fit a salt marsh for agricultural purposes.

Mr. MCCRORY. It is a little hard to give you a definite answer to that question; it depends largely on the kind of drainage they have when they start the reclamation. With good drainage, I think the average marsh should be brought up to a full producing capacity in three to four years, possibly sooner, if there wasn't too much salt. It takes some time to get that land in good mechanical condition; that is almost as difficult as anything else.

The CHAIRMAN. About how many acres have been taken advantage of in one drainage district? What is the largest area in any drainage district?

Mr. MCCRORY. The Little River Drainage District in southeastern Missouri has an area of about 500,000 acres; that will be completed in two or three years' time. There are other large districts. The Bolivar Drainage District in Bolivar County, Mississippi, has 100,000 acres, and the Cyprus River Drainage District, in Arkansas, has 300,000 acres, and that is now under construction. Drainage districts vary in size; they may comprise 200 acres or may run up to 100,000 or more. In some States the drainage organization is a permanent organization. They find it necessary to maintain their drainage structures and the law provides for a body that continues itself, and each year the commissioner of the district decides what maintenance work is necessary, after the drains are constructed, to keep their drains in good order. In that way

the drainage work has been found most profitable throughout the middle west. Very large sums are spent at times by some of those districts. The assessment in the case of some of the Iowa lands has averaged $40 or $50 an acre. North Carolina has over 100 drainage districts formed to-day. Those are in various processes of reclamation; some are completed, others are under construction and still others are just being formed.

QUESTION. I would like to ask the gentleman what the condition of the land was on the farm where 70 bushels of shelled corn to the acre were raised after the land was drained; also what they used for draining and what they found the subsoil to be.

Mr. MCCRORY. It was a swamp; that is the best description I can give you. It was almost impassable. The soil is what we call "gumbo" in that country. It is a heavy, tenacious soil; when it is wet it is as sticky as anything can be.

QUESTION. Is it composed of vegetable matter?

Mr. MCCRORY. No, it is composed principally of material deposited in still water, very fine silt, of very fine texture, with no sand to speak of; on this particular farm there was some wash from the hills and the soil was practically uniform. I could see no difference in its texture when we went down 4 feet or more. We used drainage tile exclusively, emptying into a large ditch near one corner of the farm. The tile varied in size from 12 to 4 inches in diameter. We placed the tile about 100 feet apart, on part of the farm. The idea was that later, if found necessary, we could put another line of tile between the strings as we laid them.

QUESTION. Did you lay those tile right on the ground?

Mr. MCCRORY. Right under the ground, about 3 feet deep.

QUESTION. I should think there would be danger of their getting out of place in that soft land.

Mr. MCCRORY. Well, the subsoil is not so soft; down 3 or 4 feet it is quite firm. We got the surface water off first by surface ditches. After we let the surface water off we got it quite firm, and then put the tile in and got very good results.

QUESTION. That sort of land would be firmer than vegetable matter?

Mr. McCrory. The muck soils are not so firm; we have to handle them differently.

Question. I would like to ask Mr. McCrory if in these salt marshes around here it wouldn't be considerably different from the middle western swamps, and if there would not have to be considerable work done to keep the tidewater from coming back on the ground.

Mr. McCrory. On your tidal marshes you would have to protect them by levees to keep the tide off. The drainage could be accomplished in two ways: one would be to have sluiceways with gates in them to operate at low tide, — that is the common method; another method, probably more satisfactory, would be to make a continuous levee along the front of the project and install pumps. We have been working recently on a project of that character in South Carolina, — an old rice field that had been in cultivation for two hundred years. They have a levee along the front, and this particular tract has about 100 sluiceways with gates to keep the tide out, which we call trunks. We are taking out all those trunks and putting in pumping plants and making a larger area of land suitable for cultivation, doing away with the shallow field ditches 50 feet apart. The great advantage of pumping is that you get much better drainage. In the middle west, where we had an exceedingly wet year, the pumping projects along the Mississippi River came through in better condition and yielded better returns than any others in the country.

Question. Do they use gasoline?

Mr. McCrory. For the smaller plants they use an internal combustion engine, generally; not gasoline, but a cheaper oil.

Question. I want to ask if drainage ditches always enhance the value of the land?

Mr. McCrory. Well, that is a pretty hard question to answer yes or no. In general, the results of drainage improvements throughout the country have been to advance land values. In some cases the advance has been very marked, in others not so marked. I think the factor that would determine that more than anything else would be the demand for the land after it was reclaimed. There is a tendency in the country to-day, in some thinly settled parts, to go ahead and

form a great many drainage districts, and where there is no population to use the land it has not advanced in value. But where there is a population to utilize the land, one can safely assume there will be a considerable increase in the value of the land, much more than the cost of the work.

QUESTION. I know a drainage district in southern Illinois, along the Wabash, where it really injured the land, — amounted to confiscation — because it put on such a heavy burden, and the river overflows worse since the drainage ditch was dug than before. It is not a deep river, it is a shallow river, and it has really been a great detriment to the property that was drained.

Mr. McCRORY. I think that is an example of a poorly planned and poorly executed drainage project. I have been discussing more the properly planned and properly executed project. There are undoubtedly a good many poorly planned drainage projects in the country that are not giving the returns that they should.

QUESTION. On muck lands, would you favor laying the tile on boards?

Mr. McCRORY. With muck soils, I think when they are first reclaimed it is probably best to use open ditches until the soil becomes quite compact; then drain tiles could be used. I think it probably would be better to lay them on boards unless the subsoil was clay or something quite heavy, but muck soils generally sink considerably after they are drained, sometimes as much as 6 or 8 inches, or even a foot. That sinking will continue for some time and require very deep drainage to install tiles so as to give proper depth until the muck has stopped sinking; for that reason it is better to use open ditches until the muck is quite compact. Another reason is that you have to control the water on your muck soil, and if you get the drainage too deep your soil will be too dry and the crops will not be successful.

QUESTION. I would like to ask the speaker, in regard to draining lands that have been seeded to grass, how often would you have to return and reseed in order not to lose the benefit of the seeding? Also, after a term of years, would the soil change so that it would finally revert to its wild state?

Mr. McCrory. I am not very much of an agriculturist. I am more of a drainage man, but my observation has been that if you get the soil properly drained the grasses that you use for pasture and for hay will not have to be reseeded any oftener than they would on any other part of your farm. The character of the soil undergoes a considerable change due to drainage. That change is quite permanent unless the drainage system is allowed to deteriorate, in which case it would probably change back slowly to its original condition due to the lack of drainage.

Immediately following the drainage discussion, Secretary Wheeler introduced Mr. J. A. Williams as presiding officer at the conference of horse, sheep and swine breeders. Mr. Williams introduced Mr. L. L. Richardson of Leominster, who spoke on his experiences in horse breeding.

HORSE BREEDING FOR FARMERS.

L. L. RICHARDSON, LEOMINSTER, MASSACHUSETTS.

I have been asked to open up the discussion about the horse, which I am very glad to do, and I see, in looking over the hall, there are quite a few who have been at my place and seen the class of horses that I have been trying to raise. Now the horse that I raise would not necessarily be the horse that the farmer should raise, but I believe there should be more colts raised on the farm than have been in the past. Since the beginning of the war many of the horses have been taken from this country, especially in the west, and I am very glad to say, for one thing, that they have taken off the poorest horses. I believe that if a man is going to raise a horse he should raise the best, and when I say the best, I mean that he must start with a stock that is right. Now if a farmer is going to raise a colt, usually he takes a mare that has been useful for a good many years, and has been what any one would call a first-class horse in every way, but which has passed its usefulness. Instead of laying that horse away, or giving it a good home, they think that is a good time to begin to raise colts. I would like to impress upon every one here to-day that you never can get good colts from that kind of stock, and I believe you should use the best mares for the dams and then breed to the best sires that can be found.

I suppose the greatest question here to-day is the question of what type of horse is most suitable to raise for the farm. As to this point there is much difference of opinion. Some farmers like horses that weigh from 1,600 to 1,800 pounds; others, horses that weigh from 1,200 to 1,400. On my own farm I prefer a horse that weighs from 1,200 to 1,400. One reason is that a horse of that weight can get over more country,

is a better driver, is an easier kept horse, generally speaking, and in all ways, to my mind, is better than the heavier horse. Of course if you have got long trips and a good large farm where you want to haul heavy loads, a horse that weighs from 1,600 to 1,800 pounds might be the best horse. In our State, and all over the country as well, the State government is building roads in a way that almost prohibits the use of horses on the roads. I believe the time is coming when the roads are going to be built both for the horse and for the automobile. It does not look right to me to think that anything like an automobile could come into a State and actually drive the horse off the road, which they are practically doing, and I believe that roads with horse paths beside them can be built more cheaply than we are building them to-day, and can give better satisfaction to every one. The automobile road as built to-day is not satisfactory to the automobilist because it will not stand the wear, and therefore must be made harder and more substantial. When that is done it will be absolutely impossible to drive a horse on these roads and be safe. We cannot force all of our farmers to have automobiles, neither can we force our farmers to stay at home. I believe the farmer should stand up to-day and say what he wants on this road question. The automobilists have come in and I am not saying a word against them, they are all right; but I do not believe they should come in and throw the farmer out of existence as far as using our roads is concerned; and there is an organization already established in this State that is going to take up this matter of the road question soon. If every one here would do all they could toward getting a horse path and an automobile path, the horse would come back on our roads.

Horses are going to be higher the next two or three years than to-day. I forget the number that have been taken out of this country, but there has been a very large per cent taken out, and it takes four years to produce a horse able and right to put to work and use on the farm or anywhere else. Now in regard to stallions, I should like to see a law in this State that would regulate sires. I do not mean to exclude any but registered or standard-bred sires, but a stallion ought to be up to a certain standard before he can stand for service in this State.

In regard to raising a colt, — the important point is in the feeding. When a farmer is raising good calves he feeds them well, but go to almost any farm which raises one or two colts and you will find them just thrown off in any corner where they can get a nibble now and then, and allowed to grow themselves. If you really want to raise a good colt, begin about two or three months before it comes by taking care of the dam. She can be worked right up to within a week before the time comes. After the colt comes, the mare should be fed for milk just as a cow is fed. If you are careful as to these points there is no question but what you can raise good colts. I am expecting quite a number of colts this spring, and I can almost tell you exactly what those colts will be, outside of their color. I believe that if there is any animal well worthy of attention it is the horse. If you go through our main streets and drive downtown with one or two good horses, all the children and grown people will stand and look at that team until it is out of sight; but you may go by with all the automobiles in the world and nobody knows that an automobile has gone by. This shows that the love for the horse is still here, and I hope it will stay here, and that there will be an increase in the raising of horses.

The Chairman. Now, gentlemen, we are all interested in horses, and any of us who were at Mr. Richardson's place last summer know that he is able to answer any questions. I presume there are some who would like to ask him something in regard to breeding colts, or any other question on this line.

Question. I would like to ask how much it costs to raise a colt to the age of four years.

Mr. Richardson. The cost of raising a colt to the age of four years will depend altogether on the circumstances. If you are on a farm, like myself, I put a whole lot of labor in it because I am trying to produce as good a horse as anybody can produce, and by the time those colts I raise are four years old I want them to take the blue ribbon anywhere they go. On the farm it doesn't cost any more to keep the mare, whether you raise a colt or not, to start with. You have to let that mare lie idle for perhaps not over two weeks, and then you

must be a little careful in using her not to have her heated in any way. Raising colts in this way you have not got to feed them the best of everything. You can feed them ordinarily good hay, but you want to give them enough. I am satisfied I could produce such a colt on a farm up to four years old for $150, — barring the service of the horse. Now if you go out and undertake to buy a horse that you can raise at that age, knowing the age and the surroundings of the horse, you will find that you can raise a horse as cheap as you can go out and buy him. Another thing, it is a good deal of satisfaction to a farmer to have some kind of a hobby, and I don't know anything you can have more pleasure with than a good colt, and the trouble with us farmers is that we don't have anything outside that we can have any pleasure with.

Question. What breed do you advocate for farm purposes — for stock?

Mr. Richardson. Why, I don't know that there is any particular breed. I should not want to get a horse that would not come up to at least 1,200, from there up to 1,400, or possibly, if you want to go into the larger ones, 1,600 or 1,800. Of course I use a hackney horse. I was up in the country one time about four years ago, and I saw a farm team come down with a pair of horses; those horses weighed 1,200 or 1,400. A man sitting behind those horses enjoyed riding; they had good style, good action, they were fat, sleek, looked very nice. I stopped the man and asked him about the horses and about their working. He said, "I plowed all the forenoon with this pair of horses." I believe that is what a farmer ought to have, — something he can enjoy. If you want to get a cart horse, and, like these men with automobiles, when you get through put him one side, all right; but if you want to get a horse that will know you and is worth being behind, get a small horse that has got the action and life to go with it; but you should, in the first place, not start with a mare all ready to be laid away, but with a mare that is right and has got the size, the disposition and the courage. Then you can go ahead and raise a few colts.

Question. Would you advise a man raising horses for the market to raise the lighter type of horses?

Mr. Richardson. There are two sides to that question, and one is that the heavier horses are being used more for trucking and such work, but there is a good sale for a horse that weighs 1,200 to 1,400 pounds, and there is a good sale for a horse that weighs 1,600 to 1,800. I think a farmer could raise something the same as the horse I am trying to raise. I have got a colt that I am trying to raise from my hackney stallion and a thoroughbred mare. It will be four years old in the spring, and I refused a thousand dollars for it the other day. There is another class of horses coming along, and that is the cavalry horse. If any of you have seen the cavalry of this State anywhere they have been in camp, I don't believe that any of you have been carried away with any of their horses. But go up into Canada and let a cavalry troop come out up there and it is an education to see those horses and see how they can form, and I believe that is one thing we have got to do in this State, namely, get better horses for our cavalry. Another thing, they have found that the long-legged horse 16½ hands high, is not right for a cavalry horse. A horse that stands 15½ to 16 hands high, with a deep barrel so that it can carry feed, will outdo the longer-legged horse almost two to one, and I believe there is an opportunity to raise this class of horses, weighing from 1,200 to 1,300 pounds, for cavalry horses.

Question. We work 16 horses on our farm; we don't raise any colts; our horses work every day in the year, Sundays excepted. How many teams would I have to keep to raise a colt from each mare I keep?

Mr. Richardson. There are some times in the year when those horses are busier than others, aren't there? Especially from now until the 1st of April your horses are not very busy?

A Member. Not quite so busy as in the summer time, but there is generally work for them.

Mr. Richardson. If you were going to raise colts from them all, you would probably have to have one or two more horses, but all that is necessary is to let a mare rest for two weeks. I have known them where they didn't rest even as long as that, but I would not advocate it.

Following Mr. Richardson's talk there was a discussion of breeds of swine best adapted for New England, led by Mr. Loyal F. Payne of the Massachusetts Agricultural College. Mr. Payne showed some slides illustrating the principal fat hog and bacon breeds, and explained the leading characteristics of each. A paper was then read by Mr. Edward Daniels of Plainfield, Vermont, on "Breeds of Sheep best adapted to New England Conditions — their Comparative Values and Profitableness."

BREEDS OF SHEEP BEST ADAPTED TO NEW ENGLAND CONDITIONS, THEIR COMPARATIVE VALUES AND PROFITABLENESS.

EDWARD DANIELS, PLAINFIELD, VERMONT.

I do not want any of you to think that I am any authority on sheep breeding, although I have learned considerable by experience and observation since I began to take care of sheep, and during that time I have seen a vast change in the sheep industry of New England.

When I began to take care of sheep there were more sheep kept in the town of Plainfield, my native town, than are now kept in the whole State of New Hampshire, but at the present time they have nearly all disappeared and the fertility of the soil has disappeared too.

Farms that were once fertile and stocked with sheep have been abandoned, and where prosperity prevailed, want and poverty are seen on every hand. Now I understand that the same conditions prevail all over New England. I think that all of you will agree with me that something is wrong with the sheep industry of New England; that either the farmers do not understand the management of sheep, or else they have been trying to keep sheep that are not adapted to New England conditions.

I will try to explain why some breeds of sheep are better adapted to New England conditions than others.

Fifty years ago a large part of all of the farmers in the New England States kept sheep, and at that time no one claimed that New England was not well adapted to sheep; twenty-five years later the world's production of wool became so great that the price of wool, mutton and lamb dropped to less than one-half the cost of the production here in New England, and

it was left for the farmers to keep sheep at a loss or go out of the business.

At the present time there has been an advance in the price of wool of nearly 300 per cent, and there are no records to show that mutton and lamb ever sold at as high prices as they have in the past two years.

Now we have the same farms that produce the same variety of grasses, a better educated and more intelligent class of farmers, and it is now claimed that New England is not adapted to sheep.

In order to explain why some breeds of sheep are better adapted to New England than others it will be necessary to give the origin of some of the breeds that are now kept in the New England States.

The merino is the oldest domesticated breed of sheep, and from the merino all European breeds are descendants.

The Spaniards bred for wool alone without any regard for size or build of carcass, and for centuries the kingdom of Spain monopolized the world's fine wool trade, and the price was established by law, and it sold at $5 per pound in every country.

A little more than a century ago the Spanish merino sheep were imported into New England, and here the climate, feed and general conditions were such that they improved rapidly, not only in weight of fleece but in size and build of carcass. Many of those flocks were kept pure, and they were crossed upon the native breed of sheep which were descendants of the sheep brought to this country by the Pilgrims, and which had become acclimated and were a hardy race of sheep.

Now they were the breeds of sheep that were kept in New England from fifty to one hundred years ago, and at a time when nearly all of the wool and mutton that was used in the New England States was grown right here in New England.

A large part of the mutton breeds of sheep that are now kept in the New England States originated in England, where, with a moist climate and a rich soil, rape, cabbage and roots, upon which they are wintered, grow to perfection, and with the best of grasses during the summer season they attain a great size.

The area of England is no larger than the State of Michigan,

and by a system of coddling and stuffing from the time that the lambs are born until they are slaughtered, England keeps nearly one-half as many sheep as the whole of the United States.

It is a scientific fact that when animals or plants are removed from their natural districts to one entirely different in climate and general conditions some surprising changes take place; almost immediately after the removal is made they change their character and habits to conform with their new homes, or else cease to exist or degenerate rapidly.

The millionaire farmers of New England have discovered that it is not only necessary to keep the English breeds of sheep in the same way that they are kept in England, but to employ skillful shepherds who have had experience in the management of sheep in the old country.

The digestive organs of a sheep are larger in proportion to its size than those of any other animal, and for that reason it is necessary that it be fed largely on bulky food, and the change from green, bulky food to dry, concentrated feed should be very gradual. When fed upon dry, concentrated food their digestive organs become contracted, and the sheep is in an unnatural condition, and diseases set in which make the sheep of little or no value.

It is a common saying among sheepmen that where thoroughbreds are turned in with grades they will all die within a year. Now it is accounted for in this way, that the grades are descendants of a hardy breed of sheep, and each generation makes them better acclimated and accustomed to New England conditions.

I will now give the value and annual income of some of the breeds of sheep kept in northern Vermont and New Hampshire.

Lambert Bros., New Hampshire, merinoes; number of ewes, 53; value per head, $4; annual income per ewe, $4.50.

James Brock, Vermont, merinoes; number of ewes, 110; value per head, $3.50; annual income per head, $4.

P. S. Cline, Vermont, Delaine merinoes; number of ewes, 78; value per head, $5; annual income per head, $5.50.

C. Rossiter, New Hampshire, Shropshire; number of ewes, 20; value per head, $12; annual income per head, $12.

Land, New Hampshire, Shropshire; value per head, $28; annual income per head, $4.

C. T. Brettell, Vermont, horned Dorsets; value per head, $35; annual income per ewe, $39.

A. Atherton, New Hampshire, Dorsets; reports that out of a carload every sheep died within a year from the time of purchase.

L. Jordan, New Hampshire, merino crossbreds or scrubs; number of ewes, 20; value per head, $6; annual income per head, $8.

F. C. Daniels, New Hampshire, merino crossbreds or scrubs; number of ewes, 220; value per head, $4; annual income per head, $7.75.

H. Nims, New Hampshire, South Downs; number of ewes, 40; value per head, $5; income per head, $6.20.

In order to compare the profits in the different breeds of sheep now kept in New England, it not only would be necessary to take into consideration the cost of food consumed by the different breeds, but the amount of time taken in caring for them.

The hardy breeds of sheep will thrive on scant herbage during the summer season and can be wintered on hay, straw and corn fodder, and with a small amount of grain just before lambing time will raise a large per cent of lambs. One man can take care of 500 or 600 during the winter and during the summer season (with good fences). An hour or two a week spent in salting them is all the time that is necessary to spend on them.

Now three-fourths of all the sheep in the world are merinoes and merino crossbred sheep, for the reason that they are hardy and will thrive where the mutton breeds will not.

There may be a few favored localities in New England where the mutton breeds will thrive, but New England as a whole I don't consider favorable for the English breeds of sheep; but on account of cheap lands I believe that the hardy breeds of sheep can be kept at a greater profit here in New England than any other kind of live stock. Now for New England I would recommend first the Delaine merino; second, the Vermont merino, a type without wrinkles; and third, the Cheviot, a mutton breed of sheep which originated in northern Scotland where the conditions are about the same as here in New England. For a money maker I would recommend a crossbred sheep, the first cross to be a Vermont merino ram on grade

ewes; the result of this cross would be a large, heavy-wooled, robust mutton sheep. The next cross would be a Cheviot; the offspring would be a robust mutton sheep with a little lighter fleece than the first cross; this cross would be something like the Coredale breed which originated in New Zealand. The next cross would be Delaine merino; this crossbred sheep is a robust, heavy-wooled mutton sheep, and after an experience of many years I would recommend this stamp of crossbred sheep as the most profitable sheep for the average farmer to keep in New England. Now you can hold those half-blood ewes at this stage by using a Coredale ram.

I believe that the decline in the sheep industry in New England is largely accounted for by farmers attempting to keep sheep that are not adapted to New England conditions.

Evening Session.

The evening session was called to order at 8 o'clock by Secretary Wheeler, who introduced Dr. Kenyon L. Butterfield, President of the Massachusetts Agricultural College, as chairman of the meeting.

ADDRESS OF PRESIDENT BUTTERFIELD.

Secretary Wheeler has asked me to say just a few words, before introducing the speaker of the evening, along the line of the subject of the evening, with special reference to the situation in Massachusetts, and I shall take but a very few minutes, indeed, because I do not want to rob you of any time or to rob the speaker of any time. It seems to me that Massachusetts in some ways — and perhaps this may be said of New England — is rather fortunate with respect to the credit situation, and I put it that way because I think our people — our farmers and people interested in agricultural advancement generally — have scarcely realized, and many of them do not now realize, the significance of this whole credit question for American agriculture; and so, I say, it seems to me that Massachusetts is rather fortunate. Interest rates, I think, in this part of the country for farmers are comparatively low, perhaps lower than in any other part of the country. We

have a good system of savings banks, and on the whole it seems to me they have had a very liberal attitude toward the farmers. Land prices have been relatively low so that the need for credit, in one sense, was not so great as it has been in parts of the country where land has been very high. We have very few tenants; there is no part of the whole country with so small a proportion of tenantry as New England. There has been a good deal of what might be called family capital, accumulated through the years on farms that have been farmed for six or eight generations, that has been available, and there has not been quite the same need, perhaps, for the getting of capital from outside sources as there has been in the newer parts of the country. All these things have helped. On the other hand, these same things have perhaps kept us from realizing how important a question this is, until, at least, very recently. Now I feel that the rural credit question is on us in New England as elsewhere, and will be still more important as the years go by. In the first place, the modern system of farming, — what we call commercial farming, farming that is really manufacturing, — it seems to me, will more and more require capital, and will require more capital in order to be a great success, and apparently the one great source of added capital is credit. Capital cannot be created out of nothing, but the farmer can use this instrument which the business man learned to use years ago to his advantage, namely, credit,— the borrowing of money under terms that make it advisable to borrow, not under the old terms that made it a hardship and disadvantage, oftentimes, to borrow. Sometimes men say that we do not need any credit facilities, especially here in New England. It seems to me they do not realize that if the farmers, as a whole, are to be served by credit, if agriculture as a whole is to take advantage of this same instrument that the business man takes advantage of, it cannot well be done by each individual farmer for himself, which has been the old method; that more and more, farming — or farms, perhaps, to put it better — must be the security; in other words, that there must be a system of credit, and a method by which farmers as a class may have greater access to credit. Now here in Massachusetts as elsewhere it has been the indi-

vidual borrower dealing with the individual lender or with the individual bank, but we have got to face the question, I believe, of a time when some other method will be the only method that will work in a large way, over large areas, and for the great bulk of the farmers. It simply means that in some way the collective security of the farmers must be made available for borrowing, and there must be a method which the students call amortization, by which payments can be made over a long period in very small installments and with great regularity, so that the farmer who borrows can go right ahead with his business and this debt need not trouble him. Now here in New England, I said, we had a small proportion of tenantry, and yet it looks to me as though, in the long run, a permanent system of farm ownership was going to be tied up with an adequate system of credit. On the side of personal credit I think the New England farmer has been advantaged. I think it has been fairly easy for the prosperous farmers to borrow money for short terms on their notes, perhaps as easy as in any part of the country, and yet you do not have to look into the matter very long to realize that even the New England farmers do not have access to the free personal credit that they ought to have. I do not suppose that anybody knows, I do not suppose that anybody has really studied the subject deeply enough to be able to say, how much interest is paid by the New England farmers on mercantile credit. I mean by that, the credit that is furnished by the fertilizer companies and by other supply companies by which farmers are carried for four months, six months or eight months. The manufacturers or the business men must do that, because that is the only system of credit that is available for the great masses of farmers, but it must work to the disadvantage of the farmers; the interest rate by that method must be much higher than it ought to be. Our farmers are lucky compared with those in the south and in some parts of the west in this matter, but even so, I believe that it could be shown by thorough investigation that they are disadvantaged by this system of personal credit.

Massachusetts has taken some steps to remedy this difficulty by the passage of the land bank act, promulgated a year ago,

and through the credit union law. I am wondering, however, if some adequate national legislation is not going to be necessary, especially for the land mortgage credit. However that may be, we are all interested in the subject, and I think it is a great piece of good fortune that the Board in planning this program not only had the wisdom to include this important subject, but had the good fortune to secure the speaker who is with us to-night. When the American Commission on Rural Credit Co-operation went to Europe the first stopping place for business was in the city of Rome. We were on Italian soil, we were investigating conditions in Italy, but one of the first men to greet us was the American ambassador to France, Mr. Herrick, who had come down from Paris to show his interest in this subject and to get into touch with the American Commission so that he might thereby the better arrange for our stay when we came to France, which would be some six weeks later; and he stayed with us in Rome while we were there. The officers of the commission corresponded with him at his request while they were in other countries in order that he might make sure that he would know our plans and that he could arrange with the French government and the French officials in the very best possible way, and when the commission finally arrived in Paris, where it made its headquarters for eight days, committees going out into different parts of the country for part of that time, Mr. Herrick gave himself unreservedly to helping us get all we could out of the business. Things had been admirably planned, thanks very largely to his skill and foresight, and while we were there not only did we have great hospitality from him as ambassador, but his personal attention hour after hour and day after day.

The members of the commission learned of the attitude of the French people toward Mr. Herrick, and it was no matter of surprise to those members of the commission who were in Paris when the later developments came, and you know, as well as I do, the story of Mr. Herrick's loyalty in staying in Paris, and of the way in which the French people undertook to express their gratification at his career with them. Now Mr. Herrick has had an interest in this subject for a good many years; he was one of the pioneers among the bankers,

among the public men of this country, in placing before the country the idea that here was a problem. While in Europe he gave a good deal of time to studying this question there. He has written a book about it, and now he has given largely of his time in trying to place before the American people the significance of this great question, and so, for many reasons, because I believe this question is so important, because I feel that it is of increasing significance to Massachusetts people, to New England people, because of my personal knowledge of Mr. Herrick's interest in this question and his splendid hospitality to the commission which studied this matter in Europe, and because of his knowledge of the subject, it is a personal pleasure to have the privilege of introducing him to you tonight, and I present to you the Hon. Myron T. Herrick of Cleveland, Ohio.

RURAL CREDITS.

MYRON T. HERRICK, CLEVELAND, OHIO.

I feel in speaking on this subject which, from the merest statement of it, is more or less dry, that I should endeavor, so far as I am able, to qualify a little before I attempt to instruct. I do not really mean to attempt to instruct, because I feel incapacitated for doing that. I feel almost like apologizing for attempting to speak on a subject which so many people know so much more about, but that is not the way to learn about a subject. If you attempt to tell somebody else about it you are obliged, from time to time, to know something about it yourself, and finally you accumulate some little fund of knowledge. A great many years ago, more years than I wish it were, I was a small boy on a farm, and I think I got my first lessons about land credit there. I heard my father and mother speaking of the maturity of the mortgage on the farm. It was held by one Mr. Gunn. Mr. Gunn held several mortgages on the farms in that community, and he had a way of not letting the owners know exactly whether or not he was going to renew those mortgages until near the time. All through that neighborhood — it was a thrifty one — the people could accumulate a certain amount of money over and above that necessary for the support of their families, but under the system of a mortgage falling due in three or five years — a system which still exists — it was not possible to recover from those little farms money enough to pay up the entire sum from the land; therefore these renewals. I remember that that was the very first trouble I had in the world. I heard this discussion, — whether or not that farm would have to be sold because they couldn't pay it unless they could get a renewal. The farmer is rather inclined to think that the man who has the mortgage on his

farm wants his farm. He does not, as a rule, but at the same time it appears so to the farmer. Now the mortgage was renewed and time went on, but years after, when I became the head of a savings bank, I began to consider this question and to try to understand why the decline had come in agriculture in our prosperous State of Ohio. It then occurred to me that that very influence of not being able to finance beyond three or five years must have a retarding influence in developing the resources of the farmer's land. I believe that just that fact, that the mortgages fall due within three or five years and that the principal cannot be recovered, as a rule, out of the land during that time, is a retarding influence on agriculture in the United States.

The rural credits movement has two separate and distinct objects: (1) to introduce long-term mortgaging for loans on farm lands; (2) to encourage co-operative banking among farmers. At least these were its original objects. The auspices at the start were propitious. Indeed, they could not have been brighter, since three presidents in succession and the largest political parties indorsed the movement and the entire country united in giving it godspeed. But now public opinion is divided, because the first object has been made the pretext for wild schemes of government intervention, and the second object has been obscured through a misunderstanding of the principles and purposes of co-operation.

The movement has been converted into a vehicle of experimentation. Enthusiasts on land credit have conjured up the dreams of mobilizing and "coining" the soil, and other vagaries which were obsolete before John Law's Mississippi bubble burst. They have revived plans which were tried out and abandoned in the American colonies prior to the birth of the nation. They have resurrected and unconsciously revamped as their own nearly all the rejected ideas advanced in France during the quarter century preceding her first law on agricultural credit. In scurrying over Europe for models they have passed by the German Landschafts and mortgage banks, the French Crédit Foncier, and other thoroughly tested concerns organized simply for extending land credit, and have imported for adaptation the antiquated institutions which the government some

time established for breaking up the feudal system, and the bureaus and commissions which the government has recently established to distribute money obtained or appropriated for ignorant and indigent peasants, or to meet problems arising from absenteeism, city congestion, compulsory military service, land reclamation and interior colonization.

Existing methods and institutions in the United States have been practically ignored. Originality of design, with any defects in that design cured by State aid, appears to be the hobby of the enthusiasts on land credit, and, in confusion of precedents and disregard of actual conditions and necessities, they have elaborated in their minds artificial structures which needs must have extraneous support. So it happens that there is now being proposed for American farmers a general use of government cash and credit on a scale that has not yet appeared in any country. American agriculture does not call for such aid, but these things do, since without it the chances would be slight of their ever being patronized by the farmers or the investing public.

As respects co-operative banking, the enthusiasts have overlooked the eminently practical character that it must maintain, have exalted it into altruism, and have demanded for it far more than the guiding hand and assistance of the government. They have gone even beyond the idea of charity and almsgiving, have forestalled the millennium and appealed to a sublimated spirit of self-abnegation and brotherly love. They have conceived utopias in which human instincts and personal ambitions may be suppressed, and the elysian fields may be cultivated by perennially happy farmers, each renouncing his individual good, sharing with his less fortunate co-laborers the fruits of his toil, and devoting his spare time to organizing co-operative societies in which producer and consumer, bondholder and mortgagor, lender and borrower, creditor and debtor, all may live and work in harmony, enjoying the best prices on purchases and sales, and granting or receiving loans from money obtained on their collective guaranty as cheaply as the United States government can secure funds, or at rates always lower than those current in the market.

These appeals to altruism and demands for special privilege,

class legislation and State aid have belittled the purposes of the movement and retarded its progress. Co-operative banking is of no use to farmers when it is made benevolent, or when its functions are restricted exclusively to saving and lending. It is not practiced successfully among farmers except where it is used in a very practical manner as a financial instrument for organization and for strengthening the member's purchasing and selling power. As a result of the narrow scope given to co-operative banking by the so-called "credit union" laws, unfortunately enacted in some States and by the majority of superficial investigators who have studied the subject, American farmers have not taken kindly to the idea, and rural co-operation is no farther advanced than it was five years ago when the movement first began.

Altruism and State aid are not the only burdens that are impeding the movement for land credit; it has been almost swamped by projects foisted upon it with no consideration of their probable effect, except upon the class of persons whom they are intended specially to benefit. Nearly all these projects relate exclusively to agriculture. They propose either government intervention or the adoption of some new and untried scheme, with little regard to the fundamentals of the problem or to the consequences on other industries. This is true of the bills in Congress and also of the laws enacted in the States, while the latter have the additional objection that they differ one from the other and prevent a standardization of the farm-mortgage business.

One of the manifest causes of the present financial troubles of agriculture is a deficiency of good general laws on both land credit and co-operation. The lack of such laws is felt by many persons besides farmers, and it would seem that some legislator might have suggested that the first step should be to remedy defects, supply omissions and enact general laws based on correct principles for the good of all. This is the natural course of legislation on new subjects, but no one appears to have thought of it. The idea of a general reformation has been condemned without a trial, and the solution of the problem has been made unnecessarily difficult by treating farmers and owners of farm lands as if their needs conflicted with the

interests of the rest of the people and must be supplied through special laws and means.

The shortcomings of American agriculture are traceable to the facts that the farmers have not combined their resources with the view of helping one another. Their greatest need is more co-operation. This can be brought about only through a more extended and intelligent use of the association. The associational form of organization is the best for agriculture in every one of its phases, whether it be for business, finance or social life. The problem would be simplified if this were kept in mind. The legislative steps that might be considered are —

1. An amendment of the national banking act so as to permit any national bank that confines its credit facilities to members to be organized as an association without capital stock.

2. An amendment of the banking act of each State so as to permit any kind of bank that confines its credit facilities to members to be organized as an association without capital stock.

3. A law by the nation and in each State to legalize for associations whatever is lawful for corporations, *i.e.*, a regulatory law.

4. A clause in such law to permit combinations among farmers' associations or small producers' or consumers' associations.

In the first place my desire is that the associational form of business shall be extended throughout the communities of this great country of ours and perform a service that we cannot perform in any other way — that is so great we cannot begin to comprehend its benefits and effects. The mutual life insurance companies are highly successful examples of this form of organization. Take another example, the Associated Press, which I will compare to the Landschaft in its operation, because it does not enrich itself, but it performs a service. The Associated Press of the United States, which, by its organizations puts the news down at our doors every morning for a small sum of money, performs an enormous service but does not grow rich; it does not accumulate a great capital, but it serves all the newspapers and makes their business of publication possible. That is service that is performed by an organization, and it is comparable to

the Landschaft, which performs a service, and has, throughout some twenty-seven countries abroad, and has accomplished results comparable to those of which I speak. It is along that line that we want to seek to develop the agricultural resources of this country by the associational form of service of the two kinds to which I referred. I would not confine it to that, but I think that the greatest opportunity for development, the best adapted to agricultural interests, is the associational form. I believe in the incorporation of great institutions like the Crédit Foncier and those of a similar character, and I think that we probably need some national legislation along these lines; but for the associational form of legislation I believe this would work, — an amendment of the national banking act, so as to permit any national bank that confines its credit facilities to its members to be organized as an association without capital stock. We have got a national banking act, so to the extent that you will allow an association under the inspection of the government, an association may be formed like the Landschaft association, which is comparable, as I said, to the Associated Press organizations and serves a great community.

I know that most of you know the meaning of a Landschaft, but if you will permit me I will take the liberty of explaining its meaning briefly because it is through that kind of organization that I hope we will be able to work. We will suppose the State of Massachusetts passes a law which allows organizations of farmers for the purpose of borrowing and for the purpose of marketing and selling in different districts that are divided off into townships and counties. Now, if a group of men want to borrow money and there is no money in that township, the men who want to borrow will find that an association may be formed consisting of a president and a secretary and a treasurer, and that organization will consist of all the men in that township who want to borrow money. They all come and make a mortgage to that institution, and that Landschaft, instead of giving them any money, gives them bonds running over a period of years in return for the mortgage that they give to that association. Now you will say, "What good will that do the farmer who wants to borrow money?" It does just this: that man receives his bonds, and these are negotiable in the

open market. He may make a loan for five, ten, fifteen, twenty-five or even seventy-five years, in which he pays so much of the principal and so much of the interest in the shape of annuities. As an example, I saw this instance of a loan that had run seventy-five years. I give this, because it is extreme; a man borrowed of the Crédit Foncier $5,000 for seventy-five years. He agreed to pay 4.30 per cent for the money. The obligation was drawn so that he paid 4.40 per cent instead of 4.30; the difference between 4.30 and 4.40 paid the loan at the end of seventy-five years. He paid all during that time 4.40 instead of 4.30, and that slight difference amortized the loan. That is the principle. Now this man receives bonds on which he pays annuities; he has made his mortgage, those bonds are marketable. They can be sold or used as collateral. The societies federate and become collectively liable, and the result is that that security — that bond on which he has financed himself for so many years that he can recover out of the soil enough to maintain his living expenses and pay that loan — becomes a safe and readily marketable investment. The borrower can call the loan and pay it all off if he wants to, but the lender cannot. In other words, the borrower finances his land for a time definite to himself and makes a security that anybody will buy, and they sell against government bonds in Italy, Germany and France. It is not any theory, it is a practice economically sound that has been worked out in those countries. The government should inspect it, umpire it, look after it to see that it is honest.

Second, we should have an amendment of the banking act of each State, so as to permit any kind of a bank that confines its credit facilities to the members to organize as an association without capital stock, in the same way as we have done with the national banks.

Third, a law should be enacted by the nation and each State to legalize in associations whatever is lawful for corporations. We didn't know anything about a corporation a hundred years ago; now we do everything, almost, by corporations. It is a good form of conducting business, but let us enlarge this associational form, so successful in life insurance companies, so as to include all business. It is a simple thing,

gives free scope to the affairs of organizations, and is a proper method of permitting the transaction of business.

Fourth, there should be a clause in each law to permit combinations among farmers' associations or small producers' or consumers' associations. Now allow these to combine as they do in Europe. There they have infinite combinations making stronger the credit. The short-time credit and the long credit combine until they run up finally to the Bank of Prussia, or the Bank of France, and the little fellow finds his note of 100 francs in the Bank of France. It would be a strange thing if a note of $20 of a farmer in Missouri or Kansas landed in a city bank of New York; it would be lonesome, but there are hundreds of millions of dollars of short-time financing paper that lie in the vaults of the Bank of Prussia, the Bank of Italy and the Bank of France. This system has the effect of leveling the credit all over the nation. In America, in one place you have cheap money and in another place it is 10 or 20 or even 100 per cent. With a proper system and the land and the proper machinery it is entirely possible to vitalize that credit and mobilize it and increase many times the business of this country and the development of it, and at the same time not break up the existing credit system by leaning on the government to do it. It can be accomplished infinitely better in these other ways.

The rage for innovation and the confusion which it has wrought in land credit arise perhaps from the fact that little effort has been made in the movement to distinguish one from the other the different kinds of institutions devised for organizing land credit, or to study the purpose, merits and results of each kind. The organization of land credit means the substitution of specially designed institutions for individuals as money lenders. Such institutions are of only five kinds: (1) companies for insuring or guaranteeing titles or mortgages; (2) building and loan associations; (3) Landschafts; (4) bond and mortgage companies; and (5) public or semi-public banks or establishments.

The loan transactions of institutions of the first type are largely brokerage; of the second, direct investment of their own funds. Institutions of the third and fourth types issue bonds or debentures; and, since the bulk of the loans is made through this method of finance, they tend to act as mediators

between investors and borrowers, and so are the best organizers of land credit. Institutions of the fifth type also may issue bonds or debentures, but their security and financial support lie rather in the connection with government than in the value of the land; they serve to facilitate the distribution of subsidies, usually among some particular class of persons, and so their effect on the general and proper organization of land credit is slight. Included in this last class are most of the institutions for reclaiming land by embankment, drainage or irrigation; these are always localized.

Illinois has one of the best laws, something quite like the Landschaft, and that is this: on the Mississippi River there are great areas of land which are sometimes flooded. It was not fair to make the State pay for reclaiming that land for the benefit of the individuals who owned it, so Illinois has enacted laws by which drainage districts are constituted, and this plan is patterned largely after the Landschaft. They have those great drainage districts and build the embankments and drain the land, and the obligation rests upon that district, which is partitioned off by the law of the State, like a Landschaft. They use the taxing machinery of the State to collect the installments of interest and principal and to meet those loans. Now they did not need the help of the government to institute a bank to take care of that; all they had to do was to make that law and make it possible to create those securities, which was a collective obligation upon that whole community, and they sell immediately in the market at a fair price. It would have been absurd for the State of Illinois, or any of those States, to start a bank to buy the securities, because they would say, "That can't be done unless the State advances the money." All they have to do is to give character to the security.

In no country do land credit institutions, no matter how few or how many, monopolize the business; all they can do is to supplement the work of other agencies. The real estate mortgage is so popular that it goes everywhere. Nearly all savings banks and life insurance companies maintain departments for investing their own funds in it, while many trust companies and other corporations acquire it to hold or to sell. The operations of such investors, brokers and agents would be

more extensive if the laws were better. Hence, legislative reform ought not to stop with the creation or authorization of land credit institutions, properly so called; it should continue until the laws relating to land credit are perfected for money lenders of all kinds, individual and incorporated.

Companies for insuring titles and guaranteeing mortgages, by standing good for the borrower's ownership of the mortgaged property or for the repayment of his loan, are very serviceable in mobilizing land values, but these institutions are not of a pure land credit type because their guaranty rests upon personal credit. Moreover, as they have more nearly reached perfection in the United States than in any other country they need not be discussed here.

But the laws are defective or lacking in respect to the other institutions. Building and loan associations have attained a great development in the United States; in fact, far greater than in any other country. They are, however, thrifty societies, and not well adapted to agriculture. The recent attempt in a number of States to convert them into credit institutions for farmers has, in my opinion, done harm.

Bond and mortgage companies have reached enormous development in the cities. Most of them are safe and sound, yet they all appear to be operating under defective laws. In Europe these institutions sometimes are called land credit banks, or mortgage banks. They are subject to rigorous inspection under laws in all the best of which I find two basic clauses. The first is that capital stock and surplus must be maintained at a safe ratio to bonds; this is usually $1 to $20; the second clause is that bonds in circulation must represent first liens on lands of adequate value and never exceed outstanding loans either in amount or in interest rate. I believe that if the States would incorporate these two clauses and provide for proper inspection there would be no question as to the soundness of institutions of this kind. But none should be allowed to do long-term mortgaging unless it has a large capital stock. No investors will deal with small concerns that place their funds out in long-term loans.

Public or semi-public institutions operate with the cash or upon the guaranty of government. Usually (as I said before),

they are established for assisting indigent and ignorant peasants, or else for carrying out some national policy. None in recent years has been established in a foreign nation for any other class.

The solution of the land credit problem lies in the introduction of the Torrens system for facilitating the proving of titles, in the simplifying and standardizing of the laws for recovering defaulted loans, and in the enactment of proper legislation for bond and mortgage companies and for Landschafts. The latter institutions are entirely agricultural, and are considered to be the best means for finding long-term credit for farmers.

You know, after this land mortgage craze in the west some years ago, to ward off the eastern mortgage holder the equities of redemption were deferred, and some two or three years were allowed by which the man, if he got the money, could come back and redeem his farm, and all sorts of obstructive laws were passed which tended to prevent the foreclosure of mortgages. Those laws ought to be wiped out. It is necessary to clean up the real estate situation in many States before it is safe to operate in this large way with a large incorporated institution. Some fourteen States have the Torrens system. I think Massachusetts is one of the States that has that system.

In other words, we are just at the beginning of something in this country which is of such importance — of such transcendent importance to all of the people — that while we are considering the questions of the day we must not permit this one to go wrong; and it has been very greatly in danger of doing so. Had the Hollis-Buckley bill passed in the last Congress I believe it would have been a great detriment to this country. If we can only wait long enough to appreciate the meaning of starting right in the organization of these institutions we shall accomplish something very great for the United States. Those institutions which have worked out and have performed the service in Europe for which they were created have been those which called for the development of individual initiative and resources along these lines of co-operation. It has been said that we cannot do these things as they can over there, — that we cannot establish these institutions. That is tantamount to saying that with the high order of intelligence

of our population we cannot do the things that the ignorant peasantry of Europe can accomplish so successfully. It is absurd. We can accomplish it here, and it is necessary for us to do it and to do it along the right lines, but I feel that this is important. Over there these systems of finance are devised by the government or by the people in town, and accepted by the people in the country. In this country, where the farm is the breeding place of brains, and where the people who run the government in the cities come from the land, they have been rather independent, and when the man in the town — in the city — attempts to instruct or tell the farmer what to do, he says, "Go hang, I don't need any advice from you." But the time has come in this country when we are realizing that our interests are one in the development of our natural resources. In carrying on this great machinery of government and all its financial system we are realizing more and more its co-operative, its collective thought, its organization that accomplishes these things, and if the chambers of commerce will take an interest, and the farmers will come into the chambers of commerce, and the city men will join some of the country organizations, we can collaborate and bring out a system that is financially, economically and fundamentally sound. If we do this, the next twenty-five years of advance in American rural life is going to be tremendous, because the credit system is as necessary as the track upon which the engine runs for the railway. You may develop education and develop along other lines, but keep the archaic credit system the way it is and the farming communities, the rural districts of the United States, will not come to their own for many, many years to come. It has been kept out of politics so far, and that is one of the encouraging signs of the times, namely, the idea of taking questions which belong to business out of politics and treating them as we must and should treat them, — as business questions. Now just one more word in conclusion. This is the most momentous time in the history of our lives, one time possibly excepted, the civil war. We seem to feel that we are remote here from that great conflagration which is destroying society and civilization. We seem, in a sense, remote from it. Our time is coming later. There will be placed upon the people of the United States a

responsibility, a task to perform, — we won't speak of opportunities, — greater than was ever placed upon any people in the world. It is necessary that we talk about military preparedness and all that; that is necessary, but the most fundamental necessity of all is a preparedness of our economic structure, of our manufacturing business, — a preparation by which we may finance everything that we do, that we, as a people, may work in harmony. The time has come when there is a call to patriotism, a call for the American people to respect the obligations of citizenship as almost never before. We should be serious thinking people now, planning out how we are going to perform this service for the world which it almost seems that we are ordained to perform. We are equal to it in ability. We have the resources, both in materials and in men and women; we have the capability; we have the brains; and the only question before us is whether we can work together and perfect our organizations and perform in an orderly manner those things which are necessary to carry on a great work to its consummation. I am glad that there is this feeling throughout the United States which brings people together, as we are to-night, to discuss these vital questions of human welfare, because they are far-reaching.

Third Day.

The third day's session opened with the annual meeting of the New England Alfalfa Growers' Association. President L. E. Mayo of Harding presided and introduced Mr. H. W. Jeffers of Plainsboro, New Jersey, who spoke on "Alfalfa Conditions in New England."

ALFALFA CONDITIONS IN NEW ENGLAND.

H. W. JEFFERS, SUPERINTENDENT, WALKER-GORDON FARM, PLAINSBORO, NEW JERSEY.

Alfalfa has been known and valued for centuries in the Old World. Some fifty or sixty years ago it was introduced into California by way of Chili. It met with favor as a forage plant, and its cultivation gradually extended eastward until all States west of the Missouri River became great alfalfa-growing States.

The western States were well adapted naturally for alfalfa growing; the soils were deep, dry and filled with a large percentage of lime, and rich in mineral fertilizers. The plant became a great boon to the live-stock interests of the west.

Seedings were frequently made through the east, but were generally failures except in a few restricted districts, one notable district being near Syracuse, New York, where there was a terminal moraine deposit filled with fragments of limestone.

Until quite recently it was believed that the growing of alfalfa in our eastern States would not prove profitable on the great majority of our farms, but the accumulated experience of the past few years of those who have succeeded lead us to believe that any well-drained land properly prepared by liming and fertilizing will grow alfalfa profitably, and that the introduction of this crop in our rotation will increase the fertility of our farms.

All feeders of live stock who have used alfalfa meal or hay have recognized its advantages, and have felt that it was profitable to feed even if they had to pay $25 to $30 per ton for it. The hay is rich in protein and mineral matter and relished by all kinds of live stock. It will grow better pigs, better young cattle, produce more milk when fed to the cow and more eggs when fed to the hen. There seems to be something about

alfalfa that makes it a better food than its chemical composition would indicate. This may be due to the large percentage of mineral matter it contains, or some stimulating element that is not yet understood. The man who sells alfalfa products to our eastern farmer I consider a missionary. He is giving us a chance to prove for ourselves its great feeding value. When once tried we are convinced of its worth, and then it is up to us whether we want to continue to pay from $10 to $15 freight per ton on this valuable food from the west, or whether we shall grow it upon our own farms and save the freight.

We think of alfalfa as a crop that grows spontaneously in the west. From all statistics that can be gathered on the average yields, even in the most favorable localities in the west, our yields in the east show well in comparison. Even down in the great Imperial valley, the hottest place in the United States, the average yield of alfalfa is less than 5 tons per acre. We can grow on our eastern farms a yield between 3 and 5 tons per acre per year, depending upon soil and climatic conditions.

There is no forage crop known to-day that will yield more nutrients per acre than alfalfa. There is no plant that is able to send a taproot into the subsoil as alfalfa. It feeds upon the mineral matter in the subsoil that has lain dormant and useless all these years. It is also capable, as are other leguminous plants, through the bacteria that live upon its roots, to convert the free nitrogen of the air to its own use, making it unnecessary to feed the plant with the expensive nitrogenous fertilizers. It is not only able to produce what nitrogen it needs for its own use, but will contribute fertility to other plants growing with it, or when plowed it will add more dollars' worth of fertility to the soil than it has cost to lime, fertilize and prepare the soil to establish it. Therefore we have a plant that is a winner from every standpoint It gives us the richest and best kind of food, it yields more nutrients per acre than any other crop, it is a soil builder, and by its use in the rotation our farms will grow richer and richer as the years go by, capable of yielding more bounteous crops. This means prosperity, better homes, better schools, better churches and a better community.

Can we grow it in New England? We can! The fields that are already growing it demonstrate that it can be grown. The

accumulated experience of the men here in New England who have already succeeded is enough to stimulate us to put our shoulders to the wheel, study our farms, study the type of our soils and their requirements, and prepare them for the introduction of alfalfa into our farm-crop system.

Any well-drained soil, where the water table is 4 feet below the surface, can be made to grow alfalfa by proper preparation. It will grow upon rough, rocky land, even on soils where the rock is within 2 or 3 feet of the surface, — provided it is cracked and admits of good drainage, — and will send roots down into the very crevices of the rock. Many lands that are not naturally well drained can be made so by the use of tile.

The preparation of the seed bed is of most importance. It should be deep, firm and fine. Our custom is to prepare it after taking off a crop of any early maturing vegetables, grains or even hay, — crops that are harvested about July 1. We then disk the land until the stubble or sod is thoroughly cut up and the soil pulverized. The soil mulch is made for three reasons: first, to prevent evaporation of the soil moisture; second, to hold any rains that fall; third, to germinate grain or weed seeds. We continue to disk and roll until the seed bed is well prepared, or, as soon as the soil is moist enough to plow, it is plowed, rolled and harrowed. By disking previous to plowing the soil capillarity is immediately restored. In some sections in the North alfalfa has been seeded in the spring with a nurse crop of oats, barley, wheat or rye, and good results have been obtained.

The most important essential in alfalfa growing in the east is lime in abundance. All our soils, with few exceptions, are acid, and the bacteria that thrive on the alfalfa plant cannot grow; therefore we must put on quantities of lime, whether it be hydrated, burned or ground limestone. If ground limestone can be purchased at a price of a little over one-half what it costs to purchase hydrated or burned lime I should prefer its use. I would spread on the field at least 4 tons of ground limestone per acre, using a lime spreader for this work. It had better be put on immediately after plowing so that the subsequent disking and harrowing will thoroughly incorporate it in the soil.

The next step is the proper fertilization of the soil. Stable

manures give good results when put upon the field for the crop preceding the seeding of alfalfa. There are less weed seeds by following this method. Our practice previous to the war was to apply 500 pounds of 2–8–10 fertilizer to the acre just before seeding. Potash cannot be obtained, therefore we are applying 300 pounds of acid phosphate and 75 of nitrate of soda to the acre. Acid phosphate gives us much better results than basic slag or raw phosphate rock. We have demonstrated this by sowing strips with different kinds of phosphatic fertilizers. There is something about acid phosphate which stimulates leguminous plants that our chemists do not understand. The nitrate of soda is used to give the young plant a quick start. The plant is weak in the beginning, and by stimulating its growth it will be better prepared to cope with weeds and obtain its own nitrogen from the air.

Seeding should be done at the rate of about 20 pounds of seed per acre. There are several tools for doing this work. If a disk seeder is used it can be sown one way at a depth of one-half to one inch; if the various broadcast seeders are used one-half the seed should be sown each way and then lightly harrowed in, followed by a subsoil roller. Seeding in this climate should be done early in the spring with a nurse crop, or early in August if sown by itself.

The kind of seed to use is of great importance. Unfortunately, the alfalfa seed industry has not yet been standardized so that we can always depend upon the variety or kind of seed we want. For New England, seed should be procured that is grown in the northwest on nonirrigated land, the farther north or the higher altitude from which we can procure the seed the better. Only the hardier varieties can be grown at high elevations or in the far north. Undoubtedly the Grimm is the best variety obtainable to-day. There are a number of new varieties of alfalfa which are being experimented with and which may prove better for New England conditions, but these varieties are not yet grown in large enough quantities to place the seed upon the market.

This summer I spent about a week in the alfalfa seed growing sections in order to study whether we could depend on what these men were saying in regard to seed. I believe there

are a few people who are dependable, but they are asking very high prices for their seed. I met Mr. Cooper, the State farm management man, in North Dakota. Now in North Dakota you cannot grow anything but the very hardy varieties, — the varieties such as should be grown here in New England, — and their plan up there is to push the cultivation of alfalfa as rapidly as possible, and they hope in about two years' time to be able to put out alfalfa seed in North Dakota and put a State seal upon it so that you can be assured that that seed is right. I think if the people in the mountain regions of Montana and Colorado and Dakota would do that same thing, and possibly in South Dakota, in the black hills, that we would then get seed that we could depend upon. While I was out there I did everything I could to impress upon them not only the benefit from the seed growers' standpoint, but the benefit it would mean to the eastern alfalfa grower, to get a seed that they could depend upon, because I believe a great many of our failures have been due to poor seed.

In our own practice we select the best seed we can, purchasing from three different concerns, and mixing them together before seeding. If one or possibly two of these strains did not prove hardy and one proved to be we would secure a good stand of alfalfa. All seeds should be inoculated. The government will furnish inoculation enough for small quantities, but the commercial inoculations that are upon the market have proven to be good. The seed can be inoculated at a cost of about $1 per acre, which is cheaper than distributing soil from an old alfalfa field.

After alfalfa is seeded, even if annual weeds appear, it should not be clipped, and if sown early in August should get a growth of at least 8 to 10 inches. If it gets this size it should go through the winter in good condition.

The harvesting of alfalfa is not intricate. It should be cut between the time the little shoots appear at the crown and before they are high enough for a mower to clip them off. The hay should be raked before the leaves dry, and then bunched and capped with canvas. During good weather two or three days after the hay is cocked it can be stored. Oftentimes weather conditions in the east are unfavorable for curing hay,

and it may be several days before it can be put in the mow, but the caps will protect it. I have seen hay put in the mow quite green which will go through a fermentation making a dark-colored hay, or what is sometimes known as tobacco-cured hay. This will equal the bright green hay as a feed. What we want to avoid is moldy hay. The hay should be a bright green, or else sap enough left in the plant to produce the tobacco-cured hay.

After the first season it may be advantageous to top-dress with 200 to 300 pounds of acid phosphate, and if the field becomes weedy a thorough harrowing with a spring-tooth alfalfa harrow, or a similar tool, will kill the weeds and stimulate the growth. Alfalfa should always go into the winter with at least 6 to 10 inches of top.

Alfalfa in the crop rotation will not only build up the fertility of the farm, but, if introduced in proper proportion with other crops, a uniform labor load can be maintained which is one of the large factors in economic agriculture.

To those who have not quite made up their minds to begin the planting of alfalfa as a crop by itself I would strongly urge that every farmer use at least 3 to 4 pounds of alfalfa seed in his grass mixtures. For permanent agriculture lime should be used previous to seeding any grass crop, and by the use of lime and thorough preparation of the seed bed and inoculated alfalfa seed in the mixture you will be able to grow better crops of hay than you would by not using the alfalfa. It has been demonstrated that timothy and alfalfa grown together will yield much heavier, and the timothy will be richer in protein, than if grown alone; also by this method, which will be comparatively inexpensive, one can determine the practicability of growing alfalfa by itself. In this way we found that alfalfa grew luxuriantly when sufficient lime was applied previous to seeding.

In conclusion, let us bear in mind these principal points: alfalfa is a highly desirable feed; alfalfa will grow more nutrients to the acre than any other plant; alfalfa will improve the farm; alfalfa can be grown on any well-drained soil by the use of lime, inoculated seed from hardy plants, and can be grown at a profit.

The time is not far distant when the majority of farms in the east will be growing alfalfa. Our lands will be improved, our live stock increased, and we will be able to supply the growing markets in the great industrial centers which are at our very door. We will no longer pay the transportation companies $10 to $15 per ton on our feeds; we will be able to produce more, live better and enjoy prosperity.

QUESTION. What is the general average life of the plant, from your experience?

Mr. JEFFERS. Why, in our own work we are bringing alfalfa into a farm rotation. We are leaving the alfalfa fields till they grow five years, harvest them five years, then two years in corn, then one year in grains.

QUESTION. How does alfalfa compare, from your observation, with the great fields of sweet clover we see in the west, — in Iowa and Kansas?

Mr. JEFFERS. Sweet clover is something that I know very little about. From what I saw there, they were using it largely for pastures. We have never tried much sweet clover, but I should think perhaps it might be well to experiment a little in it, especially if our land is a little poor.

QUESTION. I would like to ask the speaker if he has had any experience with scarified seed? They are using now a machine in the west to scarify the seed so that the germination is increased from 50 to 75 per cent.

Mr. JEFFERS. No, we have not used any of the scarified seed, but I am quite sure that that is very essential to sweet clover. I know we have tried sowing a little sweet clover, and sometimes it will not germinate until the next year. I tried some special alfalfa down in South Jersey with sweet clover, and found that some did not germinate till next year. I think that scarified seeds are very good, especially with sweet clover.

Mr. N. I. BOWDITCH. Mr. President, Ladies and Gentlemen: While the alfalfa growers are together I want to state to them that the oldest agricultural society in the State, — the Massachusetts Society for promoting Agriculture, — in order to further encourage the growing of alfalfa in the State of Massachusetts, through its trustees, offers $600, in five prizes, for the best

acres of alfalfa planted in 1916; these prizes to be awarded in 1918, as follows: first prize, $250; second prize, $150; third prize, $100; fourth prize, $75; fifth prize, $25. The trustees will be governed in awarding these prizes by general appearance of the crop during 1917 and 1918. A public weigher's certificate will be required, and all entries must be made on or before October 1, 1916, to General Francis Henry Appleton, secretary, 251 Marlboro Street, Boston.

We would like the co-operation of this alfalfa club in this matter, and any suggestions that any one has to make will be gladly received, because we want to make it as successful as possible.

On motion of Dr. H. J. Wheeler it was voted to extend a vote of thanks to the Massachusetts Society for promoting Agriculture.

Mr. W. P. Nickerson. In relation to the offer of Mr. Bowditch, I am going to start a new field of alfalfa this year, and want to get the $250. There will be a great many who will start fields if they know that the offer is made and if they have some one to show them how to start. They can best be shown and best helped by our county farm agents, and I think that if the farm agents are included in the offer and given full directions, they will increase the acreage of the alfalfa to be grown in the State of Massachusetts very largely. There is just one question I would like to ask, — is this one measured acre that the prize is to be given on?

Mr. C. W. Prescott. Yes, one measured acre is the area.

Mr. Nickerson. I would suggest that the alfalfa association ask Mr. Bowditch to notify the farm agents. They are in touch with all the farmers in their counties and can get it started better than any one else.

Chairman. I think notice will be sent around to the people.

Dr. William P. Brooks. There are a few thoughts suggested to me by the speaker's remarks, which I hope may prove of some value. He has spoken of the variety, and I agree with him that too much care cannot be taken to obtain the best possible seed. I want simply to emphasize this point,

— that the quality of the seed is not necessarily indicated by the name. There is a good deal of seed offered as Grimm alfalfa, and I know that it is not worth anywhere near the price charged for it as compared with common alfalfa. Now the experiment station is taking the utmost care to get as good seed as it can find, whether of Grimm variety or the so-called common alfalfa, and the two have been tried again and again side by side, and the results have more frequently been favorable for what we bought for common northern grown alfalfa than they have been for the Grimm.

I need not take much of your time, but a few of the figures I would like to read: —

In 1914, in early August, we sowed side by side five kinds of Grimm and three kinds from the Department of Agriculture. In 1915 the Grimm gave $4\frac{5}{10}$; the common, $5\frac{3}{10}$; one of the United States Department, $4\frac{8}{10}$; another, $4\frac{7}{10}$; and one, $4\frac{1}{10}$ tons. I want particularly to speak of that last, — $4\frac{1}{10}$ tons. That was the smallest yield. This variety started off fully as well as any of the others, but it showed itself particularly susceptible to rust, and this emphasizes another point, — some of you have had a good deal of trouble, I know from correspondence, with this leaf spot. This single experience of ours emphasizes the point of which I felt very sure before, but it emphasizes it in a very striking way, — that there may be a tremendous difference in the susceptibility to leaf spot, which always cuts down the yield and kills the roots, and may even ruin the stand. I have other figures concerning the relative yield of so-called Grimm, and when I say so-called Grimm I do not mean to throw discredit on the persons who sold it as Grimm. I have every reason to believe it was Grimm which I bought, after consultation with experiment station directors, of the men whom they said were the most reliable producers of Grimm alfalfa in the northwestern States. I certainly believe I am doing you a service in emphasizing this point, — that it won't pay to give the prices usually charged for Grimm as compared with good northern grown common alfalfa.

As to the time of sowing, just a word from the standpoint of Massachusetts. I think we want to sow a little more than two weeks earlier in the fall than you in New Jersey. In my

experience it pays to sow early enough to get a good growth before cold weather. I want a foot or 15 inches of growth. It protects from alternate freezing and thawing, and in every way helps the crop to go through the winter. I have often had it grow so well that it seemed almost wicked to leave it, and I might have been tempted to cut it except that I knew it was worth ever so much more in the ground than if cut. And I should say, from experience in Amherst and from observation in many parts of the State, that we ought to get alfalfa in before the 10th of August, — some time from about the 25th of July to the 10th of August will suit most parts of the State, I think. We have occasionally had good results at the college grounds at Amherst in seeding alfalfa in with the corn, but you must not anticipate so perfect a stand, so complete a cover of the ground, if you seed in that way. Yet it is quite possible, and I agree heartily with the speaker, that putting in a little alfalfa seed in ordinary mowing is a good idea, and if in your experience you have found it a satisfactory method to seed the alfalfa with corn, put the alfalfa seed in at that time without hesitation. If I were planning for a crop of clear alfalfa I should not advocate that method of seeding because it is highly important to get the ground completely covered, owing to the grass and weeds and white clover which keep crowding the alfalfa out on many kinds of land.

The question of phosphates was touched upon. This question is one on which, as some of you may remember, I have recently published a bulletin. The bulletin will support, on the whole, the position taken by the speaker. Acid phosphate seems to be a good source of phosphoric acid, and I agree with him that we don't exactly know, perhaps, just why it is so good. Many of you have been attracted, no doubt, owing to the beautiful manner in which Dr. Hopkins expresses himself, and the extent to which he is quoted, to try fine-ground rock phosphates. We have had them side by side for eighteen years with acid phosphates, with basic slag and with various forms of bone, not only one rock phosphate, but all the different kinds, — South Carolina, Florida, Tennessee, — using these phosphates every year in such quantities as to furnish equal phosphoric acid. From the start the acid phosphate was supe-

rior to any of the rock phosphates, and the truth is that after eighteen years the acid phosphate's superiority to the rock is greater than it was at the start, — considerably greater.

Question. I would like to ask the speaker, or any one through the speaker, whether there has been any successful experience with alfalfa in New England on a typical granite hill farm, with a subsoil coming pretty close to the top? I hope some little time will be devoted to this side of the problem. I know of cases where it has been grown successfully on favorable soils, but don't know of any where it has been grown on the typical New England hill soil.

Dr. H. J. Wheeler. We have a modest gentleman here who can answer that question, I think, — Mr. Andrews of Vermont.

Mr. Edward R. Andrews. I will answer that question because for six or seven years I have been growing alfalfa on just that sort of hill land in Vermont. I cannot say that the subsoil is clay because it is not. I suppose the soil is what is called clay loam, that is, it is deep rich loam. It is hard to find the subsoil in many places. There is not any question in my mind but what alfalfa can be grown on these sloping hills. My farm is made up of many of that kind, — not deep slopes, but a gradual slope, and when I first began I made the usual mistakes. I inoculated the seed with the inoculating material furnished by the Department at Washington, and not much was known about it at that time. I wanted to sow the seed right away, so I let it dry in the sun. That did not succeed. Another field that I tried not very successfully was on sod ground, — well, the grass came up and nearly killed out the alfalfa. Yet every year since then — that must have been five years ago — we have cut off a great deal of alfalfa. One year, 1912, I sowed quite a large piece of alfalfa, and that year the ground was bare nearly all winter; no snow was on it, and in the neighborhood of my farm clover was killed out, but my alfalfa was not, and I have had crops from that field in 1913, 1914 and 1915.

I used marl for a good many years which came from New York and cost me $7 a ton, including freight, but last spring a concern was started in Vermont, from which ground limestone could be purchased at $1.50 a ton, and in my neighbor-

hood it cost me, with freight charges, $3.50. I used three carloads of that lime on my farm this last summer. I have followed pretty much the plan of getting the land ready that was suggested by the speaker. If you want big crops have the land rich; sow your alfalfa in August, as I do, after a crop which has been highly cultivated. I inoculate everything, — clover seed, vetch, peas, etc. I use "Nitragin," made by the German-American Nitragin Company, at Milwaukee, and have great success. I have used the northern grown seed, and never until 1914 had I time to use Grimm, but in 1914 I sowed a small piece in front of my house, covering 2½ acres, which had been well manured and fertilized, where peas and oats were grown. I sowed one-half of that in Grimm, and since last summer we have taken off that 2½ acres over 10 tons of pure hay. I have had 16 acres of alfalfa this year and I have had 46 tons of hay from it. I sowed about 12 acres more in August.

Last year I got my lime at the low price of $1.50 a ton; delivered, it cost me a little short of $2.50 from the lime company at 92 State Street, Boston.

Question. You bought your lime in bulk?

Mr. Andrews. In paper bags.

Mr. Sanborn. I would like to know definitely whether any one here has grown alfalfa successfully for a series of years on a hardpan subsoil typical New England hill farm. I care nothing about other details.

Mr. Nickerson. It has been my pleasure, with immense interest, to pick up alfalfa in front of my house, and never was I more surprised in my life to see the extent of those roots and the size of them. I would like to inquire how you can grow such roots naturally on anything but exceedingly deep soil. What do you consider deep soil?

A Member. I am growing alfalfa on a piece of land where the subsoil comes pretty close to the top. Nothing else grows there, it is such poor land, so I thought I would grow alfalfa.

Mr. Nickerson. How deep roots do you get?

A Member. I never dug them, but have found roots an inch through. That land was very ledgy, and I planted the alfalfa to go down after that manure and it went down, and I

raised alfalfa for ten years. I have seeded it this fall for the fourth time. I have to keep my land moving, but it has grown stronger every time, and it is ten years since I put it in first, and I never inoculated any seed until this last fall.

Dr. Brooks. I notice that the last speaker said his land was ledgy. That would hardly meet the requirements of Mr. Sanborn's description. Way down in southwestern Connecticut I have a son-in-law on a farm where the subsoil comes within a few inches of the surface, and he is having some trouble with alfalfa sown in the late summer of 1914 on a field of 5 or 6 acres, not far from his house. I walked over it with him last spring, and we picked up a great many roots where the crown was over 6 inches above the top of the ground. Alfalfa culture under conditions described by Mr. Sanborn is difficult, but perhaps not impossible if there is not stagnant water in the soil. The roots cannot live in stagnant water.

Mr. Prescott. [Exhibiting specimens of alfalfa.] That was grown on a heavy clay subsoil, with a pretty good loam. That was planted the sixteenth day of August and pulled the twenty-first day of September. It was almost 18 inches long when I picked it out. These were grown on sandy subsoil. It is not hilly. The subsoil here is first 8 or 10 inches of loam, then 2 or 3 feet of yellow subsoil turning into a fine white sand, going still deeper into a coarse white sand, and at 11 feet is gravel, with stones as big as an egg. That alfalfa has been growing on that piece of land since 1908; never had any manure since; never been fertilized with any kind of fertilizer. These here [indicating specimens] are two samples of Grimm, picked last summer, which Mr. Wheeler wanted me to bring in. I don't know why they are different in color.

I don't see any reason why we cannot grow alfalfa in Massachusetts as well as we can in New Jersey.

U. S. Bates. I came here with a question in my mind. My own experience has been very small. Until I heard Professor Brooks, I had not encountered any one from whom I could get the information I wanted. He speaks of leaf spot. I suppose that is what is the matter with my alfalfa. I have called it rot and blight. I did not begin unti two years ago. I planted a small patch of alfalfa which did pretty well, and I was en-

couraged to plant again a year ago. I put in only half an acre, but it succeeded pretty well; got a good stand; went through the winter in good shape, and up to July 1 I felt proud of it and invited people to come and see it, but then the blight struck it and lessened the yield. I am wondering what will happen next spring — whether that blight is going to destroy the whole crop. The seed I bought is ordinary alfalfa seed. I did not inquire as to the name or where it came from. I feel a great deal encouraged by the speaker's remarks. I have read all the pamphlets and bulletins and heard all the speakers that have come in my way, and they have all seemed to emphasize promptness and an exact period at which we may cut our crops. They say to wait until one-third of blossoms are out; that we must watch the little crowns at the base and not cut too early, and I had made up my mind that there must be only thirty minutes between too late and too early, and that I would have to get up from the table before I finished my dinner to go out and cut alfalfa; but now I learn from the speaker that we may take a little more time. But what may I expect in regard to my leaf spot?

Dr. H. J. Wheeler. Was that the second crop that had leaf spot?

Mr. Bates. Had it on the second and third crops; the first crop was disease free.

Mr. Jeffers. We have had some of the leaf spot, but not enough to injure a field seriously. I remember one field in particular where we had rainy weather at the time of the first cutting and were delayed about ten days getting the hay off. That field became quite spotted with leaf spot, and it showed in the next crop, but after that it was all right. We thought that was due to running on the field when the shoots were coming up, but we never had enough to be a serious trouble to us.

Mr. Sanborn has spoken of hardpan soil. Where I was born and brought up the hardpan comes up to the third rail on the fence and sometimes they have to move the fence higher to get rid of the hardpan. We have tried out alfalfa on those soils in northwestern Pennsylvania; when you get a real hardpan soil it seems difficult to get the alfalfa to stand a great

many years. I don't think alfalfa will ever grow as well on one of those hardpan soil farms as on open, porous soils where it has a chance to get the roots damp.

Mr. SANBORN. I understand roots of Grimm are not like those of other alfalfa?

Mr. JEFFERS. If the conditions are the same you will see very little difference in the root growth.

Mr. PRESCOTT. I think I forgot to mention one other thing. Punkatassett Farm, in Concord, has been growing alfalfa on a hill for eleven years. The first piece they put down eleven years ago is on a very clayey soil on a very rounding hill, and they have never had a failure in any way, shape or manner on any of the pieces that they have put down, and I think they have 7 or 8 acres now on that clayey soil which has no sign of a porous subsoil.

Dr. H. J. WHEELER. Regarding what Mr. Sanborn said, I attempted to grow alfalfa for about ten or twelve years with continual failures, all the time working with common alfalfa. After getting hardy types it has been successful. I bought from Professor Hansen of South Dakota a number of plants which I set out in 1912. All have this branch habit, and most of them throw out a number of roots, and that alfalfa has come through every winter since. I don't think a single plant has died. My suggestion would be to communicate with Professor Hansen and get some of the most hardy varieties, and I believe Mr. Sanborn can succeed on the type of soil he mentions.

In regard to this cutting of alfalfa, my experience with leaf spot has been that when it comes on badly you ought to cut that alfalfa at once, no matter whether buds have appeared or not. I would not pay any attention to the state of blooming. If it becomes very dry it may be necessary to cut before buds begin to appear in order to save the crop you have. You generally get another crop, notwithstanding that leaf spot is seen. If you will cut that off at once your next crop will probably be entirely free from leaf spot, but if you leave it you will do a positive injury to the plant. I would like to know what Mr. Jeffers thinks about that?

Mr. JEFFERS. I think Dr. Wheeler is right about that. Of course it is a pretty hard matter to lay down any fast rule.

I might have the thing in my mind and try to convey it to you and you might get the wrong impression. It is a hard matter to lay down a rule in regard to cutting. You speak of cutting within fifteen minutes of the right time. We take three weeks for our cutting, and we cut just as soon as these buds appear, and during those three weeks we don't destroy very many of the new shoots.

I want to say that one outfit — one mower, one side delivery rake, two or three wagons, and one tedder — is capable of harvesting from 175 to 200 acres of alfalfa, that is, when it is grown in a commercial way.

Mr. Bates. I have found that when I delayed my cutting on account of bad weather, by raising my mowing machine I have avoided cutting the small shoots.

Mr. Jeffers. That is good.

Dr. Brooks. I agree with Dr. Wheeler about the cutting, — the sooner the better, and in many instances the crop will come up healthier the next time; but I want to emphasize again that there is clearly a great difference in varieties in susceptibility. Last summer when one variety went bad, side by side with it, on both sides, on land treated in the same way, other strains were in perfect health, so that the selection of the best possible seed cannot be too much emphasized.

Dr. Wheeler's reference to some of Professor Hansen's varieties leads me to call attention to another matter. We get Professor Hansen's literature, and in the summer of 1914 we sent and got some of his most highly recommended double, hardy, cast iron alfalfa, and it is a miserable failure. Professor Hansen is seeking particularly for alfalfa that will grow where they don't have much loam, and none of his varieties have ever done well with us. They are hardy, they are cast iron, but they don't flourish under the conditions of our humid climate.

In relation to cultures he says you can get small amounts of culture from the United States Department. If alfalfa is new to you use a culture. That advice is absolutely sound, but I am glad to be able to announce that the Extension Service of the college will furnish culture in any amount you need. The charge is a merely nominal one of 25 cents.

I want to refer to a remark made by a speaker in regard to using cultures for clover. I don't believe there is any benefit connected with it. I want to call attention to what clover will do without cultures — without any nitrogen applied to the soil. We don't want to forget in our enthusiasm for alfalfa that clover is still a mighty good crop. We have one field where no nitrogen has been applied to the soil for twenty-five years. That field was in clover last year. In 1913, in the spring, this clover was sown with a thin seeding of oats, and the crop in two cuts, on a plot to which no nitrogen has been applied in any form for twenty-five years, and on which no green manure has been grown and turned under, and without any culture, but with plenty of acid phosphate and potash, amounted to 4.27 tons of well-made hay. On a plot adjoining this where we applied nitrogen every year in addition to the same amount of acid phosphate, potash and lime, the crop was actually a little bit less than it was where we had not applied any nitrogen, — a fact of extreme significance. This shows very clearly that you can raise the best of all forage without nitrogen and without green manure.

Mr. Prescott. I wanted to ask Mr. Jeffers if he thought 75 pounds of nitrate of soda was sufficient to start an alfalfa field with?

Mr. Jeffers. Yes, we feel that it is. I have seen a number of fields started this year and last that were established with nothing but acid phosphate and ground stone, — 4 tons limestone and 350 pounds acid phosphate.

We have one field near us of 50 acres which was established without any nitrate of soda. I think a little nitrate, though, helps the crop along.

While the alfalfa growers' meeting was taking place in the lower hall the meeting in the main hall was called to order by Mr. P. M. Harwood, general agent of the Dairy Bureau, who introduced Dr. Charles E. North of New York City. Dr. North delivered an address on "The Grading of Milk as a Substitute for Dairy Inspection."

THE GRADING OF MILK AS A SUBSTITUTE FOR DAIRY INSPECTION.

CHARLES E. NORTH, M.D., DIRECTOR, THE NORTH PUBLIC HEALTH BUREAU, NEW YORK CITY.

The title refers to the control of public milk supplies through legislative enactment. Dairy inspection is a function provided for in most State and municipal milk laws, and its general possibilities and activities are familiar to all who are engaged in the milk industry or in official control of the same. Irrespective of the standards, whether by the use of score cards or otherwise, dairy inspection assumes that inspectors acting under the direction either of State or municipal departments will periodically visit certain dairy districts and report on the sanitary conditions which they observe on dairy farms or in the stations established by the industry for shipping or receiving milk. In this work the emphasis is laid on the dairy and the external appearances which can be observed, not only with respect to buildings and equipment, but with respect to the methods used by dairy employees. Such inspection gives no consideration to the product itself, which may be termed the net result of the work of the dairy industry.

In contrast with this, a new form of legislation has been devised which may be summarized in the expression, "the grading of milk." This grading refers to the separation of the product into several grades, according to the sanitary character of each. It is recognized that there may be innumerable degrees of excellence between the most unsanitary and the most sanitary milk produced, but for practical purposes it is sufficient to establish arbitrarily only two or more such divisions. The merits of the grading system do not appear until one fully appreciates the evidence which now exists showing the remark-

able results which can be achieved, even in ordinary dairies by the rank and file of dairy farmers, in the production of milk of the highest sanitary character.

The first step in sanitary milk production must deal with the dairy cow herself. The process of milk manufacture consists in the transformation of the raw material, which is the food consumed by the dairy cow, into the finished product — the milk. This is done through the absorption into the blood of the cow of certain products supplied by the digestive organs. The circulation of the blood carries these materials to the cow's udder and distributes them through all parts of the udder by the subdivision of the arteries into a network of fine branches. The udder itself is an instrument called a gland, which is of such a spongy texture that it is subdivided into numerous small pockets or cavities, all of which empty into channels or canals. These pockets are lined with numerous cells, which are small units of animal matter capable of abstracting from the blood the materials necessary for the formation of milk, and discharging these into the milk canals. In the performance of this act much of the animal matter lining the walls of these canals is destroyed and broken off, so that in addition to the milk flow itself there is a constant shedding of the tissues lining the udder, composed of the finest particles of animal matter, which flow away in the milk. Many of these consist of the white blood cells which flow in the blood, and find their way through the walls and canals into the milk. When the sediment from the milk of a healthy cow is collected by the use of a centrifuge such as a clarifier, under the microscope these cells which have been shed from the walls of the udder can be plainly seen. When the udder of a dairy cow is inflamed the appearance is remarkably changed, showing these cells blurred and in the process of destruction mixed with large numbers of bacteria and often the bacteria can be seen clustered within the bodies of some of the white blood cells, which are actually engaged in their remarkable duty of devouring the bacteria of disease. Such inflammation of the cow's udder is extremely common, and can be found present in the majority of large dairy herds. In producing sanitary milk the farmer must begin by the elimination from his herd of all cows having sore udders,

in addition to other precautions concerning the health of his cows.

Modern control over milk has as its chief basis the bacterial testing of milk. There has been some unnecessary mystery concerning the bacterial testing of milk, especially in the minds of milk producers. As a matter of fact, such tests are rather simple. The various steps can be easily mastered by any bright high school boy or girl. Milk samples must first be taken in properly sterilized sample bottles. These are usually of small size, so that a large number may be conveniently packed in a sampling case and surrounded with cracked ice. To make bacterial testing of practical value to the milk industry it is necessary that the work shall be done on a large scale, and numerous samples tested in a short period of time. This can be done only by instituting the most efficient and simple methods for laboratory work. The milk samples and glassware for testing should be arranged on long tables, high enough to permit the work to be done in a standing position. The operator first shakes the milk sample thoroughly to obtain a perfect mixture. A portion is then drawn up in a small glass tube, called a pipette, to an exact mark measuring 1 cubic centimeter, or about one-third of a teaspoonful. This is then injected into a bottle holding 99 cubic centimeters of sterilized water, which gives a dilution of 1 per cent. The mixture of milk and water is then thoroughly shaken. From the bottle of mixed water and milk a sample is then drawn in a sterile glass pipette to an exact mark amounting to 1 cubic centimeter, and discharged into a small glass dish, called a petri dish, which has been previously sterilized. Upon this is then poured a jelly paste of agar, which is a Japanese seaweed mixed with a beef-tea solution of proper strength. This jelly must be carefully mixed by shaking the dish with the dilution. In a few moments it will harden in the bottom of the glass dish, thereby fixing fast in the jelly all the bacteria which may be in the milk. The dish is then placed in a hot closet, called an incubator, at the same temperature used for the incubation of hens' eggs, where it remains for a period of two days. When first placed in the hot closet the appearance of this glass plate is perfectly transparent. If, however, bacteria are present in the milk, at the end

of two days the plate will show a decidedly spotted appearance. These spots may be very fine or very large, according to the kind of bacteria present. Where each speck of dust or dirt or individual bacterium was present a growth will take place. This corresponds in its nature to the growth observed so frequently when the housewife puts up jelly and through some mistake fails either to boil it thoroughly or properly cover the top. What has actually happened is that the laboratory worker has planted a little garden, using the jelly as soil and the bacteria in the milk as seeds. Bacteria are really tiny plants or vegetables, and grow readily in such soil as this jelly. It is not necessary to use a microscope, but the resulting growth can be readily seen with the naked eye. By counting the number of spots one estimates the number of bacteria originally in the milk.

This bacterial testing has been so perfected that it now furnishes a measure of the sanitary excellence of milk. Where milk has been produced in a clean manner and is fresh the number of bacteria will be very small, sometimes as low as 100 or even less per cubic centimeter (one-third of a teaspoonful of milk). On the other hand, where milk has been produced in an unclean manner or is stale these numbers may run into millions. By the use of this test it is possible to divide milk into several grades, according to the numbers of bacteria which it may contain. The question now is, how good is it possible for the average milk producer to make milk, and what division should be made in establishing such grades?

Milk inspectors are accustomed to condemn dairies which have barns surrounded by trash and filth, and which have cow stables in which floors and walls and ceilings are dusty, covered with cobwebs and accumulations of cow dung. Because of this, twenty-five years ago it was commonly believed that only by the establishment of the most model sanitary cow stables was it possible to produce clean milk. This belief led to the widespread establishment of certified dairies, in which no expense was spared to make the cow stable a model of sanitary excellence, with cement floors and plaster walls, iron stanchions and a complete lighting and ventilating system. Cows in these dairies are groomed twice daily just as carefully as horses are groomed.

The writer acted as manager of a model dairy of this kind for

a period of five years. On the same premises was an old-fashioned cow barn used as a place for the temporary residence of dairy cows newly purchased. Some of these would be in milk, and consequently it was always necessary to have some milking done in this old cow stable. This was done by a milker, who transported his sterilized milk cans and covered milking pails back and forth in a wheelbarrow. The milk from this old dairy barn was tested in the bacteriological laboratory, and showed that even under the existing primitive conditions it was possible to produce milk with exceedingly small numbers of bacteria, comparing favorably with milk produced in the sanitary barn. The actual figures for the year 1913 were a monthly average of 3,102 bacteria per cubic centimeter for the old stable, and 1,097 for the model sanitary barn, both of these figures being well within the limits of the standard established for certified milk, which is 10,000 bacteria per cubic centimeter.

This experience was convincing evidence that by the adoption of the simplest sanitary methods clean milk can be produced in ordinary cow stables, and led the writer to undertake to produce large volumes of such milk under commercial conditions.

The first opportunity to do this occurred when the city of New York demanded clean milk at low cost for the use of infants in the tenement house districts, which was to be distributed through municipal milk stores. These stores were at first established by the New York milk committee to the extent of 31, and later were taken over by the city, and at the present time number 55. The milk for these stores is produced at a large shipping station in the village of Homer, New York, 260 miles away, where 71 dairy farmers have been trained to observe the fundamental sanitary precautions necessary for clean milk production, which they do in return for the payment of a small bonus or premium above the regular market price. The milk is all sent in 40-quart cans to a central shipping station located on the railway, where, as the cans are poured into the receiving tank, samples are taken daily by the local bacteriologist and tested in the laboratory in the shipping station. The results are posted on the bulletin board, and the system of payment to the farmers is based on the tests thus made of

this milk. These regular tests furnish a measure of the sanitary character of the milk. The system of payment offers a bonus of 10 cents per can above the regular market for all milk containing less than 10,000 bacteria per cubic centimeter. The stimulation of this bonus has been sufficient to transform all of the milk into this high grade.

The use of a small-mouthed milking pail is a primary factor in securing these results. When one considers that nature has made arrangements whereby each little calf obtains certified milk daily under all sorts of conditions because the milk is protected in the process from external contaminations, it is obvious that the use of a small-mouthed milking pail brought close to the dairy cow can in a similar manner prevent the contamination of milk during its transfer from the dairy cow to this receptacle. In a short time the average milker can readily learn to milk into a milking pail with a mouth only 5 inches in diameter.

An inspection of the 71 dairy barns at Homer, New York, shows them to be of the most ordinary type. In some of them milk is produced containing even less than 1,000 bacteria per cubic centimeter. The score of these dairies, made by a representative of the United States Department of Agriculture, showed that many of those which scored the lowest are producing milk containing the smallest numbers of bacteria.

At this Homer station more than 10,000 quarts of milk are produced and bottled daily for the use of the infant milk depots in New York City.

The writer established a similar shipping station at Sparks, Maryland, for the shipment of milk to Baltimore. Here 28 Maryland farmers were producing over 3,000 quarts of milk daily. The conditions on these dairies were much inferior to the conditions in New York State. The majority of the barns have dirt floors, and the work is performed by negro help. The milk as brought to this station is regularly tested for bacteria by a high school boy, who takes samples daily, and makes his tests in the little bacteriological laboratory established in the local high school. Some of the dairy barns at Sparks are over two hundred years old, very badly lighted, and practically without any of the sanitary features required by dairy inspectors.

Nevertheless, the records of the bacterial test show that farm after farm has experienced a progressive reduction in the numbers of bacteria through the observance of simple sanitary precautions. The mixed milk at this station contained in the month of December over 5,000,000 bacteria per cubic centimeter, while in the month of April, due to the installation of the laboratory and the stimulation of the bonus offered, the bacteria in the mixed milk were less than 50,000 per cubic centimeter.

At Oxford, Pennsylvania, the same milk-producing system has been established. Oxford is a very large milk-shipping station to which 98 dairy farmers bring their milk for shipment to Philadelphia. It was not possible immediately to transform such a large group of farmers into clean milk producers. They were, therefore, divided into two classes, 63 of the producers going to one door in the shipping station called the "Grade A department," and the rest of the producers bringing their milk to another part of the building, called the "Grade B department."

In this station the bacterial tests are made by a young lady who was formerly the district school teacher, and who was trained by the writer in making these tests. The stimulation of the tests and the bonus acted with such force on these producers that in a short time all of them graduated into the "Grade A department." The records of individual farmers taken from the laboratory books show in a remarkable manner the reduction of bacteria from many millions under old methods down to a few thousand, and even less than 1,000, as a result of the adoption of new methods.

On one of these dairy farms, in particular, having in the cow stable a ceiling composed of poles, between which the hay overhead hangs down, and with a dirt floor, and with only two tiny windows for lighting, and without any regular cow stanchions, is a barn in which the producer is able to furnish milk containing at times even less than 1,000 bacteria per cubic centimeter. On these same premises this dairyman produced milk which took second prize and a silver cup at the Philadelphia Milk Show, in competition with milk from many model dairies.

The samples taken from the mixed milk of all of these farmers at Oxford show that on October 1 there was a great

reduction in the numbers of bacteria. Whereas before that date the bacteria in the milk had been running in many millions, after that date they were reduced to a few thousand. October 1 is the dividing line between high numbers and low numbers of bacteria. It happens that this was the very date on which the milk dealer offered to pay a bonus to the producers for extra care, and for milk coming up to the bacterial standard of 25,000 bacteria per cubic centimeter. It is impossible to look on these figures without being satisfied that the offering of this bonus was the chief factor in securing results. In other words, the dairy farmer can and will secure results if he is paid for his work.

As a further demonstration of the possibilities of producing clean milk under the auspices of the rank and file of dairy farmers, the writer undertook the following experiment. Ten of the dairy farmers at Oxford, who had been trained for one year in sanitary methods, agreed to accompany the writer to another dairy district and perform the milking operations in strange dairy barns. Precautions had been taken previously to test the milk produced in these other cow stables, which were located at a place called Kelton, Pennsylvania. The laboratory tests of the milk obtained from these dairies showed that it was running very high, containing often millions of bacteria per cubic centimeter. No preparations whatever were made for this test, it being understood that the only changes would be such as the Oxford farmers could themselves bring about on the afternoon of the experiment. When the day arrived the ten Oxford farmers took the train with the writer from Oxford, and on arrival at Kelton, in company with the Kelton producers, drove out to the ten Kelton dairies where the experiment was to be performed. Each Oxford farmer took with him one small-mouthed milking pail. On their arrival at the Kelton dairies the Oxford men took charge of the milking operations, and carried out such sanitary precautions as they were able to perform during the period of milking. In this work they used the same barns, the same cows, the same cooling apparatus and the same milking utensils, with the exception of milking pails. The milk was left in the Kelton dairies over night, and samples were not taken

for bacterial testing until it was delivered at the shipping station the next morning. The results of these tests showed that, whereas in these dairies for the previous six days milk containing millions of bacteria had been produced, the Oxford men were able in one afternoon to produce milk containing, in nine out of ten cases, less than 10,000 bacteria per cubic centimeter.

This seems to be an emphatic demonstration that the man himself is the chief factor in clean milk production. It also shows clearly that it is possible for the rank and file of dairy farmers to furnish milk which is of a very high degree of sanitary excellence, and can conform to a bacterial standard almost as severe as that used for certified milk.

The pasteurization of milk is something that should be endorsed by milk producers, simply because it furnishes a life insurance to the consumers as well as to the milk industry. Nothing is more fatal to the milk dealer's or the producer's financial interest than an epidemic of disease caused by bacteria in milk. No degree of veterinary inspection of cattle, or medical inspection of employees, can entirely protect milk against sudden outbreaks of typhoid fever, scarlet fever, diphtheria and sore throat. All of these bacteria, and even those of tuberculosis, are killed by a temperature of 145° F. for a period of thirty minutes. This can be done without the destruction of any of the food value of milk itself. Pasteurization adds great stability to the milk industry, and should be approved by the producer for financial reasons, if for no other. As a matter of fact, pasteurization can be adopted to advantage even on the dairy farm itself, especially where milk is to be used for infants or children. This can be done by the operation of a small-sized home pasteurizer, using the heat from a kitchen stove. Such machines can be purchased from dairy supply houses, and, in many instances, are effective in preventing an outbreak of disease among children.

We have completely passed the experimental stage in methods of sanitary milk production and pasteurization. It only remains to create a demand for clean and safe milk in our city markets. Such a demand cannot be made effective by the milk dealer himself, for the reason that the public refuses to accept the milk dealer's statements as to the character of the

milk which he has to sell. The only way in which public confidence can be established in a matter of this kind is through the action of the public health authorities. A National Commission on Milk Standards, composed of twenty of the leading public health authorities on milk, has been nominated and financed by the New York milk committee. This commission, after four years of deliberation, has recommended that market milk be divided into three grades, which are identified by the capital letters, A, B and C. "Grade A milk" is the title given to the best milk. Under this grade is included raw milk from tuberculin-tested cows, produced and handled by employees under medical examination, in sanitary dairies, conforming to a standard of from 10,000 to 100,000 bacteria, which is milk corresponding in character to certified milk, and selling for from 15 to 25 cents per quart. But, more important than this, under this same grade is a pasteurized milk which has a standard of from 30,000 to 200,000 bacteria per cubic centimeter before pasteurization, and 10,000 after pasteurization. This milk is more important because it can be furnished to consumers at not more than 10 cents per quart, and it can be produced in ordinary dairy barns. This "Grade A pasteurized milk" is destined to be the household milk of the future. It is the milk upon which the dairy industry is destined to build a new business. This is the milk which will be furnished by the rank and file of dairy farmers, and in the production of which they can secure higher prices.

Already on the New York City market there is for sale over 150,000 quarts per day of this "Grade A pasteurized milk," which is now retailed by practically all of the large milk companies selling milk in New York City. There are 34 shipping stations producing this milk for the city of New York. The State of New York has passed regulations of the same kind, grading the milk supply of the entire State into three grades. The cities of Jersey City and Newark, New Jersey, and Richmond, Virginia, have adopted similar regulations.

This clean milk business has advanced so rapidly that it is the most remarkable event that has occurred in recent years in the dairy business. There is more profit for the milk producer and for the milk dealer, and better milk for the milk consumer.

Quality and price seem to have met, so that at 10 cents a quart we have here the highest milk value at the lowest possible price. Milk producers should, therefore, be heartily in favor of the grading of milk, because it means more money for the farmer at the expenditure of such a small amount of his time that the bonus received is almost clear profit.

The writer has often been asked just what the dairy farmer does to produce Grade A milk. Out of the very long list of sanitary precautions, there are eight which have been selected as of primary importance. If these eight precautions are observed, any milk producer will be successful in sending milk to the shipping station which contains less than 10,000 bacteria. These eight sanitary precautions are as follows: —

1. Use small-mouthed, covered, milking pails.
2. Keep cow's udders clean.
3. Milk with dry hands.
4. Sterilize pails and cans and all other utensils with an abundance of boiling water.
5. Beware of milk strainers. Use only cheese cloth, washed and boiled before each use.
6. Beware of open coolers. Cool night's milk, winter and summer, by placing cans in tanks of cold water, ice water, or running water preferred.
7. Beware of wooden paddles or stirring rods. Use only metal stirring rods scalded before using.
8. Pay a bonus to hired help based on bonus earned by the milk.

Mr. Taylor. I would like to ask Dr. North the relative value, in his opinion, of pasteurized milk as compared with raw milk?

Dr. North. I look on pasteurization as something worth a whole meeting. If you want to know how I feel about it, I believe that all milk ought to be pasteurized. We are now getting ready a bill in New York City to compel the pasteurization of certified milk in addition to the pasteurization of all other milk, for the reason that in 20 of our certified dairies which have been recently tested it was found that 50 per cent of the cows reacted. You know what happened to the largest certified dairy in America last year, — something like 257 out of 600 cows reacted with tuberculosis. I want to say that I believe heartily in pasteurization, and I believe that the dairy farmers of Massachusetts could not do any one thing

that would increase the sales of their milk and give them such a steady market and a guaranteed market as to be in favor of pasteurization, because it is the only life insurance the industry has got. No man can tell what day his industry will be ruined through an epidemic, and I have been surprised that the dairy farmers have been so shortsighted as to think that the pasteurization of milk was antagonistic to their industry. If you will talk to men in New York who are familiar with this operation they will tell you that nothing so increases the sale of milk and gives it such a solid foundation as this little finishing touch that can be put on milk irrespective of its sanitary character. We want it as clean as we can get it, and then we want it guaranteed against disease.

Mr. Nickerson. I would like to ask Dr. North, for the producer who sells his milk at retail, who disposes of it all within fifteen or sixteen hours from the time it is produced, whether pasteurization is needed? I produce about 200 quarts myself, and the pasteurization of that, I think, would probably be prohibitive, and I want to ask whether it is as necessary as it is where it is shipped to cities and is a few days old, because there are a large number of us in this State who sell our own milk straight from our own dairies, and no other.

Dr. North. Small and inexpensive machines are now made to pasteurize such a small quantity as 200 quarts and even less, so that any producer and dealer can pasteurize milk on a small scale at very small expense, and it seems to me that even in a business of that size, where the milk is fresher and has not been subjected to the multiplication of bacteria that comes with age, nevertheless it is exposed to a cow that may have an infectious disease; it is exposed to an employee who may be a typhoid carrier or a diphtheria carrier any minute; and I have personally investigated numerous epidemics of this disease — I need only mention Poughkeepsie, in which we have 500 people down from scarlet fever traceable to one dairy farm infected by one employee who only had a sore throat, as he called it, and the city of Poughkeepsie was subjected to a terrible epidemic caused by men who did not believe in pasteurization and by boards of health who did not believe in pasteurization; but they all believe in it now.

Mr. NICKERSON. I am chairman of the board of health of my town. Now one question was asked about the boards of health; I am going to say here publicly that if you do not like your board of health and they do not use you right, get rid of them; you can do it, there is no trouble at all; you go to the voters, to the people in your town, and show them they are not doing right, and they will fire them. They did it in our town and I had to take the job. I didn't want to, but I was in the fight and I took it. I simply say this as a byword. I was against pasteurization. I thought that it spoiled the milk for children. In attending these lectures I heard Dr. North at the Grange and was very anxious to hear him again, because I wanted to get it thoroughly drilled into me. If we can pasteurize as small dealers, I think it is a good thing, and I wanted him to bring it out. I believe, as I go more into health matters, as I am obliged to now, that we can get rid of a lot of these epidemics.

Mr. BIXBY. In pasteurizing the milk, does that not have some effect on its digestibility? Isn't it harder to digest?

Dr. NORTH. We are feeding 21,000 babies a day at the infant milk depots in New York City. I have charge of the production of that milk; it all comes from this Homer station. When we first started feeding these children at these milk stores that question which you asked was uppermost in the minds of the doctors and nurses, because all of the milk now pasteurized was at first raw, at their request; they told me they could not use pasteurized milk for the feeding of these babies because it would upset their digestion. Three months went by and I produced this raw milk in those 29 tuberculin-tested dairies, and at last I was called up by some of the creameries who said that "an epidemic of diphtheria has broken out among our producers and three of our farms have got diphtheria. What shall we do?" I said, "Turn on the pasteurizer," which I had fortunately installed. The doctors in charge of these babies had told me that it would upset their stomachs, particularly if they were changed from raw to pasteurized milk. I knew we were going to have a terrible upset in New York City among the digestions of these children. Five days went by and I waited for the reports to come in to

my office of the stomach troubles all over New York City. No reports came in at all. At the end of the fifth day, I thought to myself that I might be unpopular with the doctor if he heard there was diphtheria up there, so I called him up and said, "We have got diphtheria among our dairy farmers; what shall we do?" He was very much excited, and said, "I guess you will have to pasteurize that milk." I said, "Won't that upset the babies?" He said, "Yes, but the doctors and nurses will have to take precautions in order to tide them over this change." I said, "Doctor, you have been getting pasteurized milk for five days at all these stations." None of the babies noticed it, none of them, and I will tell you why. Pasteurization to-day is very different from what it used to be. We are using low temperatures; we are heating up to only 145 degrees. In the old days they used to heat up to 158 or 165, and the milk used to be altered somewhat in its composition. To-day the chemist cannot find any alteration; at 145 degrees it is just hot enough to coagulate the bacteria substance and destroy the life and the vitality of these germs. That was four years ago, and since that time the pasteurizer has never been turned off. We have got 55 stores and a doctor and nurse attached to each one, and overhead supervision by supervising doctors and nurses, and the whole crowd were against pasteurization at first. Now they are all unanimously in favor of it, and why? They cannot find rickets, they cannot find scurvy; they find a constant increase in the weight, and more than all, the death rate in babies has gone down from 137 five years ago to 94 per thousand of all babies born.

Mr. Bixby. I would like to ask how we are going to be sure that that pasteurization is done right.

Dr. North. That is a matter that takes its place along with any other guarantee that you get by legislation or public health supervision in Massachusetts. You have got to put this matter in the hands of reliable people, and I take it for granted you have such people up here. We think we have reliable supervision in New York City of our pasteurization. The law of the board of health defines pasteurization very clearly and definitely. They have automatic machines in all the pasteurizing plants, which record the temperature and the

period of time during which the milk is heated, and these report blanks are regularly placed in the hands of the board of health, and none of the operators can tell what minute the health inspector is liable to come in and supervise the plant. We have found it very practical not only to supervise the raw milk but also the process of pasteurization.

Mr. BIXBY. If the raw milk is clean, is pure, is free from disease and is guaranteed that way, isn't that raw milk better than pasteurized milk?

Dr. NORTH. The raw milk is not guaranteed free from disease by anybody. No health officer assumes that he is able, by any amount of supervision, to prevent accidental disease from the cow or accidental disease from the dairy employee, and it is because no veterinarian can tell when a cow is going to have an udder inflammation, and no physician can tell when a dairy employee is going to have a throat inflammation, that we have to pasteurize.

Mr. POLK. I want to ask what the cost would be to a farmer to pasteurize milk.

Dr. NORTH. Well, I know of one machine that he could get for $50 that would handle the thing in first-class style.

Mr. Polk. And the farmer could do the work himself?

Dr. NORTH. Yes. And I have seen some home-made machines that did not cost more than $10, in which a man did it at home.

Mr. RICHARDSON. How much does it cost for operation?

Dr. NORTH. The cost for operation of course depends on the volume. The large milk dealers of New York have estimated the cost of pasteurization at anywhere from a quarter of a cent, which is the highest I have ever heard them say, down to a tenth of a cent a quart, which is the lowest I have ever heard a large dealer say. It is only a question of the farmer's expenditure of his own time in pasteurization and the cost of the steam heat or hot water, as the case may be.

Mr. POTTER. I should like to ask the doctor if pasteurization would not stop the spread of tuberculosis among young cattle.

Dr. NORTH. In Denmark they have a law requiring the pasteurization of all skim milk returned from creameries. That was

to protect the pigs and calves from contracting tuberculosis from some other man's cows, because the skim milk is naturally a mixed skim milk. Last year some of us tried to introduce a bill in New York State demanding the pasteurization of all skim milk returned from butter and cheese factories to dairy farmers. Now there is nobody more an advocate than I am of the granges, and yet we were met in the Legislature at Albany by the farmers themselves who opposed this bill to pasteurize skim milk, and they were misled by the owners of the cheese factories who did not want to go to the expense of putting in pasteurizing machinery. They did not recognize, as you do, that the protection of the farmer himself, the protection of his own stock against tuberculosis, can be achieved by the pasteurization of this skim milk at the factory.

Mr. Charles A. Upper. This has been exceedingly interesting to us consumers, and I would like to ask this question, — can we not utilize trolley freights to bring milk to the city?

Dr. North. I don't know enough about your geography to answer that question. I know that the trolley is extensively used in certain parts of New York State, notably Cooperstown and Richfield Springs and other districts where the farmers put their milk on a trolley, and I don't see any reason why in New England the trolley cannot be developed as a milk carrier.

Mr. Bradley. I would like to ask if the matter of pasteurization is not largely to cover up the dirty milk. I know that in my own city there is a sentiment among consumers that the matter of pasteurization is to cover up the dirt of the man who is not clean, and there is a sentiment against pasteurized milk on that account.

Dr. North. That is the oldest argument against pasteurization and it is a very good argument, and the argument is based on the fact that when pasteurization first became practical many milk dealers did abuse it to make marketable milk that otherwise was not marketable. We feel that this grading system is a complete answer to that objection, because just as soon as you divide your milk into grades according to the sanitary character of the raw material, irrespective of pasteurization, the process of pasteurization becomes a process you can apply to any milk, but the pasteurizing of the milk does

not decide the grade at all; the grade is determined by an examination of the raw material, and then the consumer and dealer can pick and choose his quality and price according to the sanitary character of the raw material.

Mr. Hoyt. A producer near me has asked this question, — if milk is pasteurized in bulk, can it be contaminated after it is pasteurized?

Dr. North. That is a very common circumstance, to find that pasteurizing milk in a big tank or in large quantities does not guarantee that after it is pasteurized it may not be injured during the process of cooling or during the process of bottling, and sometimes through the process of putting on caps. I remember one epidemic of typhoid fever in New York City which was said to be caused by the man who put the caps on with his fingers, who was a typhoid carrier, so that although the milk was pasteurized very thoroughly, it was contaminated afterwards; and do you know that some of the men who opposed pasteurization actually thought that was a good argument against pasteurization, entirely forgetting that this milk would have been contaminated by the man who put the caps on, whether pasteurized or not, so you cannot say that it is an argument against pasteurization because milk can be recontaminated; so it can if it is not pasteurized finally. By the way, all beer is pasteurized. I do not suppose you know that, but all beer is pasteurized in the finished bottle after it has been bottled, and I think that finally milk will be pasteurized in the same way, but until we can get a machine which the dealers will accept to pasteurize it in the bottle, I think the best we can do is to pasteurize it in bulk and bottle it afterwards.

Mr. Bixby. After it is pasteurized, will not milk take disease quicker than before? Don't you kill the good germs so that they can't knock out the bad ones?

Dr. North. No sir.

Afternoon Session.

The conference of breeders of dairy cattle which was scheduled for the afternoon session was called to order at 1.30 P.M., with Mr. George E. Taylor, Jr., in the chair.

Mr. Taylor introduced Mr. C. M. Winslow of Brandon, Vermont, secretary of the Ayrshire Breeders' Association, who spoke on Ayrshire cattle. Mr. Winslow was followed by Mr. W. H. Caldwell of Peterboro, New Hampshire, secretary of the American Guernsey Cattle Club, who spoke on "The Merits of the Guernsey." Mr. Caldwell was followed by Mr. R. M. Gow of New York, secretary, American Jersey Cattle Club, who spoke on Jersey cattle. Mr. Gow was followed by Mr. W. S. Pratt of Brandon, Vermont, secretary, American Shorthorn Breeders' Association, who spoke on Shorthorn cattle.

In the absence of the secretary of the Holstein Breeders' Association, Mr. J. C. Poor of Andover presented the merits of the Holstein breed.

The breeders' conference was followed by the annual meeting of the Massachusetts Dairymen's Association.

While the dairy meeting was going on in the main hall Mrs. Sarah Tyson Rorer of Colebrook, Pennsylvania, spoke in the lower hall on "Domestic Science Teaching in Rural Districts."

DOMESTIC SCIENCE TEACHING IN RURAL DISTRICTS.

(MRS.) SARAH TYSON RORER, COLEBROOK, PENNSYLVANIA.

In 1877 and 1878 the women's clubs of Boston and Philadelphia decided that the United States needed what England had already established, — schools of cookery. These schools were crude but practical. The New Century School in Philadelphia followed the Boston school; both were under the care and guidance of their respective clubs and supported by private contributions. Miss Juliet Corson of New York had done a tremendous amount of pioneer work, following the methods of Professor Blot and Miss Dodd. In many of our large cities her thoughts and aims were directed entirely toward the betterment of the homes of the poor. She was my preceptor, and a most remarkable and misunderstood woman, but her earnestness and honesty made a great impression on all of her pupils, especially myself. She proved to me that cookery was not drudgery — it was the occupation of educated women because it was the building material for human beings.

After much hard work on the part of the clubs and the pioneer teachers we were able to secure rooms in a few of the public high school buildings for school demonstrations. These were supported by the clubs. The lessons, to save expense, were necessarily short. The work was really not practical. For instance, a child in the morning class would draw half of a chicken, and the remaining half would be left for a pupil in the afternoon class, thus saving the expense of two chickens. The little "housekeepers" were taught, in groups of four, to sweep and dust the schoolroom, which was in no way applicable to the home kitchen they knew; nor was there in this teaching the slightest attempt to improve either the architecture or the

cooking of the home kitchen. School cookery and home cookery were from the first not interchangeable, nor were the pupils urged to use the school cookery at home.

The idea of cookery in the public schools grew rapidly, but to convert the taxpayers and the boards of education to this new idea we had to make it very academic, and this at once robbed it of its practical aspect. In the end it dwindled down to the immediate establishment of training schools for teachers of domestic science. These teachers in the majority of cases were young and untrained in the practical science of housewifery; they naturally leaned toward the theoretical work, and many of the reformers who were interested in the movement forgot that domestic science was the training of women for motherhood, and that many of the girls were expected by the taxpayers to be trained for their life occupation.

The system as founded was not intended to make prodigies of learning of our children. Public schools cannot teach everything that is desirable to know, but as long as it can be said that public school domestic science classes do not give instructions of value to the child for home work, the public school is not doing its best nor doing that for which we are being taxed.

The proof of these statements is found in the fact that in all these years of domestic science nothing remarkable has occurred in our clumsy system of housekeeping. We find, especially in many of the country districts, the same old-fashioned kitchens with their heavy iron utensils, earthen bowls, wooden washtubs, used with the same old methods that were in vogue in our grandmother's day. In some parts of the United States the railroad companies send practical home women in private cars to country districts to show the housewife how best to save the vegetables and fruits that she has grown and which would otherwise be thrown away. But these methods, as far as I have observed, lack instructions in systematic work which should be done in the average kitchen. It still means a "canning day," and canning should be done when one must necessarily be in the kitchen looking after other work.

Expensive apparatus does not mean efficiency. The conversion of a workable plain kitchen into an expensive kitchen

laboratory is not practical for the masses, and it is the homes of the masses that make the best citizens for the country.

The health and happiness of the family corresponds to the ease with which the housewife accomplishes her daily tasks. Home life is uplifted and made ideal only through the knowledge of the mother backed by the bread-winning capacity of the father. I contend that the public schools of this country are in a great measure responsible for both.

One drawback in the urban districts is a lack of buildings, and teachers who really know how to teach. Both, of course, mean a little more money spent on schools, but why not, — the children of to-day are the men and women of to-morrow, and as we build our children so the men and women. And this also means less crime, fewer houses of correction and a marked decrease in all forms of disease and degeneracy. As it is now, we rush our children through, crowding into a few school years a lot of educational fads — dreams of honest but impractical reformers.

My belief is that all domestic science teachers who teach girls over twelve years of age should have a practical training in the management of a house; they should know considerable about architecture, sanitation, the buying of food supplies, construction of stoves, scientific laundry work, and, if necessary, should be able to tell why the chimney smokes, how to install running water and adjust or regulate the pump; they should be skilled housewives before they enter the teaching field. Teachers in medical schools are as a rule practical physicians. Teachers in schools of domestic science should be practical housekeepers.

Books are valuable in a way, but no one ever learned the art of living without observation and practice. Who would employ a book-learned physician?

Most of the literature on domestic science is superficial, written by people who have no practical knowledge of work: theories are intermingled with everyday needs.

The agricultural schools in the various States have been able to reach the agricultural men, and they have improved in their methods of farming. Why not help the wives to a better way of doing their work? Why not teach them how to use a few

labor-saving machines in a systematic way? How can we expect our boys and girls to stay on the farms unless we make them attractive, and rid ourselves of unnecessary drudgery? The farmer too often narrows the life of his wife and children by his agricultural success. The "stock" is ever uppermost in his mind. He pushes in one direction at the expense of his family — and frequently awakes too late to correct his mistake. His children have gone to more pleasant surroundings, and his wife is simply worn out.

The district schoolhouse should be the center for this work; a small room should be fitted up like a home kitchen with apparatus simple and practical, such as the majority can obtain.

I fully realize that to change all this is a gigantic undertaking, but we have spent millions in agricultural training, why not spend an equal amount on housewifery?

The best and most effective thing I ever did was in the country districts of Canada, where I carried my utensils in a hat box and used plain boards rested on boxes for tables. It is not so much the utensils as it is the woman behind the utensils, but all these questions must be settled by women. While men and women are eternally equal they are eternally different, and our wrongs cannot be righted through the eyes of men, because they do not see things in our light.

Women as a class are not progressive; men are. We are not so much to blame, for we never have had the opportunity to study the mechanical arts that are ever before the men. But the question of domestic science in the country districts must be settled. Are we to go on drudging all our lives? Are we not to be taught the better ways? I hope to see the day that every housewife will give up her broom and dust brush, her scrubbing brush and washboard, and use the better modern appliances that are inexpensive. I hope the cooking of special fancy dishes will give way to simple and attractive foods; company meals to be unheard of, the true hostess placing her guests at the family table without change of food. I hope to see the hostess as free from care during the meal as her guests. I hope to see the woman without a maid learn how to serve a meal in an easy, hospitable way without apology.

I fully realize the importance of the work done by the domestic science teachers. They have in most cities removed the idea of drudgery from the kitchen, and in many places have improved the kitchen architecture and furnishings; but this teaching must not be restricted to certain districts — it must be universal, and for this reason I feel that we are now at the parting of the ways.

I should establish these schools after the fashion of the State tubercular dispensaries — a resident teacher, with lectures and practical work two days each week, and three days to go from house to house helping and suggesting, according to the needs of each housewife. All should be taught economy.

Women as a rule are not wilfully extravagant; in the majority of cases it is sheer ignorance and lack of knowledge of how to use materials. The profession she has undertaken is not one for which she has been trained. The average country mother shields her daughter unwisely from all the unpleasant work that she has done in the kitchen. The daughter is allowed to go to school unhampered; in fact, if she were the daughter of a queen in many instances she could not lead a more idle or more luxurious life. After high school she probably enters college, where she is allowed to take as her major any subject that suits her fancy. She pursues this theme with interest, energy and understanding and graduates with high honors. If she has a fancy for teaching it is satisfied, and she teaches until she has an opportunity to marry. Then everything concerning her profession is dropped; she enters a house, which should be a home, absolutely untrained and unskilled in every way. She is naturally wasteful and clumsy. What man under the same circumstances could do better?

I remember during my active teaching in the Philadelphia Cooking School a young bride entered the practical class — the wrong way, of course, to begin. Practice always follows theory, theory never can follow practice. This woman was making a dish which called for the yolk of an egg, and before I could catch her hand the white was thrown into the garbage bucket. She did not intentionally mean to waste her husband's money, but she did not know that the white should be saved for another dish. I find that most housewives throw

away all small leftovers and then buy new materials for soup and garnishes; instead of arranging meals for an entire week they think up each meal separately, and frequently only a few hours before serving time. I notice that they throw away the drippings from the baking and roast pans and the raw pieces of suet from meat and the fat from the surface of soups, and buy butter, lard and lard substitutes. This, of course, is a double waste — the fats have been paid for at lean meat prices, which makes frying fats cost 25 to 30 cents a pound. More bread is cut for a meal than is actually needed. The slices are either left in the bread-box for a day or two or thrown at once into the garbage bucket. They should at once be wrapped in a damp cloth or made into croutons or bread crumbs, or put aside for toast for breakfast.

Potatoes are pared quickly at the last moment — great whittlings are taken off, carrying with them most of the nourishment and leaving the soggy, watery center portion which lacks nutrition.

Rice is not washed until the last minute, then perhaps boiled in a small quantity of water and served wet and soggy. An admirable food is made indigestible.

Bits of soap are wasted. They should be put aside to melt for laundry and cleaning purposes.

Fires are allowed to burn at full force an hour before they are wanted; then, if it is a coal fire, wood is added at cooking time, which means the waste of both coal and wood.

Where the housewife is her own kitchen maid she need not necessarily live in the kitchen. She can manage her meals, make out her bills of fare and do most of the thinking in her sitting or living room. When meat is put into the oven the fire may be adjusted so that it will cook without constant attention. She must count time and fuel as well as actual money.

The more economical way is to buy just enough for each meal. Leftovers and some of the cheaper cuts of meat frequently cost hours of time, which should to her amount to money, and they also use a great deal of fuel in their preparation.

It is not true economy where the woman is doing her own work to serve her meals in four or five courses. Meals should

be satisfying, or the average country man cannot easily do his work. Plain soups come first and are made quickly, followed by a meat dish with two vegetables and either a simple dessert or a salad; this should form the complete dinner. Select foods that can be all cooked in the oven at one time, or on top of the stove over a single burner.

Desserts should be made during the morning when the housewife is obliged to be in the kitchen.

The kitchen is only one room in the house. To make a home the whole house must be attractive. The sewing and mending must be done, and the housewife must have time for recreation and reading.

I find the country housewife very extravagant in the use of butter, eggs and sugar. Eggs during the winter season are most expensive, and when used in connection with a meat dinner overcrowd the organs that excrete the poison from nitrogenous materials. Fruits and fruit desserts should follow a meat meal.

Try all utensils before you actually purchase them. Do not buy them simply because they are advertised as useful. They frequently are not needed. The meat chopper is a great convenience. Also a bread mixer, a dish washer, a spatula and good French knives. Use each utensil for the proper work, otherwise they will wear out in a very short time. A man does not use a reaper for cutting fodder.

Use cheesecloth for straining rather than a napkin.

A wire dishcloth will clean your pots and pans quickly and save the sharp edges of your knives.

Measure everything you use — a guessing cook is always a wasteful one. She may hit it six times out of ten, but the few failures are very expensive. A tin measuring cup costs but 10 cents, and with care will last a lifetime.

Use blue and white granite or Swedish ware for all utensils; if the table happens to be upset or any accident occurs these utensils are picked up whole and in good condition.

Use an ordinary 5-cent paint brush for greasing pans, and use suet instead of butter. A piece of paper or the fingers are rather extravagant greasing utensils.

Another economy is to know just how much to allow to each

individual for the week. A good allowance of butter, for instance, is a half pound; more than this is wasteful and upsets the balance ration.

Frying is the most objectionable method of cooking. It renders good food difficult of digestion.

Do not spend an extra moment in the kitchen. Do not stand over the kettles or wait for things to cook; busy yourself by preparing something for the next meal, thus shortening your time of work.

Thoughtful and intelligent women in public and private life are, I am quite sure, searching for less elaborate and more simple methods of living. There are numerous pitfalls along the way of eating. An appetite created in a child if allowed to continue leads to intemperance, and intemperance to crime in later life. A simple, well-balanced meal means health. Artificial appetites should never be created or cultivated, and are not, as a rule, except by a mother misled by ignorance, or the careless, indifferent mother who takes particular pains to be kind to her child, and gives it everything it asks for.

Thousands of lives are sacrificed each year through the lack of knowledge on the part of the mother, and this knowledge, by the way, is not incompatible with the other accomplishments. It adds to your power. It teaches you how to be hospitable, and hospitality means home making. It teaches you how to live well on small means, instead of hopelessly wringing your hands and crying out about the high price of food. It teaches you how to keep well and how to build your family.

Let us insist upon our share of instruction, rather than to accept the present condition as inevitable. Let us get together at once and see that every country schoolhouse is converted into a social center, where our housewives, too old to again enter school, can have, at little cost of time, the necessary instructions to make life worth the living.

SUMMER FIELD MEETING

OF THE

STATE BOARD OF AGRICULTURE

AT

LEOMINSTER.

JUNE 10, 1915.

SUMMER FIELD MEETING.

The Summer Field Meeting of the Board was held on June 10, 1915, at Pines Stock Farm, Leominster, the summer home of Mr. L. L. Richardson, president of the Worcester North Agricultural Society. Mr. Richardson is making a specialty of breeding coach and trotting horses, and so the question of horse raising was made a special feature of the day. Professor J. A. McLean of the Agricultural College spoke on raising farm horses, and Mr. Richardson exhibited some of his prize winners. Dr. Burton N. Gates, State Inspector of Apiaries, gave a talk and demonstration on handling bees, and Mr. F. A. Brady, representing the Association of Portland Cement Manufacturers, gave a talk on the use of concrete.

A contest in judging farm horses was held for both men and boys, and there was a demonstration of plowing by two different makes of farm tractors. There was an attendance of about 300 farmers with their families.

ESSAYS.

(Especially prepared for the Sixty-third Annual Report.)

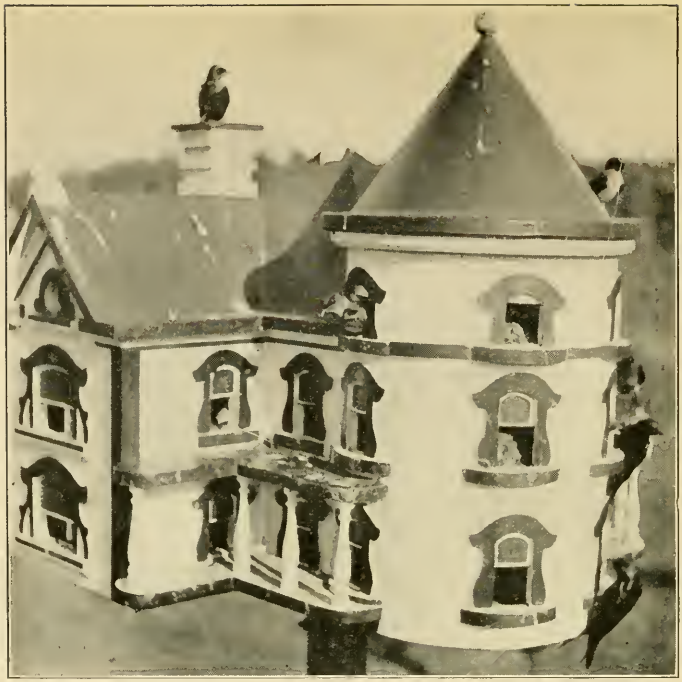


FIG. 1. — Martin box, made by Mr. J. Warren Jacobs of Waynesburg, Pennsylvania. This forms part of a nesting colony on the estate of Mr. Edward L. Parker at Concord, Massachusetts. (Original photograph.)

FIG. 2. — Swallow box, made by Mr. E. C. Ware, Wareham, Massachusetts. Male bluebird bringing insects to its young. (Original photograph taken on the author's farm.)

BIRD HOUSES AND NESTING BOXES.

EDWARD HOWE FORBUSH, STATE ORNITHOLOGIST.

Many people fail to put up bird houses or nesting boxes because of the trouble and expense entailed, or because they do not know how to prepare and erect them in such a way as to get the birds. Much that has been written on this subject has been theoretical. Fatal errors in the dimensions of entrances have been disseminated. For want of specific instructions, nesting boxes have been put wrong side up or in places where no bird would use them.

This circular has been written to encourage people to construct easily made, inexpensive nesting boxes, and to tell them where and how to put them up so that the birds will be sure to take them. Making and putting up such boxes should be looked upon as a pastime. They need cost little or nothing, and he who makes them should feel well rewarded by the joy of seeing the little tenants choose, settle down, build their nests and rear their young, singing their cheery songs meanwhile, and feeding on the insect enemies of crops and trees. We must provide homes for the birds that nest in hollow trees, as there are no longer holes enough for all, while destructive insects have so increased in numbers that the food supply is abundant.

Numerous nesting boxes properly put up will increase the number of birds in a locality by multiplying the bird families reared, and boxes rightly situated give much better protection to the young than do most tree cavities. A bird box is serviceable if it furnishes a suitable nesting apartment, shelters nest, eggs and young from sun, wind and storm, and provides security against the birds' enemies. Also it may serve in winter as a night shelter or sleeping place for a woodpecker or a party of nuthatches or chickadees. We must allow the birds to be the judges of what they want, as they and not

we are to be suited. Therefore in building a nesting box it is well to inquire first what kind of a home the bird naturally chooses.

As the hollow trunk or limb, or the abandoned woodpecker's nest, is the usual domicile chosen by the hole-nesting birds, it is natural to conclude that they will prefer something closely resembling nature's accommodations. For this purpose a section of a tree, containing an old nest of a woodpecker may be taken, or hollow limbs, pruned from apple or other trees, may be sawed into sections about a foot in length, the lower end of each plugged, and the upper end covered with an overhanging piece of board sloping to the front. A hole may be bored in the front of this contrivance for an entrance, and a piece of board may be nailed on the back (Fig. 1), so that the box when finished may be nailed up to a tree, post or pole. The hollow of the limb should not be less than $3\frac{1}{4}$ to 4 inches in diameter at the bottom, and 6 to 8 inches in depth below the entrance. The deeper the box and the higher the hole under the overhang of the roof, the less chance there will be for cats, jays and the other larger enemies of birds to reach the eggs or young. Perches are not necessary. Some birds like them, but they give the enemies of the birds the advantage of a better foothold.

Fig. 1. — Hollow limb.

Neat boxes may be made of slabs with the bark on (Fig. 2), but all bark left on bird houses should be firmly nailed on, as otherwise it will come off sooner or later. In "Bird-Lore" for January–February, 1905, I described the method of making bark boxes, but at that time they were untried. They have since had nine seasons' trial, with very satisfactory results. To Mr. William Brewster belongs the credit of their invention, and I have made a considerable number after his design. White birch and chestnut were used, as it was believed that the bark of these trees would be most durable, but Mr. Brewster suggests that elm bark is probably best of all.[1] Those portions of the trunks used were from 4 to 8

Fig. 2. — Slab box.

[1] The bark of the common gray or so-called "white" birch is not very durable, but that of the northern white or canoe birch is more satisfactory.

Fig. 1. — A nesting box made from roofing felt by Mr. Winthrop Packard of Canton, Massachusetts. (Original photograph taken on farm of Mr. William P. Wharton, Groton, Massachusetts.)

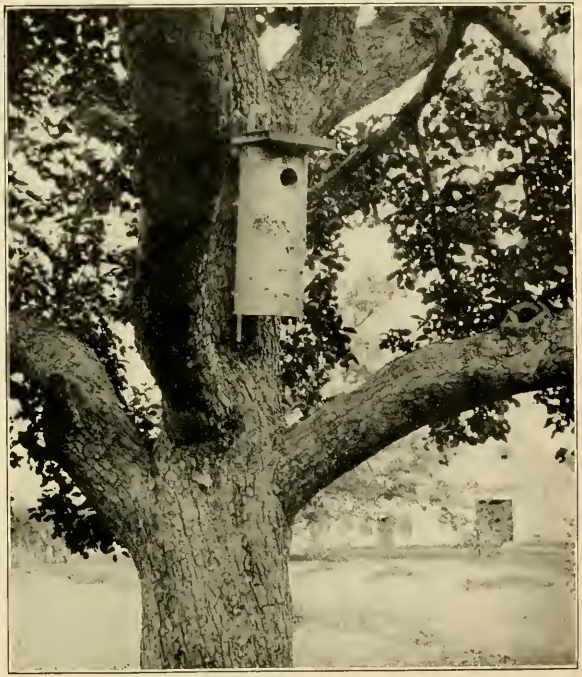


Fig. 2. — Berlepsch nesting box, made of birch after the plans of Mr. Ernest Harold Baynes of Meriden, New Hampshire. This style has proved acceptable to woodpeckers and nuthatches. (Original photograph taken on the farm of Mr. William P. Wharton at Groton, Massachusetts.)

inches in diameter. The boxes were made in summer, as the bark will not usually peel freely much earlier than June 20, and then only for a short time. When the tree had been cut down, the trunk was sawed into sections each from 10 to 18 inches long, according to the size of the boxes desired. Only straight sections, free from knots or branches, were used. A limb of the right size, however, may, when cut off, leave a hole in the bark that can be utilized as an entrance for the birds.

Fig. 3. — Chestnut bark box.

These domiciles may be made as follows: an incision is made on the side intended for the back of the box, through both outer and inner bark, from the top to the bottom of each section; then, on the opposite side, some two or three inches from the top, there is bored through the bark, with an auger or extension bit, a hole of the size desired for the entrance. If such tools are not at hand the aperture may be cut with a gouge, a chisel or even a knife. Next, a wedge-shaped stick is inserted into the incision at the back and under the inner bark, to start it off, and with this implement it is peeled very carefully. In peeling birch one should be careful not to separate the inner and outer layers of the bark. Caution should be used when working about knots or rough places. The bark will make the sides of the box and two sections, each an inch thick, sawed from the ends of the barked log, will make the top and bottom. Now the bark is tacked to the bottom and top. The bark will draw apart somewhat at the back in drying, but this aperture may be covered, when the box is put up, by nailing or screwing a short stick or pole over the opening on the back, which stick in turn may be nailed or screwed to the supporting tree, building or pole. To make the roof watertight, a piece of cotton cloth, duck or denim may be put on, tacked down over the edge and painted, or a piece of roofing paper may be used. A more permanent covering may be made by using a piece of tin or zinc, as shown in the figure of the chestnut bark box (Fig. 3). To make the expected nest accessible to examination, the top of the bark sides might be fastened to

Fig. 4.— Birch-bark box.

a hoop, and the whole capped by a tin or wooden cover, like that of a lard pail or a berry box. Mr. Winthrop Packard makes a very pretty box of roofing felt. (See Plate II., Fig. 1.) The best support is a slim pole.

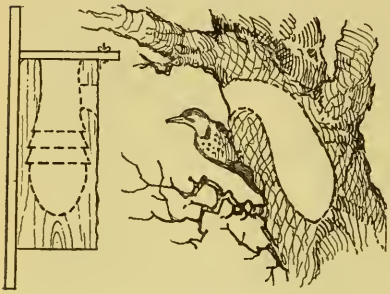


Fig. 5. — Berlepsch box and flicker hole.

Large wooden conductors, used to carry water down from the eaves of large buildings, may be obtained from some dealers in lumber or moldings, sawed into sections, and utilized precisely as in the case of hollow limbs.

Baron Hans von Berlepsch of Seebach, Thuringia, Germany, has invented a device for making nesting boxes similar in shape to the nesting holes of woodpeckers, and he has been wonderfully successful in attracting all hole-nesting German birds to these boxes. (Fig. 5 and Plate II., Fig. 2.) The theory on which they are built is admirable, but after three years' trial of them in this country I am convinced that most Massachusetts birds do not prefer them to the hollow limb or even to the rectangular box (Fig. 6) that many people have used with great success. The Berlepsch style of box may be better for typical woodpeckers, such as the hairy and downy woodpeckers. Mr. Ernest Harold Baynes reports two cases where downy woodpeckers have nested in these domiciles; but flickers and red-headed woodpeckers nest in rectangular boxes. This latter type of box is excellent for bluebirds, chickadees, wrens, flickers and tree swallows. If made 18 inches deep for bluebirds it will be very nearly cat proof. The smaller sizes of the Berlepsch type have been made and sold in Germany for about 25 cents each, but here they cost about $1. A very fair temporary substitute may be made by growing gourds which, when the contents have been removed,

Fig. 6. — Cat-proof box.

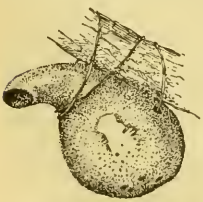
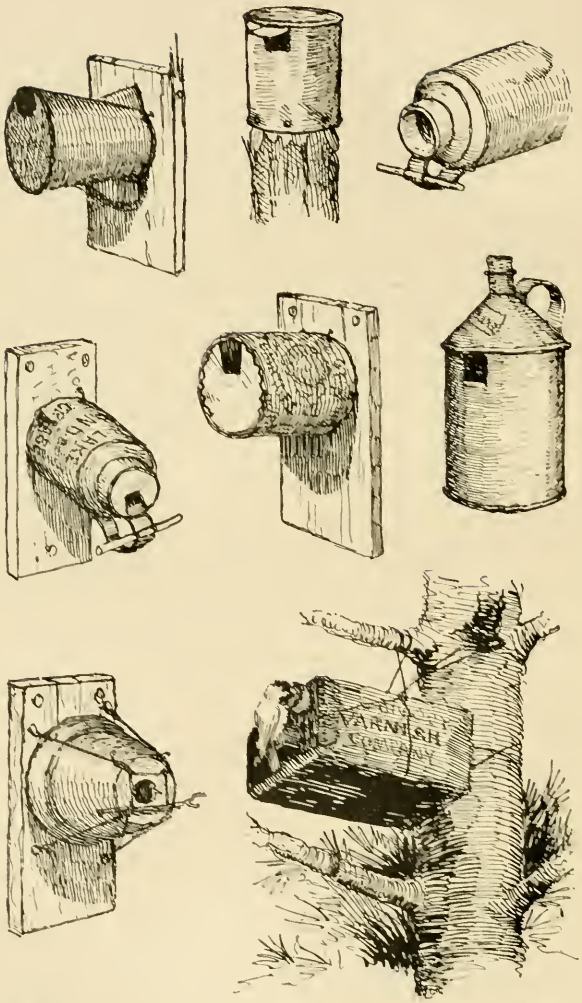


Fig. 7. — Gourd.

PLATE III.



Worn-out cans and utensils for nesting boxes. They may be nailed or wired to posts or trees, and should be so placed as to be shaded from the sun in the hottest part of the day.

are acceptable to many birds if tied upon poles or trees (Fig. 7), but they are not so durable as well-made wooden boxes, and I have not had much success with them.

My first nesting boxes, all of which were successful, were made of old shingles, picked up from the ground when the barn was reshingled, and some pieces of old weathered boards removed from the ridgepole at that time. A square section about $3\frac{1}{2}$ inches in diameter was sawed from the ridgeboard for the top of the box, and another 4 inches wide was used for the bottom, the shingles being nailed to them (Fig. 8). A saw, hammer and jackknife and a few nails were the only tools and materials required. I have made such a box in twelve minutes. These boxes were nailed up in elm, cherry and apple trees, and some happy families of bluebirds were raised, until at last the cats discovered them. A large number of shingles may be saved when a building is reshingled, and every year at the end of the season the old boxes may be taken down and burned to do away with vermin, gypsy moths, etc., that may be concealed within. It takes but a short time to make more. Tin cans and flowerpots are not quite so suitable for nesting boxes as are wooden receptacles, because pottery and metal are good conductors of heat, and unless put up in the shade are likely, in very hot weather, to overheat the young birds. Nevertheless, if such utensils are placed where they will be in the shade during the hotter part of the day they may be used with success (Plate III.). Cheap, thin boxes, such as the larger cigar boxes may be fastened up inside a barn under the eaves and a hole bored through the wall of the building into each box, or a box may be made for this purpose (Fig. 9).

Fig. 8.—Shingle box.

Many people write me anxiously asking of what size nesting boxes should be made and begging for exact dimensions; some are unhappy lest the entrance holes face the wrong way; others are anxious about ventilation; others feel sure that the smell of paint on the nesting boxes or bird houses will drive the birds away, while still others fear that they may get the box too high or too low; but all these things make very little difference. The situation, environment, and size

of the entrances, however, are important. I have known tree swallows to nest in a round box $3\frac{1}{2}$ inches in interior diameter, in a flowerpot even smaller at the bottom, and in a one-apartment bird house, nearly a foot square and about 18 inches high from floor to ridgepole (Fig. 10). This is one of the most popular houses with tree swallows. But why waste enough lumber on one bird house to make three nesting boxes? I have tried facing the entrance hole to all points of the compass. The birds used them all.[1] Painted or unpainted, weathered or unweathered, wood, bark, cement, tin, clay, papier maché and roofing felt, — all have been chosen indiscriminately by feathered house hunters. Boxes placed 6 feet from the ground and others set on poles on the roofs of tall city buildings have been taken. I have seen chickadees nesting in a hole in a birch stump 2 feet from the ground and in the hollow branch of an elm 65 feet up. One wood duck settled in a hollow apple tree 3 feet from the ground, and another 40 feet up in a hollow elm. Such experiences lead us to revise our opinions regarding the exact size of the tenement each bird requires and how high or low it should be situated. I am not so positive as I once was regarding what is best for certain species or what kind of a box or situation will best please each one. It seems that the birds have some individuality, or that they need nesting places so badly that they will take almost anything if it is so situated that it offers peace and safety.

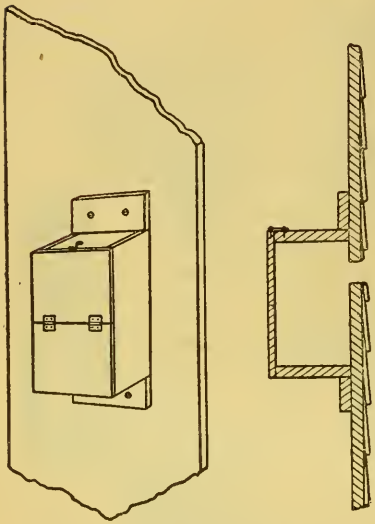


Fig. 9. — Box inside a building. (From Biological Survey.)

Fig. 10. — Swallow house.

[1] I am convinced, however, that in New England it is best to have the entrance holes face generally in a southerly direction. Only warm rains drive in from the south.

Nevertheless, there are a few rules that it is best to follow in making and erecting bird houses to secure the best results: —

1. Let the roof be made tight and overhang the entrance enough to carry rain clear and keep the sun from shining in on the young.

2. Do not make the bottom of the box too tight. If any rain drives in it should run out.

3. If the box tips forward a little on the side of the entrance hole when set in place it will shed rain well. It should never lean backward.

4. Provide a way of opening the box quickly unless you intend to burn it and replace it after the first season, as is done sometimes with gourds and shingle or bark boxes.

5. Make the entrance hole and the box itself just large enough for the bird you want — no larger. This will tend to keep out larger birds, as well as the birds' enemies, will give the bird a better chance to defend its home, and will save material.

6. Make nesting boxes of weathered wood, or paint or stain them with colored linseed oil of a neutral tint resembling dead wood or bark, or put them up in the fall that they may become weather-stained before spring. Apparently birds are less suspicious of such boxes than those made of new, bright lumber, but they have been known to use the newest of the new.

7. Fix nesting boxes on buildings or on poles rather than on trees, and make them inaccessible to cats, squirrels, mice and rats.

8. Where it seems best to put them in trees, choose isolated trees which can be protected against cats, squirrels, weasels, etc.

9. Ordinarily ventilation is unnecessary if the entrance is near the top of the box as it should be, but in very hot summers young birds are believed to have died of heat in unshaded boxes mounted on poles. Ventilation may be provided by boring 4 half-inch holes in the sides of the box near the top and filling them with corks which may be removed in extremely hot weather.

10. It is best to clean out the boxes each autumn, burning the old nesting material to destroy dirt and vermin, and putting in a little chaff as a foundation for a new nest.

A few practical details in regard to carrying out some of the above rules should be noted.

If the roof of a nesting box, made of wood, is horizontal, the water will stand on it, and even if painted it will warp somewhat in drying unless covered with zinc, good roof paint, some good roofing felt or other waterproof material. It is well to have a crosspiece nailed (with clinch nails) across the grain on the under side to prevent warping and splitting. If the top slopes downward at an angle of 45° or less and is painted, the water will run off so fast that the roof will not warp much.

Top, side or front of the box may be hinged to open as a door, or fixed to fasten by means of nails, easily removed, slid loosely into sockets arranged for them. White pine from $\frac{1}{2}$ to $\frac{7}{8}$ of an inch thick is the best lumber. Cedar and cypress are durable. Grocery or drygoods boxes may be used. The following dimensions will do for flat-roofed dwellings for the birds named. These dimensions are not absolute, but are such as seem to be popular with the birds. The boxes may be made larger if desired, but not very much smaller. The size of the entrance, however, should not be changed. If the roof is not level but slopes forward the back may be two or three inches higher.

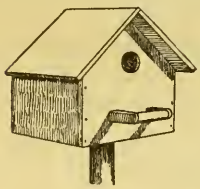


Fig. 11. — Wren house.

House Wren. — Interior dimensions, 6 by $3\frac{1}{2}$ by $3\frac{1}{2}$ inches. Entrance hole, $\frac{7}{8}$ inch in diameter. The long axis may be either horizontal or vertical and the entrance hole near the top. A miniature bird house (Fig. 11) will do as well, but takes more time to make.

White-breasted Nuthatch. — A box actually occupied by this bird on the grounds of the Rev. William R. Lord, at Dover in 1914, measured 5 by 5 inches (inside dimensions). Height, 12 inches front; $13\frac{1}{2}$ inches back. Long axis vertical. Entrance front, near top, $1\frac{1}{2}$ inches in diameter (Fig. 12). Mr. J. T. Mellus of Wellesley writes that this species has nested there in a bird house with double-pitched roof, and the long axis horizontal. The dimensions were 8 inches long, 6 inches wide, and 7 inches high. The entrance was $1\frac{1}{2}$ inches in diameter and about 4 inches above bottom. A small platform was made just below the entrance, and the house was fastened to an electric-light pole about 18 feet from the ground, facing the east and 8 feet from a brick building. Probably a box made of bark, or slabs with bark on, would attract this bird.

PLATE IV.

A nesting box occupied by the crested flycatcher. This is not the box referred to on page 203, but another, occupied later by the same birds. (Photograph by Mrs. J. W. Elliott, Needham, Massachusetts.)

Red-breasted Nuthatch. — This bird has nested in a No. 2 Berlepsch nesting box made of yellow birch by the Meriden Bird House Company, Meriden, New Hampshire, and placed in a gray birch tree, in rather open land, with the entrance slightly

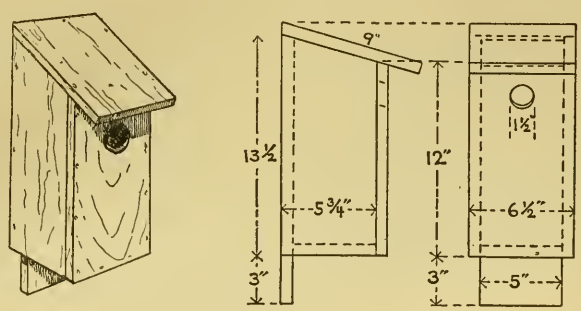


Fig. 12. — Box used by white-breasted nuthatch.

more than 7 feet above the ground. The entrance hole is $1\frac{1}{8}$ inches in diameter.

This is reported by Mr. H. S. Shaw, Jr., of Dover, Massachusetts, and is the only case, so far as my records show, where a red-breasted nuthatch has nested in a bird box.

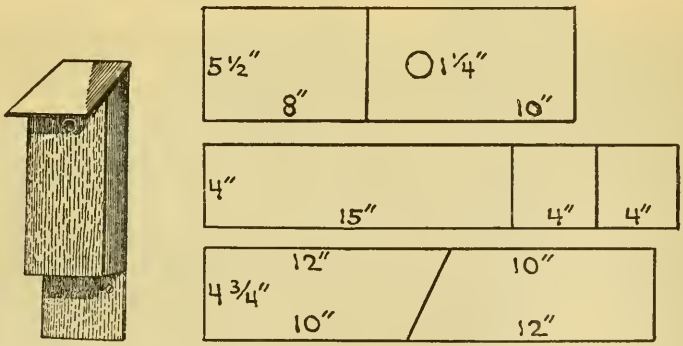


Fig. 13. — Chickadee box and details of construction.

Chickadee. — A box like Fig. 5 or Fig. 12 may be used, 10 by 4 by $3\frac{1}{2}$ inches inside dimensions. Long axis vertical. Entrance hole $1\frac{1}{4}$ inches diameter, placed near top of box (Fig. 13). Others recommend an entrance $1\frac{1}{8}$ inches in diameter, or less, but my experience goes to show that our chickadee, like the European titmice, prefers an opening a little larger than it needs, which

makes the chances of success better with the larger entrance. Many boxes for this bird have been made with the entrance too small. They are rarely if ever used.[1]

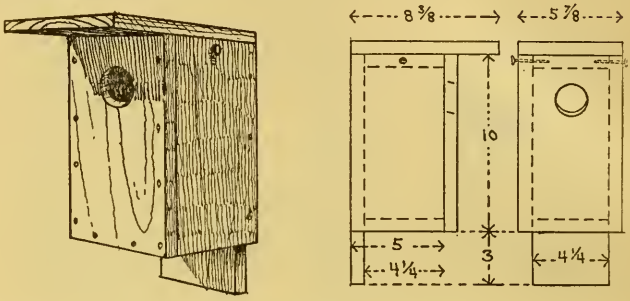


Fig. 14. — Bluebird box and details.

Bluebird. — Interior dimensions, $4\frac{1}{4}$ by $4\frac{1}{4}$ by $9\frac{1}{4}$ inches. Entrance, $1\frac{1}{2}$ inches or an eighth less — never $1\frac{1}{4}$ inches, as most

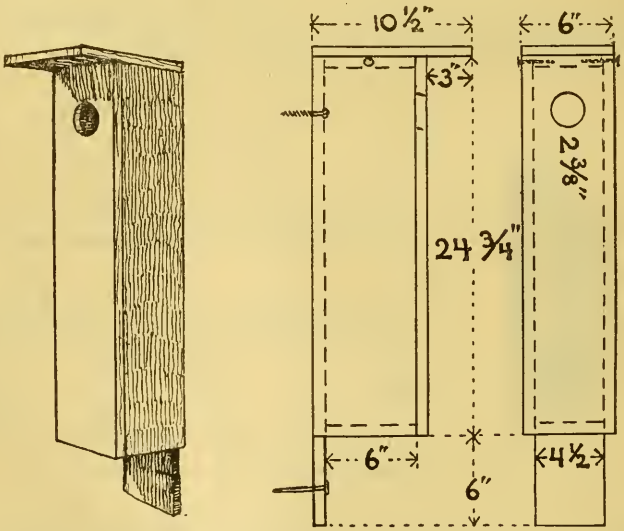


Fig. 15. — Flicker box and details of construction.

bluebirds will not enter a hole of this size. Long axis vertical (Fig. 14). Tree swallows will use this.

[1] In May, 1915, I saw in Lenox a pair of chickadees feeding young in a nesting box with a round entrance hole 1 inch in diameter, but the male bird was not seen to enter the box, and apparently could not get in.

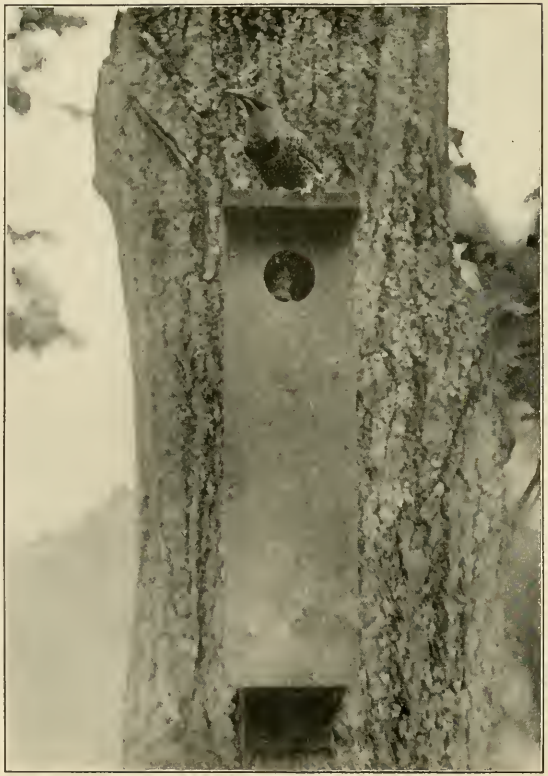


FIG. 1. — Male flicker on nesting box with young bird looking out. Box made by Mr. E. C. Ware of Wareham, Massachusetts. (Original photograph.)

FIG. 2. — Gray squirrel about to enter flicker's nesting box. Squirrels drive birds from nesting boxes. (Original photograph.)

Tree Swallow. — Interior dimensions, $4\frac{1}{4}$ by $4\frac{1}{4}$ by 8 inches. Entrance hole about, not over, $1\frac{1}{2}$ inches. Long axis vertical. Bluebirds also use this box. (See Plate I., Fig. 2.)

This is the most popular box (with the birds) that I have seen.

Starling. — This European bird will soon be common and may become a pest. It requires an entrance hole about $1\frac{7}{8}$ inches in diameter, and cannot enter boxes properly made for bluebirds or smaller birds. It will use any tenement suitable for martins, flickers, crested flycatchers or sparrow hawks, such as are described and figured hereafter.

Crested Flycatcher. — Measurement of box actually occupied, interior diameter, 6 by 6 by 8 inches. Long axis horizontal. Entrance, 2 inches in diameter. (See Plate IV.) Mr. Henry W. Stillings of Berea, Kentucky, gives the following dimensions of two boxes in which this bird has nested there: No. 1, $8\frac{1}{2}$ inches long, $6\frac{1}{2}$ inches wide, 6 inches high; entrance diameter, 2 inches; entrance, 4 inches above floor. No. 2, 10 inches long, $4\frac{1}{2}$ inches wide, 4 inches high; entrance diameter, $2\frac{1}{2}$ inches; entrance, $1\frac{1}{2}$ inches above floor. This bird has nested in small bird houses and also in hollow log nesting boxes with the long axis vertical.

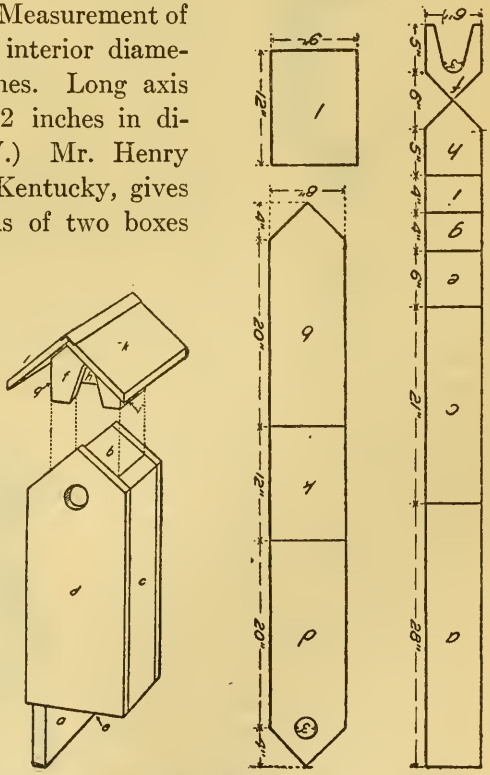


Fig. 16. — Flicker box and details. (After Biological Survey.)

Flicker. — Interior dimensions about 22 by about 6 by $4\frac{1}{2}$ inches. Long axis vertical. Entrance hole at least $2\frac{1}{2}$ inches in diameter, near top. Several inches of ground cork or coarse

sawdust and dry earth mixed must be placed in the bottom, as woodpeckers make no nest but rely on decaying wood or chips which they strike off the tree to make a bed for their eggs. (See Figs. 15 and 16 and Plate V.)

Sparrow Hawk. — Flicker boxes have been used occasionally by sparrow hawks, but a more roomy box, at least 8 inches in diameter, would be better.

Screech Owl. — Inside dimensions of box actually occupied on my place in which young were raised, 7 by 11 by 15 inches. Long axis vertical. Size of entrance hole, 3 inches wide by 4 inches high (Fig. 17).

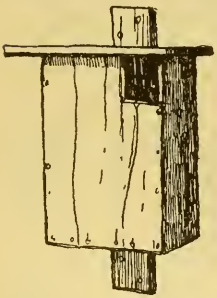


Fig. 17. — Owl box.

Wood Duck. — Inside measurements, about 10 by 10 by 24 inches. Entrance, 4 inches in diameter and 18 inches from the bottom. Long axis vertical.

Robin. — The robin uses mud as a framework for its nest, and as this makes the nest heavy it requires a good foundation and a roof over it to render it weatherproof. Robins' nests often are dislodged or blown down in storms, and sometimes the birds, warned perhaps by experience, learn to place their nests on some projection under the eaves of a house porch or summer house; on the end of a projecting log under the eaves of a log house; on a beam under the roof of a shed or railway station; under a bridge; under the overhanging sod on the edge of a bank; in a hollow trunk; in a barn cellar; or even in a bird house. Mrs. Mabel Osgood Wright experimented years ago with shallow wooden trays about 6 inches square, bracketing each one to a post, grape arbor or building, always with a branch, eaves, arbor or other screen or protection overhead. The robins did not use them the first year. The second year two were used, and the last year five others. These trays should be made so that they will not hold water. A

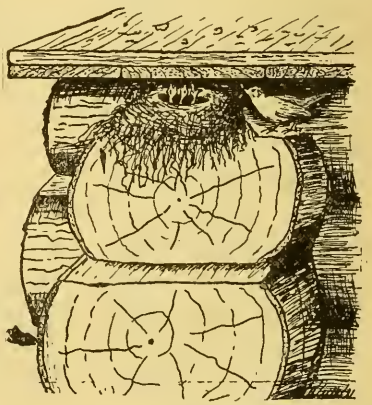


Fig. 18. — Robins' nest on log cabin.

PLATE VI.

A plan for attracting swallows. Barn swallow on nest on projecting end of a board in barn three feet above the back of a stalled cow. The bird chose the situation because of the resting place offered for the nest. (Original photograph taken by reflected light.)

small grape basket hung or nailed up under projecting eaves or a shed roof may be used by robins, swallows or phœbes, particularly if a little hay is placed in it. A pair of Carolina wrens at Fairhaven nested in such a basket partly filled with dynamite hung under the ridge pole of a barn.

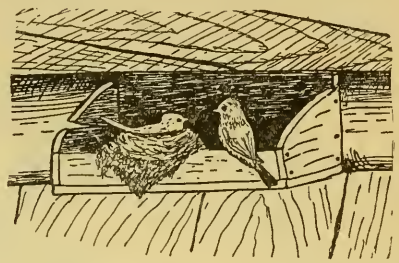


Fig. 19. — Phœbes' nest in box.

Phœbe. — Any little open box or shelf, put up under the eaves of a building or under the roof of any open shed or porch, may be used by phœbes (Fig. 19). This makes a safe support for their nests which often is appreciated by the bird. Phœbes rarely nest far from water.

Barn Swallow. — Boxes or shelves similar to those used by phœbes may be placed in barns for the barn swallows, but a little block nailed on a rafter is all they need, or a lath nailed across two rafters so that the ends project. (See Plate VI.) Even two nails driven into a beam or rafter about 2 inches apart, the heads projecting about 2 inches, may be utilized, and will be support enough to keep the nests from falling.

Fig. 20. — Device to keep cats, squirrels, etc., from climbing to bird houses.

When rafters were made of knotty logs or mere poles with the bark removed no such supports were needed, but sawed timbers do not present safe points of attachment for mud-built nests. There should be an opening in every barn for swallows to enter.

Cliff or Eaves Swallows. — These require wide eaves and a strip of board or small timber nailed a foot below the junction of the side and roof of the building. Mud does not stick well to paint, hence the need of a supporting ledge.

A Dorothy Perkins rose bush. Grown on a bird-house pole for protection against cats. (After Our Dumb Animals.)

Put Nesting Boxes on Poles.

Experience with nesting boxes on trees, particularly in woods, has proved that they are occupied mainly by squirrels and mice or remain unused. These animals, as well as cats and sometimes rats, drive the birds out and sometimes destroy their

Fig. 1. — A colony. Three nesting boxes on one tree, all occupied by birds, on the reservation of the Massachusetts Commission on Fisheries and Game at Martha's Vineyard. (Original photograph.)

Fig. 2. — A row of nesting boxes on a pasture fence on the farm of Mr. William P. Wharton, Groton, Massachusetts. This plan is successful. A large proportion of these boxes on all the fences were occupied. (Original photograph.)

eggs and young. (See Plate V.) Nests on poles are not so often visited by the foregoing enemies of birds, and such nests may be

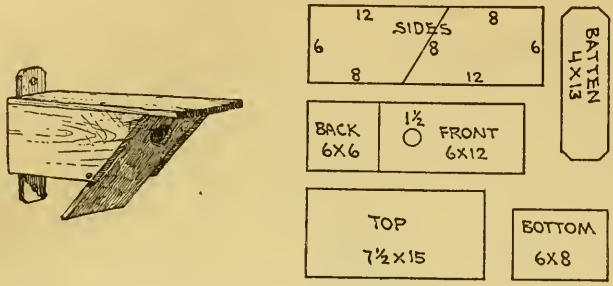


Fig. 21. — Swallow box, supposed to be cat-proof, and details of construction.

protected against them by any one of the devices shown (Fig. 20). Nests on isolated trees may be safeguarded in a similar manner, but in the woods protection is hopeless, and hole-nesting birds, with the exception of chickadees, will rarely nest there. Nesting boxes hung by wires from outer branches of trees on the edge of the woods have given good results in some cases. Cats cannot reach these and squirrels seem not to trouble them often. (See Fig. 22.) Boxes placed on poles set up in a pond or on a small island bring good results.

Fig. 22. — To puzzle cats.

Poles need not be more than 6 or 8 feet in length, except for martins, and may be very slim, made from a young pine or cedar or any other sapling. They may be screwed to fence posts with lag screws (large screws with square heads; see Fig. 23 and Plate VII., Fig. 2) so that they may be taken down in the fall and stored away until spring. (The barbed wire fence is best for this purpose as it is not used as a highway by squirrels and cats.) Where there are no fences, posts may be set in the ground and the poles fastened to them. Boxes put up on the walls or ridgepoles of buildings often attract birds if the trees are not near enough to allow squirrels to reach them, and if cats cannot get at them. (See Plate VIII.)

Fig. 23.

How to attract the Birds.

If nesting boxes are set up in accordance with the foregoing directions, English sparrows disposed of, and nests safeguarded against cats and squirrels, some of the boxes are sure to be occupied by birds, provided there is a sufficient diversity of vegetation in the neighborhood to furnish them with a variety of insect food and wild fruit, and unless they are too much disturbed by the noisy activity of their human, feline or canine neighbors. We cannot expect many birds to be attracted to a city yard where there is neither grass, trees, water nor shrubbery. They always appreciate a near supply of water. If nesting material such as hay, straw, twine, cotton, hair, string, etc., be hung on a fence or placed on a bushy branch near the nesting box, that alone may decide some bird to nest there. If twine is put out it should be cut in short pieces not over a foot in length, else birds may be ensnared by it. Wherever a pair of tree swallows nest, many other boxes, similar to the one chosen by them, should be put up on poles, for they are sociable birds and one pair will attract others.

Experiments sometimes have demonstrated that certain individual birds are grateful for nesting material placed in the box. A pair of chickadees made their nest by digging a hollow in cotton batting that I had placed in the bottom of the box for their use. It is well always to keep a few nesting boxes out all winter with some cotton or other nesting material in the bottom of each, to furnish winter lodging for chickadees, nuthatches and woodpeckers, as these birds like to sleep in such snug quarters. Chickadees and nuthatches may be attracted to nesting boxes by first destroying all the decayed trees and stumps near by, and then feeding the birds all winter on bits of suet, meat, fat or sunflower seeds placed near the boxes. If this supply is kept up during the spring, some of the birds are likely to nest in the boxes and their young seek similar domiciles until a little colony becomes established. Nuthatches may be attracted to nesting boxes in the same way.

Wrens are rare and local in Massachusetts but when once a colony is started they are almost perfectly protected in nesting boxes and are likely to increase. There should be at least

PLATE VIII.

An example of a bird colony on a building. Nesting boxes on one of the farm buildings of Mr. Geo. E. Hoxsie of Canonchet, Rhode Island. Every building on his place has nesting boxes. In 1912, forty-three nesting boxes were taken by tree swallows and bluebirds. There were thirty-two nests of eaves swallows and eighteen of barn swallows.

three boxes to each pair of wrens, as they are so industrious that a pair often will build two additional nests beside the one in use, and such building activity may keep them out of mischief. Otherwise they may attack the eggs of other birds.

Many writers express the belief that it is a mistake to put up nesting boxes too near together, as jealousy and fighting will ensue and none of them will be occupied. I have held this view and published it, but have discarded it since I have seen five pairs of bluebirds nesting in the trees around one farm house; three pairs of tree swallows nesting in boxes on one small tree; several pairs of bluebirds in boxes on one barn, and a pair of bluebirds and one of tree swallows on the same pole. (See Plate VII., Fig. 1, and Plate VIII.)

Other things being equal, the more boxes the more birds. But the house wren may be an exception to this rule, as it sometimes is exceedingly quarrelsome. My later experience seems to show that a plethora of boxes makes less trouble than is the case where few are available. In 1915 I had 25 boxes mounted on poles in a field of about two acres, and 24 were occupied by native birds. Ordinarily, boxes set up 100 to 200 feet apart are more likely to be occupied the first year than those situated closer. Later, if these are successful, the number may be increased.

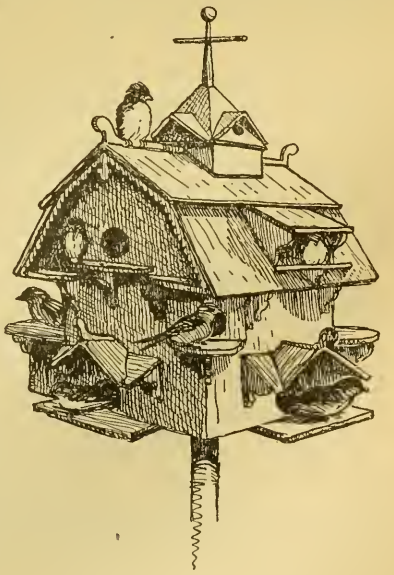


Fig. 24. — Martin house, after Trafton. (Courtesy Houghton Mifflin.)

Bird Houses.

The purple martin is the only bird that needs a bird house. It is a waste of lumber to build houses with many rooms for any other bird, as a single pair of bluebirds, swallows or wrens will hold a large, expensive house against all comers except the English sparrow or the starling. The martin is a large, handsome swallow with pleasant, cheerful notes, and is very destruc-

tive to insect pests. Martins formerly were abundant locally in Massachusetts, but after the introduction of the English sparrow the number of martins and the localities frequented by them diminished rapidly until 1904, when cold June storms nearly exterminated the species in Massachusetts.

Fig. 25. — Martin house.

Since then their numbers have increased very slowly, as few people now put up martin houses, and English sparrows or other birds keep the martins from settling in some of those that have been erected. Martins, unlike most native hole-nesting birds, prefer to nest in large colonies. Hence martin houses usually are made with many compartments. The Indians hung many hollowed gourds for the martins on the poles of their wigwams or on some dead tree near by. Some of the southern people still use gourds to attract martins. Often several gourds are hung from a crosspiece on a tall pole (Fig. 26), and these collections of gourds are popular with the martins. Only the larger gourds should be used for them. If a round entrance hole is made it should be about $2\frac{1}{4}$ inches in diameter, as the martin likes to have the entrance large enough to admit the light as he enters.

Fig. 26. — Gourds for martins.

Poles for martins should be at least 10 or 12 feet high. Such poles are sufficient if placed in quiet places, not too near trees or dwellings, or where noisy, quick-moving children or dogs are at play; but if there is much noise and disturbance, a pole 20 feet or more in height may be necessary. No pole is likely to be too high for martins. They seem to prefer a height of 20 or 30 feet. These birds frequently have nested in quiet places among trees and quite

near houses, even in nesting boxes on poles on the roofs of wooden buildings or high city blocks, but they will not accept hidden nesting places where they have to fly in among the branches of leafy trees, and they seem to come most readily to a bird house situated in an open yard or on a wide lawn. They seem to prefer low ground to high ground, and always like the neighborhood of water. Therefore an open river valley suits them, but people not having these advantages need not despair, as martins often have nested on high ground, but rarely, I believe, far from water. A drinking and bathing fountain with running water might help to induce them to settle where other water is absent. A martin house may be made of any strong barrel (Fig. 27), and I have seen such boxes occupied for many years by these birds. The bottom of each entrance hole may be made level with the floor of its compartment, to facilitate cleaning out and to allow any water that may drive in to run

Fig. 27. — Martin barrel.

Fig. 28. — Successful soap box martin colony of three houses.

out again, but it is well to have a gallery or veranda under the upper openings and overhanging the lower. This and the projecting eaves should shed most of the rain.

The entrance holes may be made $2\frac{1}{4}$ inches in diameter if square, or $2\frac{1}{2}$ inches if round.

Mr. J. Warren Jacobs of Waynesburg, Pennsylvania, who probably has had more experience in building martin houses than any one else now living, recommends making each apartment 6 inches square and 7 inches high. Any box about this size may be used for the apartments, and all may be backed by a square box running up the center of the barrel into which a square pole will fit. The barrel may be attached to the pole by two angle irons and roofed with zinc. Every martin house should be well painted outside but not inside, with two or three coats of good white or light-colored paint. Dark-colored houses are very hot in sunny weather. Care is taken not to let the paint run into the entrances, and to paint only up to the edge of each.

Fig. 29. — Sayward house.

Mr. Arthur W. Brockway of Hadlyme, Connecticut, has established a large colony of martins by building small cottages out of grocery boxes. (See Fig. 28.)

Mr. Jacobs asserts that a martin house should have only entrance ventilation, but Mr. Dodson of Chicago makes the attic of his martin house so that it may be entered from either end, and claims that the martins invariably occupy these upper rooms first. I have noted that when cold storms destroy young martins, those on the sides of the house, exposed to the cold winds, die first.

Mr. William A. Sayward of Allston, Massachusetts, has invented an ingenious device to turn the openings of the house away from strong winds and rain (Figs. 29, 30 and 31).

He takes a piece of $1\frac{1}{4}$ inch iron pipe, 7 feet long, and sets it into a cylindrical piece of cement, made by filling with cement a funnel or stove pipe 7 inches in diameter and 30 inches in length. This cement is set into the earth so that the top of the cement is level with the surface of the earth. At the top of the 7-foot pipe a reducing coupling is put on, and another

piece of inch pipe about 8 feet in length is added. Upon this a bird house of two compartments is mounted. The floor dimensions are 11 by 16 inches inside. The construction is illustrated in Figs. 30 and 31. A block is driven inside the top of the pipe and a slide caster is fastened to the top of the block. Another one, inverted, is driven into a block in the top of the house, so that the whole house easily revolves on the two slide casters. Martins seem to favor houses with nesting holes on all sides, but the Sayward house might be utilized for other birds. It is storm proof and cat proof.

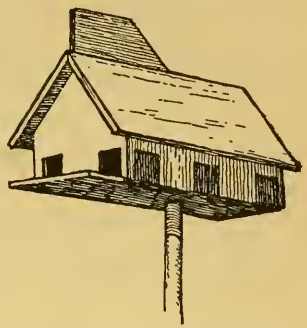


Fig. 30. — Sayward weathercock house.

Poles may be made of wood or metal. A two-inch galvanized or painted iron pipe will hold a small martin house and will be cat proof and snake proof, but rats or squirrels might climb it.

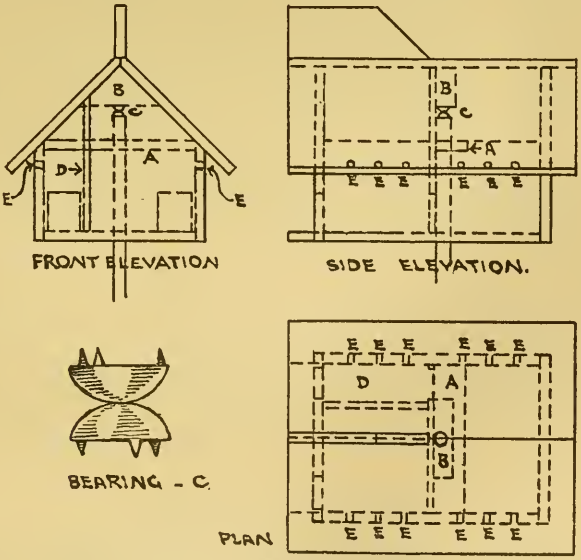


Fig. 31. — Details of Sayward house.

Nevertheless, if the house is large enough they cannot go beyond the floor unless brackets, which should never be used, are provided for them to climb. Sometimes martin houses are mounted on dead trees. Smooth poles are believed to be snake proof.

Trees with bark on are not. Cats sometimes quickly climb wooden poles and catch martins by reaching past the lower edge of the house.

Mr. Jacobs uses a hinged pole for mounting his larger bird houses, so that they may be taken down easily and cleaned out and housed during winter.

It would facilitate the handling and cleaning out of martin houses if a door opening to the full width of each compartment could be provided, and then, if bluebirds or tree swallows persisted in occupying it, their nests and young could be removed to single boxes, which should be in readiness in the vicinity.

How to get the Martins.

The bird house must be erected in a conspicuous place and the English sparrows and starlings kept out. This may be accomplished by the use of a shotgun,[1] or the entrances may be kept closed until the martins come, when a few may be opened and the martins may be able to beat off the sparrows, but if even one pair of sparrows becomes established in the house, and is allowed to breed, the martins are doomed to eviction sooner or later. They may hold on for a few years, but the sparrows will possess the house in the end. I have never known them to fail. If the martins persist, the sparrows break the eggs or kill the young.

Screech owls and cats must be watched. Cats catch the male martins when, in fighting, they come to the ground, take both parents when they alight on the ground for nesting material, and kill many young ones before they are able to fly well. The owls sometimes get the habit of reaching in at night and pulling out young birds. The martins will drive all hawks away.

The English Sparrow.

The European house sparrow is the greatest and most ubiquitous enemy of all native birds that nest in bird houses and nesting boxes. The United States Department of Agriculture, after a long and patient investigation that covered the greater part of North America, decided that it was "a curse of

[1] A long-barreled 22 caliber rifle, with extra long shells, smokeless powder and dust shot, is not noisy and ought to be effective at 40 or 50 feet.

such virulence that it ought to be systematically attacked and destroyed."[1]

Von Berlepsch rates it as one of the few birds which must be destroyed at the Ornithological Experiment Station at Seebach.[2]

Although the sparrow, like most birds that live with man, is beneficial at times, most expert testimony is against it. In view of a multitude of requests for information regarding the means for destroying it, a bulletin on the subject has been issued by the Massachusetts State Board of Agriculture as Circular No. 48.

Since this circular was written Mr. William F. DeMerrit, bird warden of the town of Dover, has shown me a box that will be extremely useful where sparrows are very troublesome. The front is a door hinged by two nails driven in on either side near the bottom. It is provided with a hasp and catch such as are used to fasten the doors of book-cases, and can be opened in a moment and closed as quickly. This is a time-saving device for the use of those who have to inspect many boxes frequently to evict sparrows or squirrels (Fig. 32).

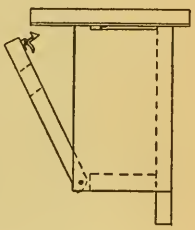


Fig. 32. — Plan for quick opening.

[1] Barrows, W. B.: "The English sparrow in North America," U. S. Dept. Agr., Div. Ec. Ornith., and Mam. Bull. No. 1.

[2] Hiesmann, Martin: "How to attract and protect wild birds," translated by Emma S. Buckheim, 1912, p. 92.

OPPORTUNITIES FOR FRUIT GROWING IN MASSACHUSETTS.[1]

FRED C. SEARS, PROFESSOR OF POMOLOGY, MASSACHUSETTS AGRICULTURAL COLLEGE, AMHERST, MASSACHUSETTS.

It is natural for the residents of any orchard section to consider it the one ideal spot in which to grow fruit. That is cheerfully admitted. But even when every allowance has been made for this prejudice we believe that New England generally, and Massachusetts especially, can come very close to making good on this proposition.

Stated briefly, the case of Massachusetts is this: first, she can produce fruit of exceptionally high quality; second, her land values are exceptionally low; third, the labor supply is abundant; and fourth, she is within easy reach of the best markets in the world. There may be sections with a more attractive combination of advantages than this, but if so we should be glad to hear of them.

Let us examine into these various claims and see what evidence there is to support each one. If they cannot be substantiated we want to know it, for Massachusetts does not want anything that does not rightfully belong to her.

First, then, as to quality of fruit. We are not going to make any comparisons because that is not considered polite, and besides, is not necessary. All we want to show is that Massachusetts does grow fruit of exceptionally high quality. The proof of the fruit, as well as the proof of the pudding, is in the eating, and it is to be regretted that it is not possible to give a sample of Massachusetts fruit to every man who is interested, or who might become interested, in Massachusetts orcharding. We certainly believe that that would convince any one. But two or

[1] This article was prepared to accompany the Massachusetts exhibit at the Panama-Pacific Exposition.

A well-loaded bough.

Young apple orchard five years planted.

three circumstances may be cited to prove the contention. The late Charles Downing of Newburgh, New York, was an authority of international reputation on fruits, and received samples from all over the continent. He once wrote a letter to an orchardist of Nova Scotia in which he said that from only one other section did he receive fruit of as fine quality as from the northeast corner of the United States and the southeast corner of Canada (Nova Scotia, New Brunswick, New England and New York), and that was from the mountain districts of Virginia, North Carolina and Pennsylvania, where the altitude gave the same general climate as the latitude did to the first-mentioned section. We believe this is a common impression among authorities and among consumers, and while we do not want to press the comparison at all, we *do* believe that the opinion of such a man as Mr. Downing carries great weight, and that our fruit must certainly be of high quality to have called forth from him such a statement.

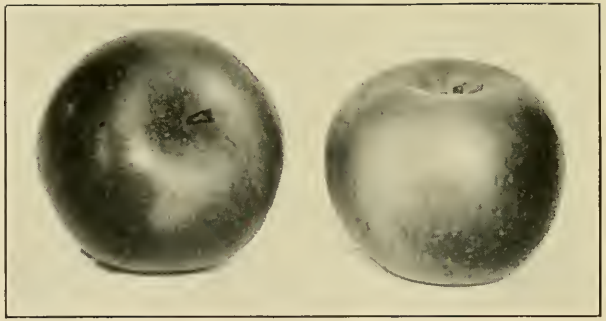
Another bit of evidence along the same line is the case of one of the large business men's clubs of Boston. It had been their custom for several years to buy their apples from a distant orchard section, where fruit of beautiful appearance and good quality is produced. One season a member of the club visited a large fruit grower of Massachusetts, and became so enamored with the Wealthy and McIntosh apples that he saw (*and* ate) there that he persuaded the commissary department of the club to place an order for apples with this orchardist. The result was that the Massachusetts apples won such favor among the members of the club that they were used exclusively from that time forward.

Second, in the matter of land values there is not the shadow of a doubt that Massachusetts can offer phenomenal opportunities. Of course as one gets close to the larger centers values are high, and yet even here they are not as high as in many orchard sections. Moreover, it is frequently possible to find, even in these near-by sections, a somewhat isolated tract of land which is admirably adapted to orcharding and yet which is extremely low in price. And when one is willing to go back from the larger centers the land values at once become very moderate indeed. Even in some of the best orchard sec-

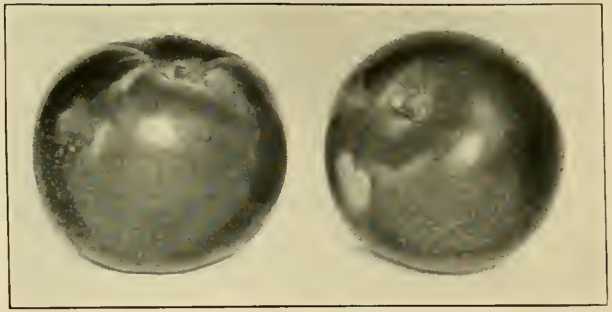
tions of the State, like Colrain, Leyden, Buckland and Ashfield, farms may be found that are genuine bargains. A single example may suffice to show what can sometimes be secured. Recently a farm changed hands at less than $2,000, which contained 175 acres of land, 65 bearing apple trees, a tract of 15 acres of good timber, a good house and barn, with running water in each, and plenty of open land with ideal apple soil which could at once be set to orchards. If this would not qualify as a bargain it is difficult to imagine a piece of real estate that *would*. It is not suggested that such bargains can be had every day, and the price of land is of course constantly increasing, but for several years to come Massachusetts and the other New England States will have orchard farms for sale at prices that will make the land values of most other sections look extremely high.

Moreover, the land in much of the State, besides being low in price, is admirably adapted to fruit growing. The soil is good, frequently ideal, for the leading varieties of apples of this section, such as Baldwin, McIntosh and Wealthy; the country is rolling, giving excellent atmospheric and water drainage, and enabling the orchard man to select warm, sunny locations which are yet free from danger of frost, where apples and other fruits of a color and quality to delight the most critical may be grown in the greatest profusion. And as already suggested, the climate is such as to impart to the fruit grown a flavor and juiciness seldom equaled.

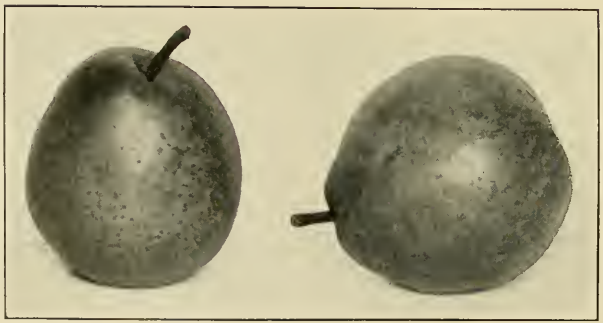
Third, on the labor question Massachusetts is equally fortunate. There is practically always available a sufficient supply of labor to handle satisfactorily any farm crops. Two factors contribute to this. In the first place, cities, towns and villages are so abundant that the grower is never far from a local base of supplies, where he can go in an emergency and get whatever help he needs. Frequently, too, many local men who are not regularly engaged in farming (such as clerks and teachers) make it a regular practice to take their vacations at the time when labor is in especial demand in the neighboring fruit plantations, and thus they secure a pleasant and at the same time profitable vacation, and thereby relieve the "pressure" in the labor situation. The second reason why the Massachusetts



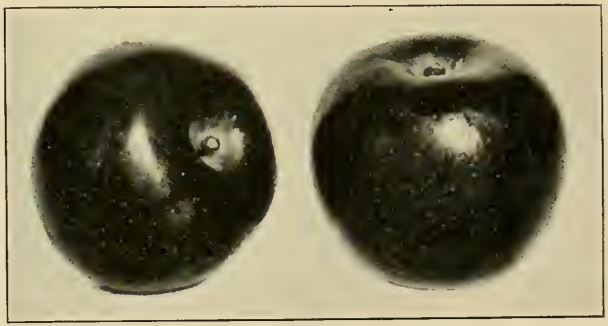
Palmer Greening Apple.



McIntosh Apple.



Dana's Hovey Pear.



Baldwin Apple.

Four high quality Massachusetts varieties.

fruit grower is unusually free from a shortage of labor is because he is so near to the great centers of immigration. Many large growers, for example, make it a regular practice to keep in touch with the Italian consul in New York, and in such rush seasons as the time of picking apples or peaches, secure through him a supply of extra laborers. Others, who employ a large number of men throughout the season, go to the consul in the spring and secure regular men for the entire season.

There seems to be no reason to expect this labor situation to change, and any fruit grower who has ever faced a shortage of labor, who has seen his fruit rotting on the trees or on the ground, will appreciate the feeling of security which this labor supply brings.

The fourth contention, as to good markets, really needs little evidence to sustain it. The mere fact that every other orchard section in the country is looking to our markets as the best outlet for its products is fairly good proof that they are satisfactory to the fruit growers of other sections. And if the orchard man in Virginia, 500 miles away, finds them acceptable, and still more, if the fruit growers of Oregon and Washington, nearly 3,000 miles away, consider them worth while, they certainly ought to prove so to the Massachusetts fruit grower who could not locate more than 125 miles from them if he wanted to.

There is no section in the country where there are so many people per square mile as right here in this northeastern corner of the country. That in itself is of great importance. But more important still is the fact that nearly all of these people are nonproducers of foodstuffs. They are mechanics, mill operatives and operators, and professional men. Many of them are well paid, and most of them spend their money freely. In most other farming sections practically every one is growing the same kind of products, so that the local market is a negligible quantity; but here in Massachusetts every village and small town has its manufacturing plant, with the result that oftentimes these small places offer exceptional opportunities to the man who locates near them and who produces a really high-class article in either fruit or vegetables.

If we grant, then, that the fruit grower of Massachusetts

is in the midst of exceptionally good markets, it is worth while to note the difference in his freight and express rates as compared with those from other sections. It costs on an average about 35 cents per barrel, or 25 cents per box, by freight, to put Massachusetts apples into Boston or New York markets. By express it costs $1.13 per barrel and 48 cents per box. It would seem that if that oft-predicted time ever comes when fruit growing becomes unprofitable, this advantage in transportation rates might easily make the difference between success and failure. (The author, for one, has heard this gloomy prediction from prophets of evil during a long lifetime and personally does not agree with it.) Moreover, the Massachusetts fruit grower not only has excellent and abundant markets, but the methods of transportation open to him are plentiful and varied. The State is a network of railways and trolley lines, so that a particular grower may have available one or two lines to Boston, the same to Worcester and Springfield, and if he cares to go to markets outside the State he has Providence, New York City, and even Philadelphia at no great distance from him. He usually has two express companies to choose from, the same in freight lines, and frequently a trolley express added. He can always rely on more consideration from the different lines because he *does* have an alternative in case their service is not satisfactory. And as a final advantage in the transportation situation the distances to many of his markets are so short, and the roads are so excellent, that the fruit grower is frequently altogether independent of the public service company because his own teams or his auto truck can take his product directly from the farm to market cheaper than it can be handled in any other way. The proportion of fruit handled by this latter method is certain to increase as our State road system, already excellent, becomes more and more extended, and as the manufacturers of auto trucks perfect them so that the fruit will be carried in even better condition. On the whole, it is difficult to see how a fruit grower could ask for much better transportation facilities than are already at hand here in Massachusetts or are soon to be realized. And certainly in this respect he is far ahead of the grower of almost any other section.

If this presentation of the claims of Massachusetts as a

Three-year apple tree.

fruit-growing section has proved interesting and convincing, as we surely hope it has, it may be worth while to spend a moment in considering some figures as to what has actually been done in the way of returns from orchards and in the costs of setting out and maintaining young orchards.

One of the best opportunities for quick returns in the orchard business to-day in New England is in the renovation of old orchards, which, through neglect, have been allowed to become unfruitful and unprofitable. There are, at the present time, thousands of such old trees scattered throughout the New England States, but they are every year becoming less and less, as men realize their possibilities and bring them back into new life. It is possible to change such old trees, in the course of three or four years, from poor, barren, disease-infested orchards into vigorous and profitable ones. Numbers of examples might be cited where this has actually been done, but the following case may be taken as typical. A farm on which was an old Baldwin orchard of 43 trees, located on about an acre of land, was bought a few years ago at $30 per acre. The trees were so badly infested with San José scale and other pests that it was seriously considered whether it would not be best to cut them down and plant out a new orchard. It was finally decided, however, to clean up the orchard and see what could be made of it. Accordingly, it was pruned and sprayed and cultivated and fertilized, with the results shown in the following statement: —

Expense, 1910.

Cultivation, cover crop, etc.,	$15 00
Pruning,	8 00
Fertilizers,	10 50
Barrels, 200, at 33 cents,	66 00
Picking and packing,	60 00
Spraying,	19 00
Total,	$178 50

Income.

150 barrels at $3,	$450 00	
50 barrels at $2,	100 00	
		550 00
Profit,		$371 50

Expense, 1911 (off Year).

Cultivation, cover crop, etc.,	$15 00
Pruning,	8 00
Fertilizers,	10 50
Spraying,	19 00
Barrels, picking and packing,	31 50
Total,	$84 00

Income.

40 barrels at $3,	$120 00	
10 barrels at $2,	20 00	
		140 00
Profit,		$56 00

Expense, 1912.

Cultivation, pruning, fertilizing, spraying, as before,	$52 50
Barrels, 175, at 33 cents,	57 75
Picking and packing,	52 50
Thinning, at 40 cents per tree for 40 trees,	16 00
Total,	$178 75

Income.

125 barrels at $4,	$500 00	
50 barrels at $2.75,	137 50	
		637 50
Profit,		$458 75

Turning now to the cost of establishing new orchards we submit the following from actual field operations: —

Cost of an Acre of Orchard for First Year.

Trees, 108, at 10 cents,	$10 80
Fitting land, setting and pruning trees, at 6 cents,	6 48
Fertilizing,	2 33
Cultivating,	4 50
Cover crops,	1 00
Clearing away around trees,	50
	$25 61

Four-year-old Wagener apple tree, bearing 110 apples.

A sour cherry orchard in bloom.

Of course many of these items are going to vary considerably under difficult circumstances, more particularly in the number and price of trees, but the total here is a fair average. When one adds to this the cost of the acre of land, $10, $20, $50, or even $100, the cost of the acre of orchard when established is certainly very moderate. The expenses of operating the orchard while young will run about as follows: —

Pruning,	$2 50
Fitting the land (plowing and harrowing),	3 60
Fertilizing,	2 55
Cultivation,	4 50
Hoeing,	1 00
Cover crop,	2 00
	$16 15

Thus far we have spoken almost entirely of the orchard side of fruit growing, but let no man imagine that this is the only side from which good returns may be secured. All kinds of small fruits, strawberries, raspberries, blackberries, currants and gooseberries offer excellent opportunities for profitable returns. Indeed, the perishable nature of these fruits, and the fact that when allowed to become fully matured before picking they are much finer than when picked green, makes them especially profitable to the local grower. It is nothing uncommon, for example, to see the price of strawberries jump from two baskets for a quarter, on stuff shipped in from a distance, to 25 cents a basket (or even 55 cents for really choice berries) when the first natives come on the market.

Let us say in conclusion that we have tried to be conservative in the brief presentation we have attempted of the opportunities for making money out of the fruit business in Massachusetts. Any one who has ever attempted to discuss a proposition in which he thoroughly believes knows that it is sometimes difficult to restrain one's enthusiasm. We feel sure we are *right*, but whether right or wrong we extend a cordial welcome to any who are interested to make further investigation.

OPPORTUNITIES IN POULTRY CULTURE IN MASSACHUSETTS.[1]

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Introduction.

The rapid growth of our cities and towns during the last few decades, partially at the expense of rural population, has caused congested city conditions, an increased price of agricultural products, and, in general, has aided materially in bringing about the high cost of living. As one would naturally expect, these conditions have turned the attention of all classes of city people toward the farm so that at the present time "back to the soil" is heard in the city nearly as often as "young man, go west" was heard several years ago. The former expression sounds very alluring to city-bred people who read of the opportunities in various lines of agriculture, — how abandoned farms can easily and readily be restored to their former state of production; what wonderful crops can be produced when handled by the "right man;" and many other similar flowery and attractive stories.

To be sure, the advantages of rural life over those of the city are enticing. Life on the farm now is not what it was a few years ago. The farmhouse, with all its modern conveniences, pure air, healthful work and more or less independent life draw many from the city, and we hope it will continue to do so. But let us impress upon the inexperienced that to-day any one of the various lines of specialized agriculture is much more of a business proposition than is general farming under less intensive conditions, and one who embarks in any branch of it

[1] This article was prepared to accompany the Massachusetts exhibit at the Panama-Pacific Exposition.

Typical Massachusetts poultry farms.

with the hope of success should at least be well versed in the rudiments of the business. The fact alone that agricultural colleges and experiment stations have been established in practically all the States of the Union — to train men and women for agricultural pursuits and to help farmers solve their problems — is evidence that those who contemplate engaging in any line of farming should be well informed on the subject. The following pages give but a mere outline of the opportunities in poultry culture in this State, with special emphasis laid upon the necessity of preparation for the industry.

Production and Consumption.

A great deal has been said in recent years about the consumption and production of poultry products in Massachusetts. From statistics gathered a few years ago on this subject the production was estimated at from $6,000,000 to $7,000,000, and consumption, $25,000,000 to $30,000,000. Students of economics believe the latter figures to be far too low, and those acquainted with the productive side believe the former do not give credit to the industry. A careful survey of the city of Ithaca, New York, in 1914 showed that the average annual consumption of eggs per capita was 400 and the number of chickens and fowls 8. Granting that the people of this State eat as many eggs and poultry per capita as those of Ithaca, the total value of products consumed would reach the enormous sum of $60,000,000 or over. The data obtained in Ithaca correspond very closely with those obtained in New York City in determining the value of poultry and eggs consumed there. We cannot be far from correct then when we say that the value of these products consumed in Massachusetts annually is in the neighborhood of $45,000,000 to $50,000,000, and there is abundant evidence that the production of eggs and poultry in this State is rapidly increasing. The baby chick industry has opened up a new field of work which enables hundreds of people to buy and raise a few chicks in back yards who have not been able to do so heretofore because of lack of facilities for hatching or obtaining chicks. I believe, when statistics are gathered showing the number of chicks hatched in Massachusetts annually, the figures will be astounding. The im-

portant point for the man to note who intends to embark in the poultry business or increase his output is the fact that as long as consumption in the State is several times greater than the production there is no immediate danger of the business being overdone.

Climate.

The climate in this State is very favorable to poultry culture, for we do not have the extremely cold spells in winter nor the prolonged hot ones in summer which are found in the more central portions of our country. At first thought, one might suppose that a section of the country having warm winters or, in other words, perpetual summer, is better suited for poultry than ours, but in reality it is found that under such conditions more work is required to keep down disease and such pests as lice and mites than to care for the poultry. Long, mild autumns and snow not remaining on the ground usually before the last of December are factors which are conducive to finishing off the pullets and bringing them to laying maturity before real winter sets in.

Last winter (1913–14) was considered one of the coldest in years, yet poultry were kept in open-front houses without freezing their combs, and in general the egg production was excellent. On many farms production was above the average. In some sections of the country many hens are lost during the summer on account of excessive heat. Such losses are comparatively few in Massachusetts, however, as the nights are always cool. This climatic condition not only adds to the comfort of the fowls, but is conducive to high summer laying.

Another point not to be overlooked is the fact that the greater part of this State is free from fogs as compared with some sections of our country having a more moderate climate. We are fortunate in this respect, as fogs cause heavy dews in spring and summer, decrease the sunshiny days in winter and dampen the poultry houses at that season of the year. In some States near the coast poultrymen are often obliged to keep their cloth screens closed in order to shut out the fog and mist. On account of the moderate climate, in the eastern part of the State especially, the early hatching and rearing of chicks is encouraged. The result is the production of early broilers,

early roasters and early pullets for fall layers when eggs are extremely high, thus insuring high prices throughout the season. Again, on account of the mild climate, the winter growing of chickens has become an important industry, and the "South Shore Roaster District" is known throughout the world. Winter growing enables the producers to put large, fine roasters (capons) on the market from March to July, when the cold-storage plants are practically empty. In other words they control the market, and the prices (live weight) range from 25 to 33 cents per pound.

Soil.

In no section of the country is soil better adapted to poultry. Most parts of the State have a light, sandy or gravelly loam. There is no danger, therefore, of its becoming contaminated with droppings, as it is leached out by the heavy rains. On such farms in New England poultry have been kept on the same land for 40 years with no serious results. Of course, I refer now especially to poultry farms, not general farms where only a few fowls are kept, and to the extensive rather than the intensive system. Again, much of the soil here is adapted to the growth of corn, mangels, beets and all kinds of green crops for poultry. Its sandy condition gives a quick growth which means tender, palatable green food throughout the growing season.

The fact that our soil and climate are well adapted to all kinds of fruit is an advantage that cannot be overlooked. Fruit trees not only yield a crop, but furnish shade in summer and windbreaks in winter. Much of the soil is well suited to the production of corn, and immense crops can be produced by raising corn and poultry on the same ground in alternate years. Very little fertilizer other than that produced by the poultry need be used, other things being equal.

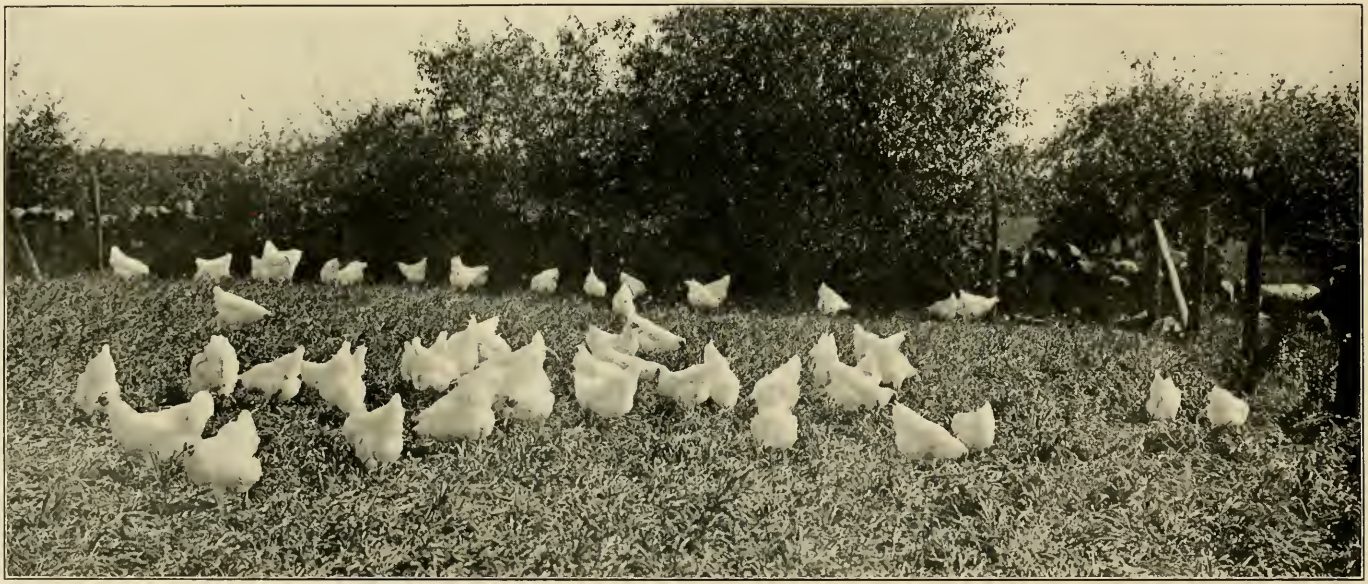
Low Price of Land.

We are sure very few people living in New England realize the difference in the cost of land here as compared with that in the middle west. Very little farm land can be bought there for less than $100 per acre, and most of it sells for $125 to $160,

if the location is at all favorable. On the other hand, good land for raising poultry can be bought here for $25 to $50 per acre. The advertising columns of any of our Sunday papers bear testimony to this statement. The cheap land in this State is not inaccessible to good markets as is the case in the west. In fact, there are very few places in the State from which eggs and poultry cannot be gotten to Boston within from two to six hours. It is true, of course, that most of the land here is not comparable with that in the west so far as quality and general fertility are concerned, but it is much better suited to poultry, with the exception that it will not produce as much feed per acre for the hens. Rolling land such as we have enables us to select a suitable sunny location for poultry buildings where they may be protected from winter winds either by a hill or natural forest. Again, our quick soil will grow an excellent windbreak in a very few years. Furthermore, by selecting land for poultry carefully and locating the buildings judiciously an automatic water supply can be obtained for the poultry buildings. This is a labor-saving item that should receive much more consideration than it does in planning poultry projects.

Capital.

One needs very little capital to start in the poultry business as compared with that needed in some other branches of farming. Even a few dollars are sufficient to equip a back-yard poultry plant, and $600 or $1,000 in addition to the land will almost furnish equipment for a one-man poultry project. The great mistake which most people make is in putting too much of their capital in land and equipment and not reserving enough for emergencies. They overestimate their ability and underestimate the amount of knowledge, skill and practical experience required to run a large poultry farm. Were they to invest only a small portion of their funds at the beginning, and be sure their knowledge, skill and experience are keeping pace with the size and development of their plant, much better results would follow and fewer failures would be recorded. Again, many people embark in the poultry business without a well-prepared plan for development. For this reason there is more or less of a waste in capital. If the project were definitely



White Plymouth Rocks in rye field.

planned at the start and developed step by step, or the additions made year by year, the available capital would be more economically expended. The amateur or inexperienced man should not spend more than $300 or $400 on poultry buildings and equipment the first year, nor should he think of reaching the maximum size of his plant within five years at least.

Markets.

There is no State in the Union that presents greater opportunities in poultry culture than Massachusetts. Boston, at one end of the State, and New York City, practically at the other, give access to two of the greatest markets in the United States. The fact, also, that the fancy trade in the former city demands brown-shelled eggs, and that of the latter, white-shelled, gives considerable freedom in the choice of breeds. It is said that Connecticut does not produce enough eggs to supply Hartford, and we are sure that Rhode Island cannot supply Providence nor Massachusetts Boston. This, therefore, makes Boston the greatest egg market in New England, not only because of her great population, but because she is situated farthest from the great egg-producing sections of the country. If reliable statistics could be gathered, we believe they would show that this State consumes as many eggs and poultry, if not more, in proportion to its population than any other section of the country. Furthermore, the quality demanded by the people of New England is far superior, I am sure, to that required elsewhere. On account of the great disparity between production and consumption of poultry and eggs in Massachusetts the producers have practically a retail trade for their products, whereas poultrymen in sections of the country where there is an overproduction are obliged to ship their eggs long distances or seek what might be termed a foreign market. In other words, the poultry producers of this State are nearer the consumer than those of any other section of the United States. I think, also, that we are safe in making the general statement that the middleman's profits on poultry and eggs are much less than those on most farm products. As an illustration of how the market is brought to the poultryman's door, take the summer hotels which are found in all sections of the State, where

people from the larger cities spend their vacations. These assure a good price for eggs during the summer months when they are usually cheap in the regular markets. The price of eggs in Massachusetts during the spring and early summer, the period of maximum production, does not reach the low price attained in many parts of the country. This is due to the fact that millions of eggs are incubated at that time, and also because of the very important fact that hundreds of thousands of eggs are shipped to other States. Massachusetts has long been considered the center for hatching eggs and breeding stock of high quality, and this has a double effect in that it not only means high prices for eggs and stock when market prices are lowest, but it lessens the number of marketable eggs at that season, and thereby insures prices of a higher level. In comparing this with a section where practically all eggs produced are placed on the general market, and the hatching eggs imported, so to speak, it is easily seen that the general trend of prices will be much lower in the latter section than in the former.

Marketing.

A very large proportion of the eggs produced in this State are retailed locally. There are very few towns or villages of any considerable size in which the demand is not greater than the supply. Many of the large producers do not cater to the local retail trade, but prefer to ship their eggs to the large cities where they can secure a special price equal to or even greater than the retail price in their home town.

Parcel Post.

Parcel post is rapidly coming to the aid of many producers in outlying districts. By this means eggs can be sent to the consumer by the producer in 5 to 10 dozen lots, and the container returned at a cost of from 4 to 5 cents per dozen. Many people in the large cities and their suburbs are only too willing to pay a little above the retail price in order to get eggs of first quality. Reports from postmasters in various parts of the State show that large quantities of eggs are already being marketed in this way. Dressed poultry are also finding their

way to market by parcel post. In most parts of the State a dressed fowl mailed in the afternoon reaches the consumer in time to be used for dinner the next day. Many producers have marketed their products during the entire summer in this way, with good results. The fact that Massachusetts is a small State, and the rural population small, makes it an ideal State for this method of marketing. Parcel post for handling poultry lends itself best to sections of our country where the intelligence of the farmer is relatively high, in order that the birds may be properly fattened, dressed and packed. We believe Massachusetts excels in this respect.

Express Companies.

Express companies are only too anxious to assist poultrymen in marketing their products. They are willing at any time to take eggs and poultry, dispose of them through their agency department, and after deducting their commission and express charges, return the balance to the producer. It is easily seen that inasmuch as these companies have a double interest they will seek the highest price possible for their customers. It is not known to what extent the express companies contemplate branching out in the marketing of eggs and poultry, but if it is done to the extent that present indications warrant it will be a great boon to the outlying districts. One poultryman in a neighboring State told me that the prices express companies can get at times are more than satisfactory.

Marketing Associations.

Up to the present time very little has been done by poultry or egg marketing associations. No doubt this is due to the fact that the local markets are so good in most places. This means of marketing lends itself admirably to sections several miles from markets where the annual production of individuals is not very great. By co-operation there is considerable saving in labor and expense; more frequent shipments can be made and therefore fresher products placed in the hands of the consumer. This method of marketing poultry and eggs is used by hundreds of communities in Canada and the western States, as

well as in foreign countries. It is now being considered by a number of communities in this State, and will no doubt be found advantageous by a few at least.

From the above it is evident that the poultry keepers of this State have all the advantages possible in marketing their products. Parcel post, express companies, excellent local markets and co-operative associations will in the future enable them to reach the consumer without leaving very much in the hands of the middleman.

Feeds.

The fact that all the feed required for poultry cannot be produced in Massachusetts leads many to think that poultry keeping cannot be made very profitable. We believe this should give no cause for alarm, however, for when we compare the prices of grain, poultry and eggs in the great grain-producing sections of the country with those of ours we find the advantage is still in our favor. In October, 1911, farmers in the middle west were selling live chickens at 7 cents per pound, and at the same time they were bringing from 14 to 18 cents here. In September, 1912, eggs were selling in Massachusetts at 40 cents when farmers in Wisconsin were getting only 22 cents. On November 20, 1913, a farmer in southern Minnesota wrote me that all he could get for eggs was 24 cents, and the retail price here was from 55 to 70 cents per dozen. On the other hand, we find no such variation in the prices of feed.

I spent several years of my life at both Warren, Illinois, and Oshkosh, Wisconsin, and it may be of interest to compare prices in these places with those in Massachusetts. Accordingly, on November 11, 1914, I communicated with a reliable man in each place who buys his feed at retail. The results are given below: —

White Wyandotte cock, first prize, Chicago Show, 1914. Raised at Vineyard Haven, Massachusetts. (Photograph by permission of "Owen Farms," Vineyard Haven.)

Rhode Island Red cockerel, first prize, Chicago Show, 1914. Raised at Vineyard Haven, Massachusetts. (Photograph by permission of "Owen Farms," Vineyard Haven.)

TABLE 1. — *Comparative Cost of Feed (per 100 Pounds).*

NAME OF FEED.	Amherst.	Oshkosh.	Warren.
Whole corn,	$1 75	$1 60	$1 34
Wheat,	2 20	2 08	2 00
Oats,	1 95	1 65	1 56
Barley,	1 77	1 77	1 56
Cracked corn,	1 75	1 90	1 75
Corn meal,	1 75	1 90	1 75
Ground oats,	1 95	2 00	1 60
Bran,	1 40	1 35	1 30
Flour middlings,	1 75	1 65	1 50
Red Dog Flour,	1 95	1 65	1 60
Gluten feed,	1 70	1 50	1 60
Linseed meal,	1 85	1 90	1 75
Ground alfalfa,	1 55	2 00	1 75
Beef scrap,	2 75	3 50	2 00
	$26 07	$26 45	$23 06

What interested me most was the slight difference in the cost of keeping a hen for a year in those sections and in Massachusetts. Given below is the comparative cost of 100 pounds of mash and 100 pounds of scratch feed in each place. Data from experiment stations and other sources show that a good laying hen eats on an average about 100 pounds of feed, grain and mash, annually.

Assuming that she consumes equal quantities by weight of each, the cost of keeping a hen a year in each place is as follows: —

TABLE 2. — *Comparative Cost of Keeping Hen One Year.*

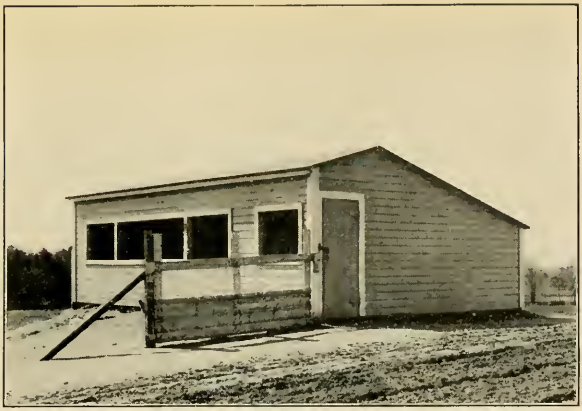
NAME OF FEED.	Amherst.	Oshkosh.	Warren.
Mash (per 100 pounds.)			
Corn meal,	$1 75	$1 75	$1 75
Ground oats,	1 95	2 00	1 60
Bran,	1 40	1 35	1 30
Flour middlings,	1 75	1 65	1 50
Gluten feed,	1 70	1 50	1 60
Linseed meal,	1 85	1 90	1 75
Meat scraps,	2 75	3 50	3 00
Cost of 700 pounds,	$13 15	$13 65	$12 50
Cost per 100 pounds,	$1 88	$1 95	$1 79
Grain.			
Corn meal (200 pounds),	$3 50	$3 80	$3 50
Wheat (100 pounds),	2 20	2 08	2 00
Oats (50 pounds),	98	83	78
Cost of 350 pounds,	$6 68	$6 71	$6 28
Cost per 100 pounds,	$1 90	$1 91	$1 80
Grain (50 pounds),	$0 95	$0 95½	$0 90
Mash (50 pounds),	94	97½	89
	$1 89	$1 93	$1 79

It is readily seen from these data that the average cost of keeping hens in the middle west and in Massachusetts is practically the same if feed is purchased at retail prices. This, coupled with the fact that on that same date eggs were retailing here at from 50 to 70 cents per dozen, and at 30 cents at both Warren and Oshkosh, gives the Massachusetts producers a great advantage. It must be kept in mind, also, that our milder climate means a much higher egg production at that time of the year. The farmers in the middle west who raise all their grain have the advantage, as they can value it at wholesale instead of retail prices, but even then the difference in cost of feed per hen would not be more than 20 to 25 cents per year, which would be fully counterbalanced by the difference in price of one dozen eggs during the fall or winter season.

Modern Poultry Equipment.

The rapid strides made in poultry keeping during the last two decades have eclipsed that of most other lines of farming, due largely to the efficient apparatus and equipment which necessity has brought into use. When the incubator came out a number of years ago thousands of people held up their hands and said that good, strong, vigorous chicks could not be hatched in a wooden box, believing, many of them, that the hen transmitted to the chick through the shell, not only vitality but certain poultry instincts among which was that of egg production. These notions have not only been proved false, but at the present time the "wooden box" has developed to such an extent that we have incubators varying in egg capacity from 40 or 50 to as high as 20,000 or 25,000, and, as already stated in a preceding paragraph, one hatchery in this State is capable of incubating 1,000,000 eggs annually.

The influence of the incubator is much greater than many of us suppose. It not only enables us to hatch eggs in large numbers if necessary at any season of the year, independently of the hen, at a low cost and with a minimum amount of labor, but one of the far-reaching advantages is the fact that it is enabling us to breed the maternal instincts out of the hen. The advantage of this can readily be understood when we realize



Laying house for 100 hens, Massachusetts Agricultural College, Amherst.

Interior of 100-hen laying house, Massachusetts Agricultural College, Amherst.

Incubator cellar.

that broodiness is one of the great factors in cutting down egg production among our American and English breeds.

Many methods for brooding chicks artificially also have been devised. These cover a great range, with the fireless brooder at one end and the large pipe brooder house at the other. Intermediate between these are innumerable kinds of hovers, brooder stoves, etc. Our modern brooding equipment not only furnishes the means of caring for chicks in larger flocks, but concentrates the work and cuts down the labor to a minimum. This is evident from the fact that the pipe brooder houses are capable of caring for from 1,000 to 3,000 chicks at one time. Brooding equipment has not yet reached as high a point of efficiency as that of the incubator, but we hope in a few years to place the former on just as sound a working basis as the latter.

Modern methods of dry mash feeding, together with the hoppers and other utensils that make up our feeding equipment, enable us to keep a larger number of birds at a much lower cost and with less labor than formerly. Many kinds of automatic hoppers are being tried out, and it is possible that we may be able to so equip our houses that the hens will do their own feeding.

What has been said concerning hoppers can also be applied to drinking fountains, as some of the newer ones on the market are so made that the water is kept warm during the winter season by the use of a small lamp.

The Large Flock House.

The large flock house has come to stay. I do not refer to flocks of several hundred, but to those of 100 to 150. It has been shown conclusively that flocks of this size can be kept profitably, and the egg production will be nearly as high as that of smaller flocks. The great drawback in the past in keeping large numbers in one pen was the inability to devise a house that would comfortably accommodate such a flock. Modern poultry houses will do this.

Shipping Cases for Baby Chicks.

No one can tell of the far-reaching results when suitable shipping cases for baby chicks are invented to keep pace with incubator development. These, together with the incubator, enable thousands of back-yard poultry keepers and others, who are not able to keep breeding flocks, to get baby chicks in good condition at a low cost.

With our present knowledge of the care and management of poultry we are able to do many things that were not thought possible a few years ago. For example, as a boy, I learned that Brahmas were not of any practical or utility value; that they were just a fancier's bird that required a year for development; that they were poor egg producers, poor mothers, but great sitters. They were poor mothers because the immense amount of toe and shank feathering kept them from seeing their chicks, and as a result their babies were trampled to death.

All these notions came about through ignorance of the best methods in the care and management of this variety. To show the falsity of these I have only to cite that there is one man in Massachusetts who does not pose as a fancy breeder at all, but simply as a utility man. He keeps a very large flock of Brahmas, and they have paid for his farm, given him a good bank account, kept his family in good circumstances and educated his children. He considers his Brahma stock even better than bank stock. What is the secret? There is none. This man has learned to how handle Brahmas. He knows when to hatch them and how to care and manage them throughout the various seasons of the year. "Knowledge is power."

Probably one of the most notable achievements in poultry culture is placing the duck business on just as sound, safe and profitable a basis as any line of manufacturing or practically any business. Some of these duck men through long years of study have at last reached the point of efficiency where they are able to hatch ducklings practically the year round. One of the greatest troubles was to get their breeders to produce eggs during the fall and early winter months. Recently, however, some of them have learned that by hatching ducks at a certain time, with good management they are able to bring them to

laying maturity during the late summer or fall, so that the output of the duck plant now practically covers the entire year.

What has been said in regard to the efficiency of the duck business is almost as true of the South Shore soft roaster business. The art of caponizing and the skill in using modern poultry equipment are enabling the people of that section to take advantage of the high prices during the period of scarcity of meat from March to July.

It is easily seen from the above that poultry culture has not only made rapid strides in the last few years, but it is fast being placed upon a sound business basis.

Labor.

Successful poultry keeping like everything else requires plenty of well-directed labor, but it is not of the heavy, strenuous kind found in many other lines of farming. About the heaviest work connected with it is handling bags of grain, and if one has a well-placed grain room the feedman will do that. Keeping poultry may well be termed busy work, and that is one reason why it appeals to retired or broken-down business men who are not capable of existence unless they are working. Whether the labor is productive or not does not concern some, as long as they find pleasure in the work. Most of the labor on a small poultry farm can be done by women or men not capable of doing heavy work. Another very attractive feature about poultry keeping is that very little night work is required, due to the fact that hens go to their roosts and come down from them with the sun. Of course, during the incubation and brooding seasons, and those periods when the poultry-man is selecting his breeders and studying his birds, some late labor will be necessary, but work of that kind is so interesting that it is considered a pleasure rather than a drudgery.

Transportation Facilities.

No State in the Union is more fortunate than ours in transportation facilities. It is literally covered with a network of railroads, besides being cut up in a similar way by trolley lines. The places, therefore, that are not reached by either one or the

other are very few indeed. The fact that trolley lines run express cars means good service in every part of the State. Again, in a section of the country so densely populated as this many railroad trains must be run daily in order to handle the traffic. Quick and efficient service is the result.

One of the greatest assets of the farmer is good roads, and we venture to say that no State has a better system of State roads than Massachusetts. Only those who have been obliged to use poor roads can fully appreciate the value of good ones. It is not overestimating to state that with a system of roads such as we have here fully half the time usually spent in marketing and hauling is saved. With the present-day prices of labor this is an item well worth considering. These exceptional facilities in transportation, therefore, enable the poultrymen of the State to get their products to market quickly, in good condition and at a low cost, to say nothing about the labor and expense saved in obtaining grain and other raw materials.

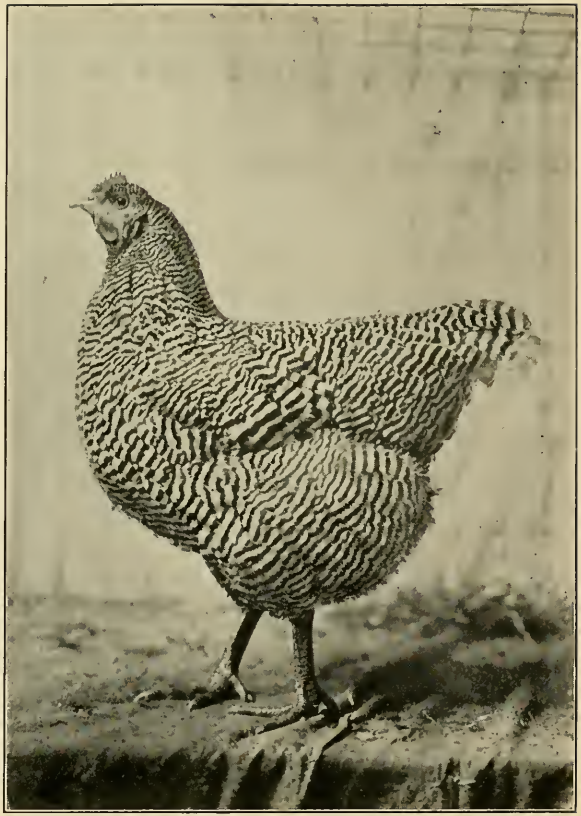
Construction.

It is true that the cost of lumber and labor are much higher at present than a number of years ago, but our modern methods of construction and management nearly offset the difference. The building of wider houses and keeping hens in flocks of from 100 to 150 has decreased very materially the cost per hen for housing. For instance, a house 8 feet deep and 100 feet long will house about 160 to 175 hens, and one 18 feet deep and 100 feet long will house 400 hens. But the former has 216 running feet of wall and the latter 236. The extra 20 running feet of wall and additional roofing more than doubles the capacity of the house. Again, certain manufactured commercial materials are gradually taking the place of lumber, and sand and gravel can be obtained practically for the handling for concrete construction.

Quick Returns.

There is probably no line of farming that furnishes quicker returns than those obtained from poultry. To those who have but little capital this is an important consideration. If one begins by buying mature pullets or hens the income is im-

White Orpington cockerel, first prize, New York Show, 1914. Raised at Vineyard Haven, Massachusetts. (Photograph by permission of "Owen Farms," Vineyard Haven.)



Barred Plymouth Rock hen raised at Waltham, Massachusetts. (Photograph by permission of American Poultry World.)

mediate, and even if he starts with eggs for hatching, broilers will be ready to market in from ten to twelve weeks, roasters five to seven months, and the pullets will begin to lay when from five to eight months of age. The opportunity to turn one's capital several times during the year is equivalent to having double or triple the amount. This compared with some other lines of farming, where one or more years are required to produce a crop, gives poultry keeping a big lead. Another thing of great importance is the fact that every kind of poultry business is done on a strictly cash basis. This means quick money and no bad bills.

Poultry and Eggs as Delicacies.

Eggs and poultry have long been considered delicacies for the table. Our greatest of all feasting days, Thanksgiving Day, is not enjoyed to the fullest extent unless the table is decorated with the king of fowls, the New England turkey, and yet on account of the scarcity and high price of these the last few years many of us have been glad even to get a good capon, fowl or chicken. Throughout the entire farming sections of the country the highest honor paid to a guest at the dinner table is to place before him a delicious chicken or fowl cooked by the farmer's wife herself.

Eggs, on account of the ease with which they can be obtained, their palatability, digestibility and the many ways in which they can be prepared, have become one of the principal foods for the sick and convalescent. Their almost absolute freedom from injurious disease germs highly recommends them for this purpose. The size of the egg and condition of the shell make its use not only convenient, but very economical, as it contains all the rich nutriment that a child or invalid should take at one time. The structure and condition of the case with which the hen encloses the egg preserves it for a considerable length of time without deterioration. There is practically no waste, therefore, in the use of eggs, and they are unsurpassed in richness of flavor. Again, the fact that an entire carcass of a fowl is purchased at one time, and that its size can be regulated to meet the convenience of the family, gives it a great advantage over that of other animals on the farm.

It is greatly to be deplored that such good wholesome food as eggs and poultry of all kinds should be so scarce and expensive that they are reserved for the sick, the wealthy and for special occasions only, instead of being within the reach of the poor and those of moderate means.

Scarcity of Meat.

Each year meat of all kinds, except poultry, is becoming scarcer and scarcer, and the price therefore higher and higher. A careful study of the receipts at the Chicago stock yards cannot fail to convince one that beef, pork and mutton will soon be beyond the reach of the family of ordinary means, and the worst feature about it is the fact that no relief is in sight. As far as we are able to learn, no increased production of these meats can be expected within the next few years, and the recent tariff act has had no perceptible effect upon the price, at least, to the consumer. We must, then, look more and more to poultry products to make up this deficit in meat supply. The large roaster plants and duck farms are doing a great deal toward it now, and we hope to see very soon a decided impetus to goose farming and turkey raising.

The Egg-eating Habit.

The extent to which the egg-eating habit has increased during the last few years is very noticeable. A careful canvass will show that many families are now having eggs for their breakfast who, a few years ago, either did not care for them or felt they were too expensive. Not only has their use increased in the private family, but egg sandwiches and egg drinks are now popular at restaurants and soda fountains. A man remarked in my hearing not long ago that there is not a drug store in the country, of any consequence, but what keeps a large dish of fine fresh eggs on the counter. This was not the case a few years ago. No doubt the high price of meat and our habits of living in recent years have done much to bring this about. The people of New England were the first to learn the true value of eggs as a food, and many of them have commented, in talking with me, on the fact that some people will quite willingly pay

5 cents apiece for oranges and apples, or buy plums at the rate of 2 or 3 for a nickel, and at the same time make a tremendous kick and talk about combines or trusts when good wholesome eggs sell at 4 or 5 cents each. This same egg-eating habit has taken possession of Europeans also. About four years ago a commission was appointed in England to investigate the high price of eggs. In their report it was stated that one of the most important causes for their scarcity and high price was the development of the egg-eating habit among the peasants of western Europe, in southern Russia and certain parts of Germany and Austria. All these facts are evidence of the increasing demand for poultry and eggs, and the opportunities in poultry culture in Massachusetts will not be confined to the next few years, but will continue for many years to come.

Poultry Instructors.

There never has been a time in the history of education when there was such a demand for a particular class of people, and at the same time so few qualified to meet this demand, as we have in our instructional work in poultry culture at the present time.

During the last twelve or fifteen years poultry departments have been established in nearly all of our agricultural colleges. A large number of county agricultural schools have been organized in various parts of the United States, and agricultural departments have been established in high schools. Furthermore, there have been instituted in the country quite a number of what are termed agricultural high schools. In nearly all of these institutions poultry instruction has been demanded, and to meet this demand a great many people have taken these positions who have not been trained professionally for that kind of work. Such positions require men with, as one can readily see, a particular kind of training, one covering all three phases of the work, — scientific, practical and professional or pedagogical.

I believe there are no greater teaching opportunities in the country to-day than those offered to young men who will fit themselves for teaching poultry culture in these various schools. In addition to teaching there has come a great demand from our agricultural experiment stations within the last five years for trained men to carry on experimental work in poultry

keeping. This offers a still greater field at the present time so far as salaries and opportunity for original investigations are concerned.

Poultry Journalists.

Poultry journalism is gradually being raised to a higher plane, and there are great opportunities in this line for young men and women. At present our remuneration for such work is not what it should be, but this is due to the fact that many people are only too glad to contribute articles free of charge for the advertising they get. As can readily be seen, this has a tendency to place poultry journalism on a much lower plane than would otherwise be the case. There are splendid opportunities in poultry journalism for young men with careful scientific training, together with broad practical experience.

Managers of Poultry Farms.

The demand for men to take charge of poultry farms is several times greater than the supply. We have reference to men well qualified for the work, and not those who are simply looking for such positions. One man told me he would pay $2,500 for a manager of his poultry plant, but he wanted one who was worth it. People who are investing their money in farms and poultry equipment are looking for men who have both scientific and practical training, some experience and considerable business ability. Opportunities for such men are unlimited.

Poultry keeping is no longer confined to one particular line of work. It has become a thoroughly specialized line of agriculture, and there are opportunities in any one or more of these lines. The most important phases of the work are the following: —

Meat Production.

Roasters.

The marketing of fowls and cockerels in the fall is an important part of the poultry work on every general farm in the United States. But there are a number of poultry farms in this State that have made the production of roasters a special-

White Leghorn cock, first prize, New York Show, 1914. Raised at Vineyard Haven, Massachusetts. (Photograph by permission of "Owen Farms," Vineyard Haven.)

Buff Orpington cock, first prize winner at Holyoke Show, 1913. Raised at Agawam, Massachusetts. (Photograph by permission of W. E. Blodgett, Agawam.)

ized line of agriculture. Most of them are in the South Shore District mentioned above. This district includes the towns of Hanson, Rockland, Hanover, Pembroke, Marshfield, Duxbury and Abington in Plymouth County. The systems or methods of carrying on the work vary to the same extent as those found among the market-egg producers. On some of these farms no breeders or layers are kept except for family use. Eggs for hatching are bought and incubated from July to November, the chicks brooded in long pipe brooder houses, grown to maturity in colony houses, and placed on the market from March to July. The killing and picking are done principally by one man who runs a commercial establishment of that kind. There is no expense to the producer in advertising and selling, as the buyer comes to the farm every week and takes those that are ripe (in good condition) till they are all gone. No doubt more poultry history has been made in this section of the State than in any other part of the country, at least so far as utility poultry farming is concerned. It is here that caponizing was put to practical use on a large scale, and the large pipe brooder house reached its maximum use.

Broilers.

The production of broilers as a specialized line of agriculture has never met with any great success. This is due to a number of causes, the first of which is the lack of knowledge in systematizing and conducting such an enterprise; second, the methods used were too intensive; and third, the cold-storage plants brought down the price at a time of the year when the business should yield its greatest profit. When these broiler plants began to operate they found there was an over-production from June till October, during which time the cold-storage plants filled up, and kept the price down until the following spring. One of the great difficulties encountered was the inability to obtain good, fertile eggs every day in the year. In order for a large, expensive plant to be successful, several hundred eggs must be set daily, and the period when they are needed most is that in which eggs are very scarce and hatch poorly. For example, to pay a high price for eggs during the months of November, December and January, hatch not more

than 30 to 40 per cent of them, brood and grow the chicks with artificial heat with the usual accompanying losses, means high-priced meat. The man who undertakes this work should be well equipped in every sense of the word. Poultrymen who have a special trade for broilers and can secure hatchable eggs the entire year may do well if they understand the business.

Market Egg Farming.

Eggs, Fruit and Hay.

There are very few poultry keepers in the State who do not at some time during the year produce marketable eggs, but under this heading we have reference to that class of poultrymen who make a specialty of this line. These could be divided and subdivided into a large number of classes on account of the great variations and combinations under which their work is carried on. Only a few, however, will be mentioned. There are many who run what might be termed an egg factory. They buy pullets in the fall, keep them until the following summer and dispose of them for meat, clean and disinfect their houses and begin again with new stock; no breeders are kept or stock raised. On farms of this kind some other line of agricultural work is usually combined with that of poultry. Poultry and hay, or poultry and fruit, make a good combination. One man with the former combination who keeps about 1,000 hens states that with very little additional fertilizer he is able to sell about $1,000 worth of hay annually, and one with the latter combination markets about $4,000 worth of poultry and eggs. Most of the people, however, have more complete poultry equipment. Some buy baby chicks, brood and grow them to maturity, while others who feel they can profitably do so buy eggs, do their own hatching as well as rearing, and still others keep their own breeding stock. The last system is much more complicated, as the production of good, hatchable eggs year after year requires considerable skill. The production of market eggs is the major line in poultry farming. The plan or system that one adopts should depend first upon *himself*, second upon his knowledge, skill and experience, and third, his facilities.

Hatcheries.

The Mammoth incubator has come to supply the demand for baby chicks. There are thousands of people who are not equipped to incubate their eggs, either by natural methods or artificially, so the hatchery is supplying a long-felt want. A large number of these are scattered throughout the State. Here eggs can be sent for hatching and baby chicks returned by express. Some of these hatcheries are run by men who make a regular business of hatching for other people, while others have their own breeding flocks for supplying eggs. At this writing the largest hatchery in the United States is being built at Holliston, Massachusetts. Its capacity is 166,000 eggs at one sitting or about 1,000,000 eggs annually.

The Baby Chick Business.

There are a number of poultrymen who make a business of selling baby chicks. Some of them find a market for these throughout the entire year, while others supply them only during the main breeding season. This business has developed to such an extent that some of the poultry supply houses in Boston deal in baby chicks just as in grain and other supplies, and many thousands pass through their hands annually. These houses are a source of supply for a large number of back-yard poultry keepers.

Poultry Breeding.

This line of specialized poultry keeping requires the greatest amount of knowledge and skill, and yet it is generally the first to be taken up by amateurs. We have now two classes of breeders, the exhibition and what I like to term the "standard utility" breeders. The former breed exhibition stock almost exclusively, and furnish breeders and eggs to others in their class, and also the foundation stock for most of the utility men. Many of these do well, as they usually begin in a small way and learn the business by hard knocks. It is a side line with them for a number of years at least, and as soon as they find they can succeed with poultry, they drop their other employment.

The standard utility breeder is of more recent origin. He is a result of the great demand for lower-priced hatching eggs and stock. There are some of these who contract practically all their eggs the year round to the meat producers in the South Shore District. Some have incubators of their own, and when there is a lull in the egg trade they hatch their surplus eggs and sell the baby chicks or keep them for their own use. It seems to me that this field of poultry work has the prospects for a great future. There is a tremendous demand for eggs for hatching from good, strong, vigorous utility stock. I attempted to place an order with one of these utility breeders about the middle of December 1914, and was informed that there were orders ahead of mine aggregating 20,000 eggs. This man keeps 350 females, and as can be seen is unable to meet the demand for hatching eggs. Many of the exhibition breeders are assisting in supplying this demand by keeping what they term utility pens, or matings.

The Duck Business.

This is the one line of poultry farming that has been reduced to a system. The soft roaster business is fairly well systematized, but not nearly to such an extent as that of the duck business. Duck eggs hatch well and the ducklings mature early, usually at from ten to twelve weeks of age. Very few diseases affect them, and they find a ready market the entire year. The fact that they can be grown on the same ground for a number of years without any trouble makes them a surer crop than chickens. There are a number of men in New England who market annually from 20,000 to 50,000 green ducks besides selling many for breeders. A man with a good duck plant is practically independent; that is, if he understands the business. Climatic conditions are such in this State that duck raisers are usually able to obtain green rye during the entire winter season. This is an item of considerable importance, inasmuch as a large portion of the ration of both ducks and ducklings consists of green stuff.

At Wrentham, Massachusetts, almost within hailing distance of each other, are three large duck growers whose annual output is not far from 100,000 green ducks, and two of them are now enlarging their plants with a view of increasing the output

A large Massachusetts duck farm.

A prize tom, Concord, Massachusetts.

about 50 per cent. These duck farms are all examples of beginning small and growing large on the profits.

Certain varieties or families of ducks have been selected and bred for the production of white eggs, and the producers are able to get 5 to 8 cents per dozen more than for hens' eggs. The 200-egg duck has become an actuality. The following record sent me by a man living on the border between Massachusetts and Rhode Island is proof of this: —

TABLE 3. — *Estimated Value of Eggs received from 15 Ducks beginning November 1, 1913, and ending October 31, 1914.*

MONTH.	Number of Eggs.	Price per Dozen (Cents).	Amount.
November,	58	50	$2 42
December,	117	60	5 85
January,	136	48	5 44
February,	66	40	2 20
March,	256	35	7 46
April,	435	30	10 87
May,	413	28	9 63
June,	382	28	8 91
July,	422	30	10 55
August,	368	35	10 75
September,	253	42	8 85
October,	194	50	8 08
Total,	3,100	–	$90 99

The average number of eggs per duck was $206\frac{10}{15}$.
Average value of eggs per duck, $6.06.

Ducks are hardy rapid growers, and about the right size for family use. A few raised on every farm help greatly to keep down the meat bills.

TURKEYS.

At one time New England was the great turkey-producing section of the country, but the disease known as blackhead practically wiped out the business. The general opinion prevails that when once this disease gets a foothold on a farm very little can be done with turkeys. The germs that cause blackhead are quite widely distributed. They are found to infest

the digestive tract of fowls and chickens, but are not extremely harmful or deadly unless found in great numbers. It is almost impossible to keep a place free from them, as they are carried from farm to farm by sparrows, pigeons and possibly other birds. Notwithstanding this, we have seen several flocks during the last few years, and *one* in particular was raised under the most unnatural conditions; that is, it was kept in the same yard (a small pasture) with hens, ducks and geese, contrary to the modern methods of growing good turkeys, and in spite of germ theories a large flock of healthy turkeys was raised. Success in this case was due almost wholly to the fact that the owner was very sympathetic in nature, a good nurse and an interested worker. We may find that extreme care, sanitation, better methods of feeding and some nursing will again enable us to carry on this line of poultry farming successfully. If good results can be obtained under the conditions mentioned above, think what we should be able to do with our flocks spread out over fields and wooded districts, instead of being confined to already infested yards. Massachusetts is not lacking in land for this purpose as there are thousands of acres of woodland, dry and rolling, ideal for turkey runs.

Production of Squabs.

A number of people in the State have specialized in squab raising with good results. This is a line of poultry work that can be conducted on the intensive plan. It is well adapted to back-yard conditions, and the nature of the work is such that it can be carried on by boys, women or invalids. Furthermore, the equipment for this work need not be expensive.

Goose Farming.

On account of the high price of meat, ideal climate and the large area of suitable land, goose raising is bound to come to the front in this State. Geese, like ducks, are very quick growers, and are ready for market in from ten to fourteen weeks. Being vegetarians, they are great foragers, and very little grain is needed except for the fattening period. A piece of swamp land containing some running water with a portion of

the land high and dry for a roosting place is almost ideal for geese, and any amount of such land can be found in this State. Another great advantage lies in the fact that very little outlay is necessary in the way of houses or shelter, as any kind of a shed will do for adult geese even in the coldest weather, and after the goslings are a few weeks old the only shelter needed for them is shade. As the price of feathers is gradually increasing, their value is an item well worth considering. With our cheap land and the high price of meats, this line of poultry farming will receive more consideration in the near future.

Pullet Growing.

This is a line of poultry culture not yet developed, because it is difficult for many to produce good, vigorous stock. Usually poultry raisers do not grow more than they need themselves because of overcrowding, but there is good money in raising pullets for sale, as thousands were sold last season for $1.50 to $2 each. There are hundreds of people who would not try to raise chicks under adverse conditions if they could buy pullets. It would surprise many to know of the thousands that were handled by the commercial firms in Boston last fall, and their sales aggregated only a small per cent of the number that change hands.

Fattening and Killing.

This is a line of poultry work that has not been specialized to any great extent in this State. Many of the large packing houses in the west have fattening stations in connection with their meat-packing establishments, where thousands of chickens are fattened annually.

A great many chickens are marketed during September and October, not because they are in market condition, but because of congested quarters or the fear of losing money by keeping them. Good money can be made by buying, fattening and putting these on the market in first-class condition. I know of two high school boys who are doing this in a small way. As their time is limited they fatten only enough to supply regular customers at retail prices, and their profits are good.

Keeping Summer Layers.

There are men who keep poultry only a part of the year and find them very profitable. They live near summer resorts and buy hens in June that have been shipped from the west. On arrival, they are usually quite thin and are purchased by the pound. They take on flesh rapidly, lay well during the summer months, and are sold early in the fall for roasters. Being fed on hotel waste mostly the cost of feed is small, and, as the eggs are sold to resorts at from 40 to 50 cents a dozen, the profits are good. More might find this line of poultry culture profitable.

The foregoing, with the exception of the last four, are all specialized lines of poultry culture in this State. They have been treated to some extent separately, not only to show the opportunities in the various branches, but to show the advancement made in this particular line of agriculture during the last few years.

There are two other lines of poultry keeping, not of a specialized nature, that should not be overlooked because the opportunities in them are usually much greater than in the more specialized lines, especially in proportion to the size of the project. I have reference to the farm and back-yard flocks.

The Farm Flock.

Statistics show that notwithstanding the fact that there are hundreds of large egg farms in the eastern part of the United States, about 90 per cent of all the eggs produced in the country come from general farms where poultry is kept as a side line. To my notion the farm furnishes more nearly the ideal conditions for poultry, and it is astonishing and also to be regretted that better and larger flocks of poultry are not found on all of the farms in this State. So much range can be given the birds that the feed bill is cut down very considerably. The farm buildings, such as barns, sheds and tool houses, as well as orchards, furnish excellent protection from cold winds, so the hens can range quite freely during the winter and early spring. There is nothing we can do that will increase the strength of the germ and therefore insure better hatches than treatment of

Driving the geese to market, Bristol County, Massachusetts.

A Middlesex County turkey farmer.

A prize-winning flock.

this kind. Again, chicks grown under farm conditions are apt to be more vigorous than those grown in a more intensive way. Instead of farmers buying breeding males year after year, they should be selling large, strong, vigorous birds to those who are obliged to grow stock under less favorable conditions. The natural food obtained by poultry on free range and the manner of getting it are important factors in raising good stock. Nothing would increase the size and vigor of the stock throughout the country any more than a larger output of farm-raised breeding stock. Many advertisers are now using the statement that "all our poultry are farm raised." Of course it goes without saying that most farmers would have to select their breeding stock more carefully than at present.

The following data were sent me by a farmer's wife in this State, with the statement that a portion of the corn and wheat fed was produced on the farm: —

TABLE 4. — *Four Years' Record from Farm Flock.*

YEAR.	Number of Females.	Number of Eggs laid.	Number of Eggs set.	Chickens hatched.	SALES.			
					Eggs.	Poultry.	Expenses.	Profit.
1911, . . .	203	28,045	775	542	$645 15	$309 56	$436 13	$518 58
1912, . . .	220	28,833	904	631	802 19	361 45	412 04	751 50
1913, . . .	225	33,896	872	668	868 86	356 42	509 28	716 00
1914, . . .	279	39,907	899	658	1,122 02	303 73	640 01	785 74

BACK-YARD POULTRY KEEPING.

I believe back-yard poultrymen make a greater profit for the amount of money expended than any other class of poultry keepers. They have an advantage in having a portion of the feed for their poultry furnished in the form of table scraps, either from their own table or from that of their neighbors, and they usually sell their products at a special retail price. In addition to these, the amount of time spent in caring for their poultry is not valuable, as this work is considered a side line with them, and the cost of their equipment usually does not exceed a few dollars. Again, a small flock in the back yard makes a very good training school for larger future operations.

This work, together with a correspondence course, or a systematic reading course, and a few live poultry journals, does much to fit one for independent poultry farming. The immensity of back-yard poultry farming in Massachusetts can readily be realized from the fact that 5,000 people within the city of Boston applied for a license this winter to keep poultry. If these applicants keep, on an average, 20 hens each it means that there are 100,000 hens in the city of Boston alone. If 100,000 hens are kept within this congested area imagine what the total must be for all the cities, towns and villages of the State. The profits made from these flocks are often astonishing, as the following data from three poultry raisers will show.

Not long ago I was introduced to a boy twelve years of age who had the reputation of being a good poultryman. He told me of his wonderful success, and I asked him to send me complete data on his poultry work. As he complied with my request I have all the principal facts at hand. He bought 9 pullets and 1 male June 13, 1913, and sold out January 29, 1914, seven and a half months later. During that time he made a net profit of $55.17, not counting labor. He should have given each hen credit for 18 cents' worth of poultry manure. The profits were made by selling eggs for table use and hatching purposes, baby chicks and half-grown stock.

TABLE 5. — *Data on Back-yard Flock for Three Years.*

YEAR.	Number of Females.	Eggs.	Eggs per Hen.	Value of Eggs and Poultry sold.	Expense.	Profit.	Profit per Hen.
1912,	25	4,303	172	$234 25	$115 72	$118 53	$4 03
1913,	23	3,996	173½	194 36	87 00	107 36	4 29
1914,	20	4,159	208	165 27	85 07	80 20	4 01

Data on 16 Pullets for One Year.

Income: —		
Eggs (3,259),	$130 17	
Hens,	16 00	
Droppings,	5 60	
Gross income,		$151 77

Expenses: —		
Feed,	$34 28	
Pullets,	20 00	
Total expenses,		$54 28
Net profit or labor income,		$97 49
Net profit per hen,		$6 09
Average number of eggs per hen,		203 11/16

Failures.

The moment one begins to talk or write about opportunities in poultry culture he is sure to be asked the following question: "Why are there so many failures in the poultry business?" In the first place, I doubt somewhat as to whether there are any more failures in poultry keeping than in other lines of work. Some one, somewhere, at one time compiled statistics showing that only from 3 to 5 men out of 100 are what might be called business successes. If this is true, I think poultry keeping as a business measures up very well with the others.

Those who are best posted in poultry keeping do not wonder at the failures there have been nor will they be surprised to see many more. Just so long as people will outline projects for and undertake to conduct a business of whose underlying principles they are wholly ignorant, just so long there will be failures in that particular business. Most of the failures in poultry keeping have been due to one or more of the following causes: —

1. Ignorance in regard to the amount of labor connected with the business. People get an idea in some way that poultry keeping requires but very little work; that all they need is a house, corn and birds and the hens will do the rest. They soon realize that it is like any other line of work, care and attention to details being necessary to success.

2. Distorted notions as to profits. Occasionally a man who has made an exceptional profit on his hens lets it be known, and at once there are hundreds who are tired of their jobs and begin to annex ciphers to the results, and in a very few moments find themselves almost millionaires.

3. Lack of capital at the crucial moment. Many of the would-be poultrymen who know nothing about poultry embark

in the business, and soon find that experience is sometimes expensive. After a few years they gain considerable knowledge and skill, but by this time their finances are in such a deplorable condition that they are unable to continue.

4. Ignorance of the business principles and methods underlying a large poultry project. I know nothing about the manufacturing of shoes, where to get the leather, the machinery, amount of capital necessary, the profits, etc., and I have often wondered what people would think of me if I were to buy a lot, build a factory and advertise for a manager. I am sure they would think I was crazy, yet scores of people engage in the poultry business under just such conditions and hope to succeed. We find plungers in every line of human activity, and poultry keeping is no exception to the rule, but in the past has furnished a fertile field for them. It is gradually coming to light that these are not the money makers in poultry keeping, and they are becoming fewer each year. Most of these who stay in the business are enabled to do so either by writing a book, establishing a commercial business of poultry equipment or supplies, and using the farm as an advertising agency. On the other hand, the successful poultry raisers are the farmers and poultrymen who begin in a small way, increasing the magnitude of their operations as they grow in knowledge, skill and experience. Their success demonstrates that it is not necessary to keep thousands of hens and raise thousands of chicks to make a living, but that better results are obtained by most people from a few hundred hens well kept.

State Assistance.

Opportunities for Preparation and Guidance.

The combined efforts of a number of agencies in the State are doing much to foster the poultry industry and assist poultry raisers to put their business on a good sound basis, and the work is so distributed that it reaches every nook and corner of the State and gives assistance to all classes.

State Board of Agriculture.

This organization has always considered poultry keeping one of the leading agricultural industries of the State, and has done everything possible not only to improve the quality of the stock, but to spread broadcast in various ways much valuable information. To encourage the production of better poultry, a large number of institutes are held each year under the auspices of the State Board of Agriculture in different parts of the State by agricultural societies and poultry associations. Thousands of dollars are distributed in the form of premiums at the different agricultural fairs and local poultry associations. This not only encourages the raising of standard stock, but creates a general interest in poultry associations. Pamphlets and circulars on opportunities, methods, management, etc., are issued from time to time and distributed free of charge.

The Massachusetts Agricultural College.

This institution is doing all it can with its present force, equipment and funds to meet the needs of the poultry men and women of the State. The breadth and scope of its work are shown by the following outline: —

Courses of Instruction.

A regular college course in poultry husbandry.
Summer and winter short courses and an annual convention.
A correspondence course.

Other Means.

Conferring with poultrymen either at the college or their farms on all subjects relating to poultry.
Conducting experiments and publishing results from time to time.
Publishing and distributing circulars and bulletins from time to time on all subjects relating to poultry.
Sending helpful and suggestive exhibits to fairs and shows.

Journals and Organizations.

There are two poultry journals, one a semi-monthly and the other a monthly, published in the State, besides two State-wide poultry organizations and a large number of local poultry asso-

ciations that are doing a great deal to encourage and standardize the poultry business. From the above it is evident that the would-be poultry keeper in Massachusetts does not lack opportunity for preparation, guidance or encouragement.

Profits.

We are asked innumerable questions regarding profits in poultry culture. Does poultry pay? Can a man make a living from poultry? With an investment of $6,000 in a farm, equipment and stock, what profits should a man realize annually?

As man is the controlling factor in poultry keeping, no definite answer can be given to these questions. There are a great many men in this State who are making more than a living from poultry; there are many more who are making a good living from the business; and there are thousands who keep poultry as a side line, either in the back yard or on the farm, and find it very profitable indeed. But just what a particular man or woman can do who has had very little or no experience is a question no one can answer, as the success of any project depends largely upon the human element involved. The profits per hen should range from $1 to $4 or $5, depending upon the use to which the eggs are put and the method of calculation. Many poultrymen add to the value of eggs produced the value of chicks raised, giving the hen credit for both. By this method of calculation the profits per hen appear large.

From the foregoing it is evident that Massachusetts possesses many advantages as a poultry State, and that poultry culture has developed in recent years into one of our most important lines of specialized agriculture. There are opportunities in the various branches of poultry keeping not offered elsewhere in this country. In taking up poultry culture for a livelihood or as a life work we believe one should prepare for it the same as for any other business or profession. As with any other branch of industry knowledge is power, and experience and skill are necessary to success.

ONION GROWING IN THE CONNECTICUT VALLEY.

LESLIE R. SMITH, HADLEY, MASSACHUSETTS.

[Next to potatoes and green corn the onion crop has the largest value of any vegetable crop in Massachusetts, the last State census giving this crop an annual value of $662,000. The two leading counties in onion production as with tobacco are Hampshire and Franklin, in the order named. Hampden County, the southernmost of the Connecticut River counties, however, does not rank high in this crop. The distribution of the onion crop over the State is much wider than with tobacco, and Essex, Middlesex, Bristol and Worcester counties all raise appreciable quantities. The towns of Arlington and Belmont, in particular, both raise considerable quantities.

Hatfield and Sunderland are the two leading towns in onion growing and are followed by Hadley, Deerfield and Whately. Probably the principal reason for the preponderance of onion growing in the Connecticut valley is the ease with which the land there can be worked on account of its level and comparatively stoneless nature. The crop is fairly adaptable, however, and farmers who have any flat land of a muck nature would do well to try onions on it in a small way. — EDITOR.]

In the past twenty years onion growing in the Connecticut valley has grown from almost nothing to a money crop second in importance only to tobacco. Acres that were formerly given up to grass, corn and other general farm crops are now taken up with this crop, which is successful both on the heavier and lighter soils of the valley. The abundant Polish help is probably the one largest factor in bringing this about, and the fact that onions can be grown with very little capital has given many of these hard-working people a start toward prosperity. The Polish are raising nearly all the onions in the valley to-day, either on shares, by the acre, or on their own farms. Other factors which have combined to make the crop very much of a success are the ease with which the valley can be worked by modern farm machinery, on account of its level nature

and freedom from stones; the system of storage houses that has become a necessity to the handling of the crop; nearness to the large market centers; and first-class shipping facilities.

Without any great fanfare of trumpets, a system of co-operation has grown up here in the onion business, very practical and very successful, which enables the man who owns the land to do a profitable business only limited by the number of acres that he has suitable for onion raising. This is what makes it possible for an honest, industrious man without a cent of capital to go into business for himself and to get a start toward a home. This has happened here in the valley time and time again.

A farmer may have forty acres of onions being grown by a dozen or more different men, each absolutely independent of the other. By one plan the farmer will furnish the land and the fertilizer, sometimes the team work and one-half the seed; the grower will do all the hand labor, harvesting, etc., and each have one-half of the proceeds. By another plan a farmer may contract with the grower to do the work for a stated sum per acre, and the grower contracts to take care of from two to five acres, according to the size of his family, for in the onion business "every one works, father not excepted." Each plan is in common practice, and there are arguments in favor of both.

With the "share system" the grower is as much interested in the success of the crop as the owner, and will work as hard to keep the land clean from weeds and do everything in his power to get the crop early, in order to receive the highest price at market time and incidentally to make a reputation for himself as a good grower. A successful grower is in good demand and can get his pick of the onion fields. With the other plan, the grower is sure of his price per acre, as the owner takes all the risk, and of course all the profits if such there be. In either case a contract is drawn up signed by both parties which specifies just what each party agrees to do. This contract gives the owner permission to enter upon the premises at such time or times as he may see fit to inspect the crop of onions, and, if at any time the grower shall fail to perform all the labor necessary to raise the crop, gives the owner the privilege of doing or furnishing such work and labor as shall

be necessary to raise and protect the crop until the time of sale, and the grower agrees to pay to the owner such sums as this shall be reasonably worth. These contracts are nearly always fulfilled. Once in a while a crop does not look well when it comes up on account of poor seed, or for some other reason, and the grower will throw up his contract, and in so doing forfeits what work he has already done. Cases have occurred where, after the grower had given up his contract, the owner has hired the same party to care for the crop at so much per acre, and has made more money than he would had the grower held to his agreement.

Growing the Crop.

After the owner has planned how many acres of onions he will let out next year he will get busy in the fall, plow his land, and if possible apply lime if his soil needs liming. The onion crop is sown just as soon as the land is dry enough to work in the spring, and so this fall work is essential. In the spring every horse is at a premium, and a team with driver has received $7.50 a day at this time. If, however, lime has not been applied in the fall and is to be applied, then it is the first job in the spring and should be followed by the wheel or cut-away harrow, and right here is a good time to say that extra team labor expended at this time will be time and money saved later in hand hoeing and weeding. Team work is far cheaper than hand work, and this is true of any crop: a deep-plowed, well-fitted soil is an asset all the season through, especially in case of drought.

The plow that has become the most popular is the sulky, because the dead furrow is obviated, which is a great advantage in the onion field. The harrows used are mostly the wheel or cutaway, the Acme and the Meeker smoothing harrow. After the field is thoroughly wheel-harrowed the fertilizer is applied with a fertilizer distributor, a machine universally used. This machine is not only a labor-saver, but allows fertilizer to be applied on a windy day, when hand work would be out of the question.

Fertilizer: Kind and Amount.

The onion field has to be enriched by the use of commercial fertilizer. Barnyard manure is seldom used because of the weed seeds which it carries, as this material in the soil would interfere in a measure with the use of the wheel hoes and hand cultivators, and also because the onion grower does not have it to use; so it is a question of commercial fertilizer. Opinions, both with regard to the brand and the amount of fertilizer, are as varied as there are different growers. A grower is very apt to try again the brand that has raised him one good crop, or that has raised his neighbor a good crop. There are growers who buy the chemicals and mix their own fertilizer, but others, and probably the majority, buy ready-mixed goods. Both methods are in vogue and there are arguments in favor of each. An analysis of 3.30 nitrogen, 8 phosphoric acid, 7 potash (actual) is about the popular goods used in the valley, and nearly all the fertilizer companies make a brand of this or similar analysis. Hundreds of carloads are used annually in the onion section.

The growers all know that there must be no shortage of plant food for the crop. The up-to-date farmer understands that his overhead charges are fixed, that is, he has to stand the expense of plowing, fitting, cultivating and harvesting; that the cost is about the same whether an average crop is grown or a bumper crop, and that up to a certain point the profit increases with the increased yield; so it is a vital error of judgment to hazard chances of a profit by being "pennywise and pound foolish" in skimping the fertilizer. The Connecticut valley grower sows one and one-half tons of fertilizer to the acre, and is not at all backward about putting on an extra half ton if he thinks that it is necessary. This is usually applied at one time, but some large growers are trying the experiment of keeping one-half ton to apply in mid-season.

After the fertilizer is applied there is probably no better tool to use in harrowing it in than the Acme harrow, and after all is done that can be done with this or similar tools there is nothing that will put on the finishing touch and leave the land

Irrigation system on onion farm, Hatfield, Massachusetts.

in as nice a condition for sowing the seed as the Meeker smoothing harrow. This implement was born with the onion industry and increases in popularity yearly.

Sowing of the Seed.

Good seed is important, so important that fortunate indeed is the grower who (regardless of price) has purchased a really first-class seed. Southport Globe is the variety most commonly used, and the growers are very particular in regard to it, often purchasing subject to a germination test at the Massachusetts Agricultural College, and in a great many cases having the seed "blown" at the college. This process consists in running the seed through a machine with a bellows attachment that will blow the dirt and the small light seeds out. The amount varies from 5 to 6 pounds per acre. Either of these amounts would be too much if every seed matured, but all do not sprout; the onion maggot gets some, and more are cut out from time to time in the process of hoeing and weeding throughout the season. The rows are sown either 12 or 14 inches apart, and there are a number of seeding machines on the market, both single and double row, that do satisfactory work.

Cultivation.

As soon as the rows can be seen the hoe is started, either the wheel or the common scuffle hoe. One will often see hoes of three or four makes working in the same field and all doing good work, as much more depends on the man than the hoe that he uses. From this time until the crop is drawn away the fields are alive from dawn until dark with men, women and children. Many growers put up a little shanty which serves as a shelter on hot days for the hands to eat their lunch in and to keep the tools in at night.

The lesson has been well learned that onions and weeds do not get along well together, and the good grower knows that he must weed early and often to keep the field clean. Fields that have grown onions for years, or "old fields," as they are called, will be easily kept clean with three or four weedings during the season. New fields will require more attention, the crop need-

ing to be hoed from six to ten times, depending on weeds and weather. After the crop has grown so that wheel hoeing is out of the question the weeds can be taken care of with a common hoe with a handle cut to a length of 6 inches.

When the onions have attained their growth and begin to die down they are "pulled" either by hand or with machine. There is an attachment to the wheel hoe which consists of a curved and sharpened blade that runs under the rows, cutting the roots and throwing the onion out of the ground, and this does good work if the field is free from weeds.

The onions are allowed to lie for a few days to let the tops cure, then "clipping" begins. This operation means the handling of each onion and clipping the top off with the onion shears. In the west machines do this work, but as yet they have not been received with favor in the valley. After clipping, the onions should not be allowed to lie on the ground too long, especially during rainy weather, as this will cause the outer skin to crack open, leaving the onion green, and interfering with the selling and keeping quality. The better way is to shovel them into old fertilizer bags with a wire scoop; from these they can be readily dumped into the screen. Screens of different sizes are used, varying in mesh from $1\frac{1}{8}$ to $1\frac{1}{2}$ inches. Running over these screens the onions are sorted into No. 1's and picklers. Incidentally this cleans and improves the looks of the crop. From the screens the onions are put into bags holding 100 pounds net and sewed up, and are then ready for shipment. The practice of putting the crop into new and uniform bags is gaining in favor, especially at the market end of the business.

Marketing.

The bulk of the onion crop is sold to a buyer in the fall; indeed, if the grower has not storage he must either sell the crop or rent storage. The system of storage houses that has grown up in the valley within a few years is the direct result of necessity. The old practice of dumping the whole crop of valley-grown onions on the market as soon as ready was disastrous, as it simply meant glutting the market and unsettling market prices to a marked degree. Whether to sell or to hold in storage is a question for every grower to settle for himself,

Digging and sacking onions, Hatfield, Massachusetts.

as his own circumstances will be the determining factor. One prominent grower and dealer made this statement this winter, "that in a period covering ten years the grower who sold in the fall would make fully as much money as the man who held in storage." There is the cost of handling, storage and shrinking to take into consideration, and as stated before each grower will have to decide the question for himself. The buyer stores the onions and then supplies the market as fast as the demand appears.

Troubles.

Yes, the onion grower has troubles, and some years there are plenty. Perhaps the first thing that troubles the grower and causes him to lose sleep is the high wind that comes each spring through April and May. This is especially dangerous for the man who is raising onions on light land, as the wind will in some cases blow the seed from the ground, and every year finds some fields resown for this reason. The only remedy for this trouble is irrigation, of which more will be said later.

Next, the onion maggot has the floor, and as yet no remedy for this pest has appeared. The eggs of this insect are laid by the onion fly on the outside of the plant close down to the earth; the eggs hatch and the young maggot directly eats his way into the heart of the plant. The first sign of trouble the grower has is when the onions begin to die, and on pulling them up he finds the maggot, sometimes four or five in a single stock. A little extra heavy seeding and keeping the plants growing as rapidly as possible is about all one can do in this case.

Another serious insect enemy is the thrips, and here the best remedy is irrigation, as this is a dry-weather trouble. The writer has seen a field covered with thrips and looking as though a fire had run over it, while just across the road was a field as green and healthy as one could wish, simply because of irrigation. The thrips is an insect that appears in dry weather and sucks the juice out of the tops of the onions, always starting on the knolls and spreading very rapidly. In practically every instance the crop will stop growing at whatever stage it happens to be.

On some old fields a disease known as smut has appeared and caused trouble. One partial remedy is to use formaldehyde

diluted 1 gallon to 50 of water and applied at the time of sowing the seed. A 2-gallon tank is attached to the seed sower with a small hose or lead pipe running down under it and running a small stream of the mixture directly into the seed.

Irrigation.

Up and down the valley are different growers who are experimenting with irrigation on the onion fields, and so far reports are favorable. This will obviate the trouble of the seed and fertilizer blowing off in the spring, and is believed to be a remedy for the thrips; but most important of all is the fact that the grower who irrigates can control the supply of moisture and so increase his crop. The system used is the overhead one, and the cost of installation will range from $150 to $200 per acre, depending on the area and the amount of labor that the grower can do or furnish. Instances will be found where absolutely reliable men say that the system has paid for itself the first year.

Cost of Growing.

It is comparatively easy to figure the cost of raising native onions. The crop should be charged with whatever equally good land could be rented for; then there is the cost of plowing, fitting, etc., depending on how much time is put on the field. Fertilizing will cost from $50 to $60 per acre, seed from $5 to $12 per acre, hand labor from $65 to $90 per acre, and if there is trouble with smut there is the cost of the formaldehyde. Sacks are usually furnished by the buyer.

A man who understands his business can care for three acres of onions, and if he has a family with children will do more by occasionally hiring a few days' help. As stated before, plenty of our thrifty Polish farmers have made their start this way, but they work and work hard, believing that "seed time and harvest will never fail." And in the majority of cases they win out.

Cost of One Acre of Onions.

Rent of land (or interest if land is owned),[1]	$20 00 to	$40 00
Plowing,	2 50 to	3 50
Fitting,	5 00 to	5 00
Fertilizers,	50 00 to	60 00
Seed,	5 00 to	12 00
Labor,	65 00 to	90 00
Formaldehyde,	1 00 to	1 00
	$148 50 to	$211 50

The yield per acre runs from 500 to 1,000 bushels, and the average price to the grower for the past five years (in the fall) has been about 55 cents. From these figures it is apparent that a good-sized crop of onions should yield a good profit to both the owner of the land and the grower.

[1] These figures are based on Connecticut River valley conditions. The item for rent is of course high, but this is because good onion land in this section commands from $400 up to even $800 an acre. A farmer in another section where land was not so valuable would save considerable expense on this item. — EDITOR.

TOBACCO GROWING IN THE CONNECTICUT RIVER VALLEY.

LESLIE R. SMITH, HADLEY, MASSACHUSETTS.

[According to the latest census reports the Connecticut river towns in Massachusetts produce about a million and a half dollars worth of tobacco annually. As the last definite enumeration was the Federal Census of 1910, which reported the 1909 crop, these figures are now six years old. The increase since that year has been steady, and it is safe to say that the annual value of the crop in this State at present is not far from $2,000,000.

The tobacco towns of Massachusetts are entirely in Franklin, Hampshire and Hampden counties. By the latest available figures Hatfield is the banner tobacco town of the State, with a production valued at $301,-204; Hadley, second, $192,258; and then come Agawam, Whately, Deerfield, Southwick, Westfield and Sunderland in the order named. Hatfield alone has 17 tobacco storehouses, and 425 freight cars are needed to ship the tobacco crop from this one town. — EDITOR.]

Tobacco has been grown in the Connecticut valley since about 1840, and while the crop has had its ups and downs it may be said to have steadily increased in acreage since that time. The past fifteen years have seen by far the greatest percentage of increase, and the end is not yet. Every grower is growing all the tobacco that he can hang in his curing sheds, and so new sheds are the very best indication of an increase in acreage. The increase of 1915 over the 1914 acreage was around 25 per cent. This crop is by far the most important money crop grown in this section, and represents extensive and intensive agriculture of the highest order.

The rapid increase of the past fifteen or twenty years may be explained by improved machinery, more abundant help, and, most important of all, the fact that in recent years the crop has brought prices that enable the grower to make expenses

Irrigation system on tobacco field, Hatfield, Massachusetts.

and have something left over for his labor and as a profit for his operations.

The successful tobacco grower is a specialist, as no crop grown calls for more scientific knowledge or the application of more common sense. In the growing, harvesting and curing of the crop the grower has to know something of practical chemistry, physics and biology.

But after all is said and done, the weather is the dominant factor. The history of the good or poor tobacco crop tells the story of the weather, — as in 1893 when the crop was largely a failure on account of drought, and in 1897 again a failure on account of excessive rain. Late frosts in the spring, early frost in the fall, the hail and windstorms, periods of excessive moisture or too dry weather at curing time, all show how the grower must depend upon nature for his ultimate success. Indeed from the time the seed bed is sown until the end of the season the only time that the grower is sure of his success is when he gets the money for his crop. Yet he is optimistic; he "nurtures hope," he raises his crop, doing all he knows how, and if appearances count for anything he is getting along perhaps as well or better than the average business man.

There is no ironclad rule to be laid down for raising tobacco. The best growers often change their methods and are constantly on the lookout to learn of new ideas that will prove beneficial, so that the story of tobacco growing as told in this article will not attempt to tell of any best way, but will describe the methods as practiced by the most progressive growers.

The Seed Bed.

Tobacco is raised on the same land year after year. Most growers plow or harrow the land immediately after the harvest, thus avoiding a useless second crop of suckers that grow from the stump and remove a good deal of plant food from the soil. Many believe that if the field is kept fallow during the late fall and winter it will not attract the moth that lays the egg of the cutworm, a pest that is the cause of much trouble. The land is left fallow until the next year's crop is set out. This period is a convenient one in which to apply lime.

Each year finds the grower paying more and more attention to the seed bed, there being perhaps no one thing that gives him as much satisfaction in the spring as a good bed. Operations begin in the fall, the grower selecting a place for his bed sheltered from the cold north and west winds. Sometimes it may be necessary to build a board fence for this purpose. Many apply the fertilizer at this time and harrow it in. This is considered the better way if cottonseed meal is used, and some of the best growers say that there is nothing better. In the spring as soon as the ground is dry enough to work the beds are "made." This operation consists of fitting the land, putting up a frame and sowing the seed. Beds used to be covered with brush, but this material has been superseded by cloth and glass, glass being by far the better. The sash are 3 by 6, 3 by 9 or 3 by 11 feet, to suit the grower. These glass beds have enabled the grower of to-day to transplant or "set" tobacco from three to four weeks earlier than from the brush-covered beds of years ago. In "making" the bed the land is made as fine as possible with harrows and rollers, and last with a hand rake. The seed is sown by some growers at the rate of one teaspoonful to the square rod; others sow one tablespoonful to the square rod. After being run through a cleaning machine to blow out the dirt and light seeds the clean seed is usually mixed with plaster, ashes or fertilizer so as to get an even stand. After sowing, the bed is either raked lightly, rolled with a hand roller or simply wet down with a hose; then the cloth or glass is put on. Some sow the seed dry, while others sprout it first.

There are two varieties of tobacco raised in the valley, — Havana seed and Seed Leaf or Broad Leaf. The former is by far the most common in the Massachusetts part of the valley, only a comparatively few raising the Broad Leaf.

After the plants are up every known method is used to force them. The bed may be sprinkled with manure water, or with water which has had ammonia added at the rate of one teaspoonful to the gallon, or water with nitrate of soda dissolved in it. Another method is to sow fertilizer before watering. Dry ground fish is a good material for this purpose as it does not injure the young plants and it is quickly available. Great

care should be taken of the bed, especially a glass bed. Often a fine bed is ruined because the owner did not raise his sash on a hot day; again, lack of air also causes "damping off," a disease in which the plant decays just above ground. Sterilizing the ground with live steam in the fall or spring is growing in favor as this not only kills all fungous diseases, but the weed seeds as well. A large square pan of galvanized iron, boards or other material is inverted over the bed. This is pushed down into the soil, after which live steam is turned under the pan and held at a pressure of 80 pounds for half an hour, when the pan is moved to a new place. An objection to the wood box is that it becomes heavy after being soaked with steam. One pan made of galvanized iron 6 by 12 feet cost a grower $22. This grower claims that his beds were steamed at a cost of about $1 per square rod. He grows about 30 acres and started to steam his beds in the fall, but was compelled to give up the operation on account of freezing and finish in the spring. This grower advocates steaming in the fall, as fuel is saved by the ground not being cold, and there is no frost to thaw out. Many growers claim that this steaming will pay for itself simply in the saving of weeds.

Fertilizing the Crop.

Materials used to fertilize the crop are barnyard manure, city stable manure, tobacco stalks, tobacco stems and commercial fertilizers of many kinds. Barnyard manure is not extensively used because it is not to be had. However, if used it should be plowed under either in the fall or spring. A great deal of city stable manure is bought. Tobacco stems are used to some extent, but the quantity is limited. Quite a number of growers are plowing under their tobacco stalks which have been found to contain from 6 to 8 per cent potash. At a tobacco meeting held during the winter of 1915 one of the speakers asked how many growers present plowed under their stalks, and about one-half of those present replied in the affirmative. This well illustrates the attitude of the grower.

The bulk of the valley crop is raised on chemical fertilizer, and nearly every fertilizer company makes one or more special brands for this crop. Neither all the good nor all the poor

tobacco is raised on one particular brand. Years of experience have taught the grower to be particular about the goods he uses. The materials must be quickly available as the crop must ripen in from sixty to eighty days from setting. The fertilizer also has considerable effect on those desirable qualities known as "body," "finish" and "burn." Cottonseed meal is the favorite source of nitrogen. Other ammoniates used are linseed meal, dry ground fish and castor pomace. Bone of some sort is well liked as the source of phosphoric acid, and sulphate is the favorite potash, muriate being tabooed on account of the chlorine contents which affect the "burn."

With a coat of manure 1 ton of fertilizer per acre will raise a good crop, but where manure is not available 1½ to 2 tons of the high-grade goods are often used, the idea being to have enough plant food to insure a good growth. After the land is plowed, harrowed and rolled the fertilizer is applied broadcast. For this operation the fertilizer machine is invaluable, especially in windy weather. No time or expense should be spared in properly fitting the tobacco land, filling in furrows, if there are any, and using the most efficient tools to pulverize and level the land.

Setting.

Transplanting or setting the plants generally begins about the 20th of May, and is the order of the day until the crop is well started, usually a month later. Setting is almost wholly done with a machine called the tobacco setter, and this is by far the most valuable machine used in the business. The old back-breaking method of hand setting has almost entirely disappeared from the valley. The setter needs plants that are a little larger than for hand setting, but does the ridging, setting, watering and marking for the next row at one operation. This machine requires three men and a pair of horses, and can easily set two acres in an afternoon, while in an all-day session three to five acres can be set, depending on conditions. Tobacco is usually set with the rows 3 feet apart, and the plants from 15 to 20 inches apart in the row. Plants that do not live should be reset at once by hand if an even stand is to be had.

Cutting tobacco and hauling it to the curing shed, Hatfield, Massachusetts.

Cultivation.

As soon as the plants have started cultivation begins. A favorite tool for the first time is a 12-tooth cultivator, which by careful handling will allow the operator to work close to the row, the machine being run twice in each row. If deep cultivation is to be practiced, the early part of the season is the time to do it, before the root system has developed. Hand hoeing is next in order, and from now on as long as a horse can travel between the rows the land should be stirred once a week or even oftener. Some growers hoe by hand three or four times in a season, while others use the horse hoe. Many different methods are used, but the principle is the same, namely, to keep the soil well stirred so as to retain moisture and to keep the plant growing all the time.

Topping and Suckering.

When the plant has grown large enough for the seed bud to appear, the top is broken off, or the plant is "topped," the idea being to throw the strength that would naturally go into the small top leaves, blossom and seed into the larger leaves left on the stalk. These are usually from 18 to 22 in number. After the field is topped it presents a very even appearance. In a week or ten days after "topping" suckers will appear, starting from the base of the three or four top leaves. These are picked off, or the plant is "top suckered." After these top suckers are taken off the leaves further down the stalk will begin to throw out suckers, and these in turn must be picked off. Usually when the bottom suckers are grown or are big enough to take off the plant will be nearly or quite ripe and ready to harvest. This will be about three weeks from "topping." The crop should be allowed to get ripe, a condition which is shown by the plant having a slightly wilted appearance, especially on the bottom leaves. Light green blotches will also show all over the top leaves. There can be no doubt that some crops are cut too green, the result being a dark-colored crop that will not bring the best prices.

Harvesting.

There are three methods of harvesting in vogue in the valley to-day. The first two to be described have been in practice for years; the third is a new method that is gaining in favor each year. The first is "hanging on lath." The plants are cut close to the ground with a thin-bladed hatchet made for the purpose. They are then laid down lengthwise of the row and overlapping each other; after lying in the sun long enough to wilt they are picked up and handed to the "stringer" who strings them on a lath. These laths are similar to builders' laths, being sawed a little thicker and from better lumber. One end is placed in a "stringing horse" and the other end is fitted to a steel needle. The plant is then strung on the lath by forcing the needle through the butt of the stalk about 6 or 8 inches from the end, 5 or 6 plants being strung on a lath. The full lath is either laid on the ground and later picked up, or handed directly to a wagon fitted with a rack made for the purpose. It is then drawn to the curing shed and hung on poles, arranged so that each end of the lath rests on a pole, allowing the tobacco to hang downward. Poles are usually 15 feet long and from 25 to 30 laths are hung on a pole. They begin at the top of the shed and are hung tier after tier until the shed is full, the tiers being usually 5 feet high.

"Hanging on string" is another well-known method of harvesting, and many growers favor it above all others. The plants are cut as before, only they are laid crossways of the row, and after being allowed to wilt are loaded directly onto low wagons, the butts laid all one way. The plants are then drawn into the shed where they are hung on poles with tobacco twine. The hanger carries a bag on his back which holds a ball of twine. With this he hangs the plants about 8 inches apart on the poles by tying a half hitch around each plant. When the pole is full the twine is tied around the last plant, broken off and the next pole started.

Priming.

This new method of harvesting tobacco came with the shade-grown tobacco, and has found favor among many growers who grow the outside or sun-grown tobacco. The barn has to be rigged differently, with the tiers only half as far apart as either of the methods previously described. The plant is not cut, but the leaves are picked off or "primed," as they ripen, four or five at a time, beginning with the bottom one. The pickers sit down between the two rows and "prime" both rows, placing the leaves in little piles. These are picked up by another man and placed in baskets and are drawn to the end of the row on a hand truck, loaded onto a wagon, and taken to the shed where the leaves are strung. Generally women and children do this work, using large needles and stringing forty leaves on a string, which has been knotted at one end. After the leaves are all on, the stringer knots the other end of the string and hangs it on a lath which has been notched at either end. These laths are then hung up tier upon tier as aforesaid. In a few days the second priming is taken and so on until the crop is harvested. Cases have been known where the first priming has become cured and taken down before the last priming was taken, thus giving a chance to use the shed a second time in the same season. When the crop is to be primed it is not necessary to top the plant. After the priming is finished the stalks are cut down and utilized in different ways; some growers run them through a cutting machine and plow them under or use them for top-dressing grass.

Curing.

The curing shed is really the factor limiting the increase of tobacco acreage. It is useless for the grower to set more plants than he has shed room to take care of. To hang an acre of tobacco requires a shed 30 by 30 feet. A building this size will cost from $300 up, depending upon whether it is of frame or of pole construction. The pole shed is built by setting the posts in the ground and is not framed, the braces being nailed on. This type of shed is by far the most common. The frame

shed is built so that every third board is a door for ventilating purposes.

With the crop in the barn the grower has to watch it closely, opening the ventilating doors on some days and closing them on others; at all times there should be a man near at hand to note the changes in the weather and to act accordingly. With tons of water in the crop which must evaporate in a few weeks this is an anxious time for the grower. Too much moisture will retard evaporation; then, too, there is danger of "pole sweat," while a dry season with the doors open all the time will dry and not cure the crop.

Taking Down.

With the crop cured the next step is to take it down. The tobacco has now changed from a heavy green leaf to a light thin brown, and is so dry that it will crumble if grasped by the hand. To get the crop down whole, therefore, it has to be handled at a damp time, when the leaf is said to be in "case" or, more commonly, "in good shape." "As soft as a kid glove" is an expression often used in describing this condition. When this warm, damp spell comes, no matter if in the middle of the night or on Sunday, the grower gets very busy with all the help he can command and takes down all he can handle. With the lath method the laths are simply slipped off the pole, and with a man on each tier are handed very carefully and quickly to the floor. There the tobacco is pulled off the lath and piled with the butts laid both ways, making a pile about 6 feet wide and as high as the weather will allow. Early in the fall the pile cannot be made as high as later, because the stalks are green and there is more danger of the pile heating.

When hung on string a man at each end of the pole pushes the tobacco into a bunch in the middle of the pole. One man with a sharp knife then cuts the string, the other man handing the bundle to the man lower down, when it is piled as before. With the primed tobacco it is simply slipped off the string and placed at once into a bundle. After the pile is made it must be at once covered so as to retain the moisture. Different materials are used for this purpose, such as damp cornstalks,

Priming shade-grown tobacco.

paper, cloth, etc. From now on the crop must be kept damp, and the shed should be shut as tight as possible to keep out the wind.

Stripping.

As soon as possible after the tobacco is taken down "stripping" begins. With the hands on either side of the pile a section is uncovered, each plant is taken up, and the leaves rapidly picked off or "stripped" one at a time. The stripper begins at the butt, and when finished piles the stumps behind him. The leaves are placed in the stripping boxes which are of different sizes, 36 inches long and 12 inches square being about the average. The box is made with three sides and the ends tight, with saw calves on the side for the string. First the string is placed in the box, then paper of the right size. After the box is full the paper is brought over the top, the string is tied and the bundle taken out of the box. The bundles are piled up from three to five high and the crop is then ready for delivery. The grower has to deliver the crop to the place agreed upon at time of sale, either to a warehouse or a railroad station. Some of the crops are bought in the field before they are harvested, but the majority of the tobacco is sold, and nearly all is delivered to the sorting shops in the bundle. The sorting, packing and sweating is done by the dealer in most cases, and there are the best of reasons for this, as from twenty to thirty varieties are made from the crop and one single grower would have only a little of each variety.

The sorting shop of to-day is a good example of specializing. Here the dealer will grade and pack to suit his trade, making light, medium and dark wrappers, with three to five sizes of each; binders, top leaves and fillers, with different sizes of each. These different grades are packed into boxes $2\frac{1}{2}$ feet square and of different lengths. From 300 to 375 pounds are packed and pressed into a case, which usually goes directly to the sweatroom. This sweating process used to be done in nature's good time, and was accomplished during the hot summer months, the tobacco being dry and ready for market in the fall. Now, however, the crop is forced to sweat by

placing it in a steam-heated room with the thermometer at 130 degrees. In about thirty days the operation is complete, and the goods are ready for market. The sorting shops employ a great deal of help during the winter and pay good wages. They usually open about November 1 and run well into April, closing in time to let their men out for outdoor work.

Shade-grown Tobacco.

This article would not be complete without describing in a measure the latest thing in growing tobacco in the valley. To get a cigar wrapper that would possess the qualities of the domestic leaf and yet be thin enough to compete with the goods grown in the tropics the experiment of growing tobacco under shade was tried first in 1900. To-day this process seems to have passed the experimental stage and has evidently come to stay. Many growers are growing from 20 to 50 acres under cloth, while the larger corporations are growing from 100 to 300 acres.

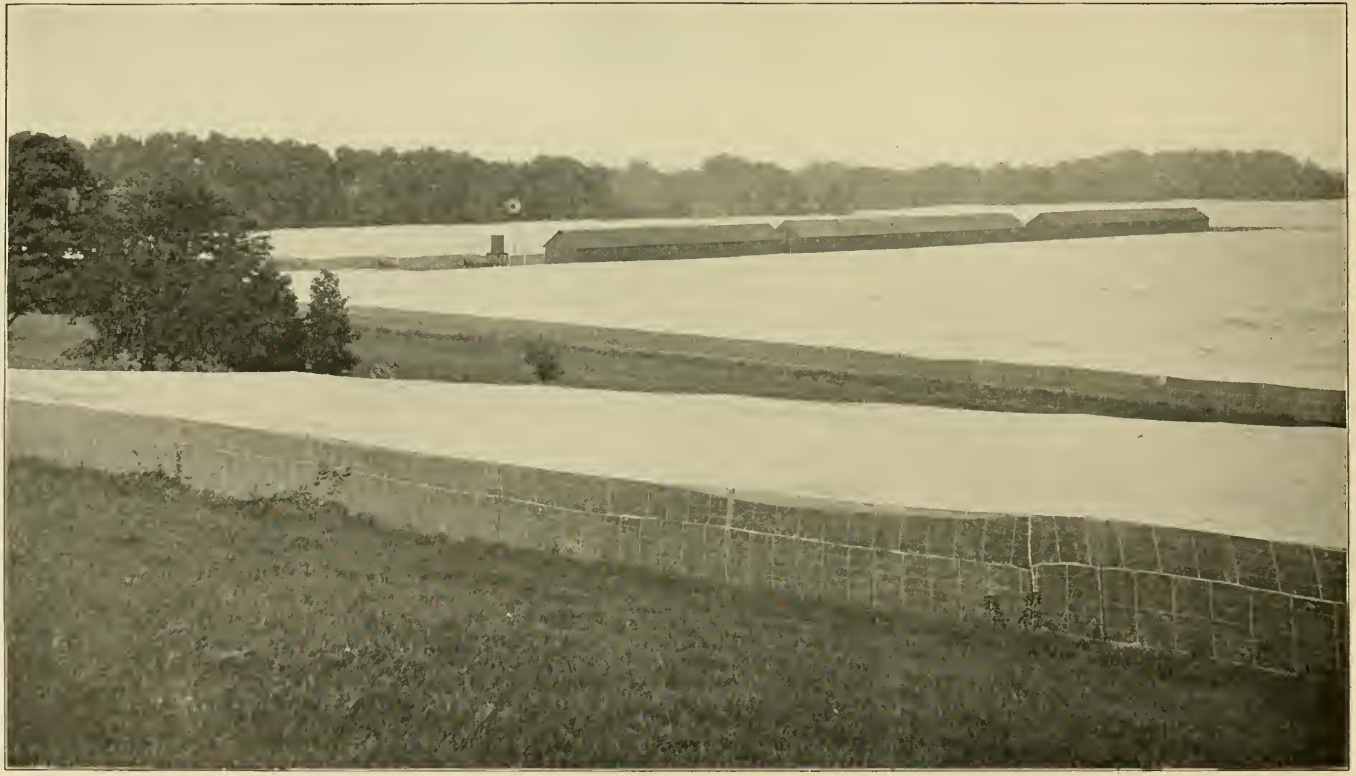
The entire field is set with posts with wire strung across the top. This framework is then covered with cheesecloth, making a vast tent. The plants are set as before described, then the sides are covered so that the cloth reaches to the ground. This tent tobacco is not topped, and often the blossoms will reach the cloth 9 feet from the ground. The tobacco is cultivated by the same methods as outside tobacco, and is harvested by the priming method.

Enemies.

The first real trouble with tobacco is the fungus in the seed bed, and the steaming process already described is the remedy, in the opinion of many growers.

Cutworm.

Immediately after the plants are set the cutworm begins to operate and is at times a serious enemy, not only causing a lot of resetting, but, what is worse, causing an uneven crop of tobacco that will not ripe evenly. A good remedy is a poisoned mash made by mixing a pound of Paris green with a hundred pounds of bran; this should be sweetened lightly with cheap



A field of shade-grown tobacco, showing curing sheds in background.

molasses, using water enough to make a stiff paste, and a very little should be dropped beside each plant. This may be done by hand at no great trouble or expense, or by a machine made for the purpose and attached to the setter. Another way is to mix 1 pound of Paris green with 50 pounds of red dog flour, sifting a little on each plant. This is done with a home-made sifter and is not an expensive operation.

Wireworms.

Sometimes, and especially in a cold, wet season the wire-worm causes considerable trouble for the tobacco growers. While the plant is small the worm will bore directly into the heart of the stalk, and the plant will have the appearance of being alive, yet will be dying all the time. The only remedy is late plowing which not only kills the worm but will destroy many of its egg cells.

Horn Worm.

Early in July there will appear on the tobacco plant a small green worm hatched from an egg about the size of the head of a pin. This egg is laid by a moth that flies only at nightfall. The worm will grow as large as a man's finger, and as it grows will eat more and more ravenously. One worm will often spoil two or three plants. Hand picking is the only remedy practiced in the valley.

Grasshopper.

The ordinary grasshopper will cause trouble occasionally, especially if the field is next to a grass lot. After the grass is cut, if the weather is dry and the rowen crop does not readily start, the hopper will eat the leaves of the plant next to the grass full of little round holes. Some growers protect their field by planting two or three rows of corn between the tobacco and the grass.

Hail and Wind.

The elements mean real trouble for the grower, as hail and wind may quickly ruin his crop. Insurance is possible at a cost of $7.50 per acre. A policy of $150 per acre for a total loss will about pay for the cost of the crop.

Early Frost.

The remedy for this is to have the crop under cover before the frost comes.

Pole Sweat.

Pole sweat is caused by a spell of damp, warm weather during curing time, when the atmosphere is so damp that evaporation cannot take place. It may be controlled by the use of charcoal fires built in the shed, either in holes dug in the dirt floor or in small furnaces made for the purpose.

These are a few of the troubles that keep the tobacco grower guessing the whole season long. Other problems will only be settled as time brings the answer. One question that is causing much discussion is the supply of humus. Without manure there is a danger of the soil being without vegetable humus, and as a result it packs down too hard and does not retain moisture as it should. Some growers are using a cover crop, sown as soon as the tobacco crop is harvested and plowed under early in the spring. This plan is being tried out more and more, the claim being made that not only does the cover crop supply a certain amount of humus, but that it also keeps the soil from washing and blowing during the late fall and winter months. Barley, vetch and rye are the crops usually sown.

Just a few last words on the subject of "handling." The idea of tobacco growing is to make money. In order to get the best price for his goods the grower must raise good tobacco. He must handle it right after he has raised it. Many a crop is spoiled in harvesting. The leaves should be kept free from holes, sunburn, bruises, etc., all of which can be avoided by proper handling. The grower is mistaken when he thinks he can save money by using boy or cheap help, as a slovenly, careless man may easily spoil more tobacco in a day than he is worth. The dealer will many times buy tobacco before it is harvested if he knows that the grower is a good handler and that he will put up his crop right. Another grower gets the name of being a "hog handler," as it is called. Dealers say that he handles his tobacco just as he does his cornstalks; thus, as in other things, it is true of tobacco raising that "whatever is worth doing at all is worth doing well."

Estimate of Cost of raising One Acre of Tobacco.

Rent of land (including use of shed),	$50
Labor (including raising plants),	70
Fertilizer,	50 to $80
If bed is steamed,	2
Paper and twine,	2
	$174 to $204

Estimate of yield for past five years,	1,500 pounds
Estimate of price for past five years,	15 cents

This is the average, but it is true that many growers get from 1,700 to 2,000 per acre and from 15 to 20 cents per pound.

Cost of Shade-grown Tobacco.

According to the figures obtainable it costs around 45 cents per pound to raise shade-grown, and it has been sold at 90 cents per pound. The yield per acre has been around 1,400 pounds.

Agricultural Legislation.

1915.

AGRICULTURAL LEGISLATION, 1915.

PART I. — LEGISLATION CONFERRING POWERS AND DUTIES ON THE BOARD OF AGRICULTURE.

TERM OF MEMBERS OF STATE BOARD.

General Acts, Chapter 114.

An Act relative to the tenure of office of members of the state board of agriculture.

Be it enacted, etc., as follows:

Section 1. Chapter eighty-nine of the Revised Laws is hereby amended by striking out section two and inserting in place thereof the following: — *Section 2.* The term of office of the present members of the board shall expire on the first Tuesday of December of the last year of the term for which they were appointed, and the term of office of members hereafter appointed shall be three years, and one third of the members shall retire annually on the first Tuesday of December, except that appointments to fill vacancies, other than those which occur from the expiration of terms, shall be made in the same manner as original appointments for the residue of the unexpired term.

Section 2. This act shall take effect upon its passage. [*Approved March 30, 1915.*

INSPECTION OF NURSERY STOCK.

General Acts, Chapter 161.

An Act relative to the inspection of nursery stock.

Be it enacted, etc., as follows:

Section 1. Section six of chapter five hundred and seven of the acts of the year nineteen hundred and twelve is hereby amended by inserting after the word "inspector", in the first line, the words: — either personally or through his deputies, — and by adding at the end of the section the words: — The state nursery inspector, either personally or through his deputies, shall also have power to inspect all fruits brought into the state from any other state, province or country, grown on plants, shrubs or trees of kinds which also grow out of doors in this state, and, should such fruits be found to be infested with injurious insects or plant diseases liable

to establish themselves in this state, he may cause such fruits to be destroyed, or treated or returned to the consignor at the consignor's expense, — so as to read as follows: — *Section 6.* The state nursery inspector, either personally or through his deputies, shall have power to inspect at its point of destination all nursery stock coming into the state, and should such stock be found to be infested with injurious insects or plant diseases he may cause it to be destroyed, or treated or returned to the consignor at the consignor's expense. The state nursery inspector, either personally or through his deputies, shall also have power to inspect all fruits brought into the state from any other state, province or country, grown on plants, shrubs or trees of kinds which also grow out of doors in this state, and, should such fruits be found to be infested with injurious insects or plant diseases liable to establish themselves in this state, he may cause such fruits to be destroyed, or treated or returned to the consignor at the consignor's expense.

Section 2. Said chapter five hundred and seven is hereby further amended by inserting after section six the following new section: — *Section 7.* Every person, firm or corporation who shall receive, bring or cause to be brought into the state from such states, provinces or countries as may be designated by the secretary of the state board of agriculture, any fruits grown on plants, shrubs or trees of kinds which also grow out of doors in this state, shall immediately after the arrival thereof notify the state nursery inspector of such arrival and hold the same until they have duly been inspected.

Section 3. This act shall take effect upon its passage. [*Approved April 12, 1915.*

POULTRY THIEVING POSTERS.

General Acts, Chapter 140.

An Act to authorize the printing and distribution of posters relative to poultry thieving.

Be it enacted, etc., as follows:

Section 1. The secretary of the state board of agriculture shall cause to be printed on durable material, proper for posting in the open air on buildings or otherwise, copies of chapter five hundred and ninety-four of the acts of the year nineteen hundred and fourteen. He shall furnish not more than five copies in any one year without charge to any person applying therefor, and may sell additional copies at not less than the cost thereof, and annually on or before the first day of April shall send one such copy printed on paper to each post office in the commonwealth. All amounts received from the sale of said posters shall be paid into the treasury of the commonwealth.

Section 2. This act shall take effect upon its passage. [*Approved April 6, 1915.*

PUBLIC MARKETS.

General Acts, Chapter 119.

An Act to authorize the establishment of public markets by certain cities and towns.

Be it enacted, etc., as follows:

Section 1. All cities and all towns having a population of ten thousand or more are hereby authorized to provide and maintain public markets with suitable buildings and grounds. For this purpose, any such city or town may, with the approval of the state board of agriculture, take or acquire land by purchase or otherwise, with or without buildings, and may make alterations in buildings and construct new buildings on land so acquired.

Section 2. All cities and all towns having a population of ten thousand or more which do not maintain public markets under the provisions of section one hereof shall, within one year after the passage of this act, designate one or more streets or squares, or parts thereof, or other public places, which shall be suitably situated and shall be approved by the state board of agriculture, to be used by farmers and other persons as public market places. [*Approved March 30, 1915.*

APPLE GRADING.

[Note. — One of the most important pieces of agricultural legislation of the year 1915 was the so-called apple grading law. Vermont, Connecticut, Maine and New York now have similar laws, and it is hoped that before long Rhode Island and New Hampshire will pass legislation on this subject, in order that there may be uniform apple grading legislation in all the northeastern States. A pamphlet has been issued by the Massachusetts State Board of Agriculture explaining the provisions of this act and containing the regulations for its enforcement, and a copy of the same may be secured by writing Wilfrid Wheeler, 136 State House, Boston, Massachusetts.]

General Acts, Chapter 261.

An Act relative to the packing, grading and sale of apples.

Be it enacted, etc., as follows:

Section 1. The standard barrel for apples shall be of the following dimensions when measured without distention of its parts: — length of stave, twenty-eight and one half inches; diameter of heads, seventeen and one eighth inches; distance between heads, twenty-six inches; cir-

cumference of bulge, sixty-four inches, outside measurement; and the thickness of staves not greater than four tenths of an inch: *provided*, that any barrel of a different form having a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel.

The standard box for apples shall be of the following dimensions by inside measurement: eighteen inches by eleven and one half inches by ten and one half inches, without distention of its parts, and having a capacity of not less than two thousand one hundred seventy-three and one half cubic inches.

Section 2. The standard grades of apples grown in this commonwealth when packed in closed packages shall be as follows: — "Fancy" shall include only apples of one variety which are well matured specimens, hand-picked, above medium color for the variety, normal shape, of good and reasonably uniform size, sound, free from disease, insect and fungus injury, bruises and any other defects except such as are necessarily caused in the operation of packing, and shall be packed properly in clean, strong packages: *provided*, that apples of one variety which are not more than three per cent below the foregoing specifications may be graded as "fancy."

Standard "A" shall include only apples of one variety which are well matured specimens, hand-picked, properly packed, of medium color for the variety, normal shape, sound, practically free from disease, insect and fungus injury, bruises and other defects except such as are necessarily caused in the operation of packing: *provided*, that apples of one variety which are not more than five per cent below the foregoing specifications may be graded as standard "A."

Standard "B" shall include only apples of one variety, which are well matured, hand-picked, properly packed, practically normal shape, practically free from disease, insect and fungus injury or any other defect that materially injures the appearance or useful quality of the apples, and which may be less than medium color for the variety: *provided*, that apples of one variety which are not more than ten per cent below the foregoing specifications may be graded as standard "B."

"Ungraded." Apples not conforming to the foregoing specifications of grade, or, if conforming, not branded in accordance therewith, shall be classed as ungraded and so branded.

Section 3. The marks indicating the grade, as above prescribed, may be accompanied by any other designation of grade or brand if such designation is not inconsistent with, or marked more conspicuously on the package than, the mark or marks required by section two of this act.

Section 4. The minimum size of the fruit in all grades, including the ungraded, shall be marked upon the package, and shall be determined by taking the transverse diameter of the smallest fruit in the package at right angles to the stem and blossom end. Minimum sizes shall be stated in variations of one quarter of an inch, such as two inches, two and one quarter inches, two and one half inches, two and three quarters inches, three inches, three and one quarter inches, and so forth, in accordance with

the facts. Minimum sizes may be designated by figures instead of words. The word "minimum" may be designated by using the abbreviation "min."

Section 5. Every closed package of apples packed or repacked in the commonwealth and intended for sale, either within or without the commonwealth, shall have marked in a conspicuous place on the outside of the package in plain letters a statement of the quantity of the contents, the name and address of the packer or of the person by whose authority the apples were packed, the true name of the variety and the grade and the minimum size of the apples contained therein, in accordance with the provisions of sections two, three and four of this act, and the name of the state in which they were grown. If the true name of the variety is not known to the packer or other person by whose authority the apples are packed, the statement shall include the words "variety unknown", and if the name of the state in which the apples were grown is not known, this fact shall also be set forth in the statement. If apples are repacked, the package shall be marked "repacked", and shall bear the name and address of the repacker, or the name and address of the person by whose authority it is repacked, in place of that of the original packer.

Section 6. The branding or marking of barrels under the provisions of this act shall be in block letters and figures of a size not less than thirty-six point Gothic. The secretary of the state board of agriculture shall prescribe rules and regulations as to the lettering to be used in branding or marking other closed packages.

Section 7. It shall be unlawful for any person to pack, sell, distribute or offer or expose for sale or distribution, apples which are adulterated or misbranded within the meaning of this act.

Section 8. For the purposes of this act, apples packed in a closed package shall be deemed to be adulterated if their measure, quality or grade does not conform in every particular to the brand or mark upon or affixed to the package.

Section 9. For the purposes of this act, apples packed in a closed package shall be deemed to be misbranded: —

First. If the package is packed or repacked in the commonwealth and fails to bear all statements required by sections two, three, four and five and in accordance with the provisions of section six of this act.

Second. If the package, whether packed or repacked within or without the commonwealth is falsely branded, or bears any statement, design or device, regarding the apples contained therein, which is false or misleading, or if the package bears any statement, design or device indicating that the apples contained therein are of a specified Massachusetts standard grade, and said apples, when packed or repacked, do not conform to the requirements prescribed by this act for such grade.

Section 10. Apples which have been in cold storage shall not be sold or distributed, or offered or exposed for sale or distribution, in closed packages until they have been inspected in accordance with rules and regula-

tions to be prescribed by the secretary of the state board of agriculture, unless a statement of the length of time during which the apples have been kept in storage shall be plainly marked upon the package.

SECTION 11. The secretary of the state board of agriculture shall make rules and regulations for carrying out the provisions of this act, and he shall publish, on or before the first day of September following the passage of this act, and after a public hearing, rules for the grading and packing of apples and specifying, for each variety of apples, the minimum size which shall be included in the grade designated as "fancy"; and he may thereafter modify such rules and regulations.

SECTION 12. The secretary of the state board of agriculture, in person or by deputy, shall have free access at all reasonable hours to any building or other place where apples are packed, stored, sold, or offered or exposed for sale. He shall also have power in person or by deputy to open any box, barrel, or other container, and may, upon tendering the market price, take samples therefrom.

SECTION 13. For the purpose of carrying out the provisions of this act there may be expended during the present fiscal year a sum not exceeding one thousand dollars, and thereafter such annual expenses as may be necessary shall be paid from the annual appropriation for disseminating useful information.

SECTION 14. Any person who adulterates or misbrands apples within the meaning of this act, or who packs, repacks, sells, distributes, or offers or exposes for sale or distribution, apples in violation of any provision of this act, or who wilfully alters, effaces or removes, or causes to be altered, effaced or removed, wholly or partly, any brands or marks required to be put upon any closed package under the provisions of this act, shall be punished by a fine not exceeding fifty dollars for the first offence, and by a fine not exceeding one hundred dollars for each subsequent offence.

SECTION 15. No person who sells or distributes or offers or exposes for sale or distribution apples adulterated or misbranded within the meaning of this act shall be deemed to have violated any of the provisions of this act, if it shall appear that he acted in good faith solely as a distributor, or if he shall furnish a guaranty signed by the person from whom he received the apples, with the address of such person, that the apples are not adulterated or misbranded within the meaning of this act. In such case, the person from whom the distributor received the apples shall be liable for the acts of the distributor who relied upon his guaranty, to the same extent as the distributor would have been liable under the provisions of this act.

SECTION 16. The word "person", as used in this act shall include persons, firms, corporations, societies and associations, and the acts of agents and employees shall be construed to be the acts of their principals and employers as well as of the agents and employees. The words "closed package" shall mean a barrel, box or other container the contents of which cannot be sufficiently seen for purposes of inspection without opening the container.

Section 17. This act shall take effect upon its passage, except that the provisions of sections one, two, three, four, five, six, seven, eight, nine, ten, fourteen, fifteen and sixteen shall not be operative until the first day of July, in the year nineteen hundred and sixteen. [*Approved May 17, 1915.*

PART II. — LEGISLATION OF GENERAL AGRICULTURAL INTEREST.

FARMLAND BANKS.

General Acts, Chapter 231.

An Act to authorize the incorporation of farmland banks.

Be it enacted, etc., as follows:

GENERAL PROVISIONS.

Section 1. In this act the words "farmland bank" shall mean a corporation formed in accordance with the provisions of this act for the purpose of promoting rural mortgage credit in the commonwealth; the word "bank", unless otherwise designated, shall mean a farmland bank; the words "land reserve fund" shall mean the capital stock of a farmland bank; the words "land reserve certificate" shall mean a certificate of shares of stock in a farmland bank; the word "mortgage" shall mean a mortgage upon farm land of which a farmland bank is the mortgagee; the word "bond" shall mean a bond issued by a farmland bank and secured by mortgages upon farm lands; the word "farm" shall mean any tract of land of not less than two acres, cultivated or managed wholly or principally for the purpose of obtaining a revenue from the sale of farm, dairy, or poultry products; the words "farm land" shall mean any land, improved or unimproved, having a present or potential value for agricultural purposes and comprising the whole or a part of a farm in this commonwealth; the word "board" shall mean the board of bank incorporation authorized by section four of chapter two hundred and four of the acts of the year nineteen hundred and six; and the word "commissioner" shall mean the bank commissioner of the commonwealth.

This act may be cited as The Farmland Bank Law.

INCORPORATION.

Section 2. Ten or more persons resident in this commonwealth, who have associated themselves by an agreement in writing with the intention of forming a farmland bank for the purpose of promoting rural mortgage credit, may, with the consent of the board of bank incorporation, become a corporation upon complying with all of the provisions of this act. The board is hereby authorized to grant such consent when it is satisfied that the proposed field of operation is favorable to the success of a farmland

bank, and that the standing of the proposed incorporators is such as to give assurance that its affairs will be administered in accordance with the spirit of this act. The words "Farmland Bank" shall be a part of the corporate name of every corporation organized under the provisions of this act, and the word "Farmland" shall not be used in the corporate name of any other corporation doing business in this commonwealth.

POWERS.

Section 3. Every corporation which is subject to the provisions of this act shall have the following powers and privileges and shall be subject to the following liabilities and restrictions: —

First. — To adopt and use a corporate seal.

Second. — To have perpetual succession in its corporate name unless dissolved according to the provisions of this act.

Third. — To make contracts, incur liabilities and borrow money as hereinafter provided.

Fourth. — To sue and be sued in its corporate name, and to prosecute or defend to final judgment, execution or decree in any court of law or equity.

Fifth. — To elect not less than six nor more than fifteen directors, a treasurer, clerk, and auditing committee, and, by its board of directors, to elect a president, vice president, committee on loans, and other officers and agents, and to fix the compensation of all directors, officers and committees and to define their duties.

Sixth. — To make by-laws, not inconsistent with the laws of this commonwealth, for regulating its government and for the administration of its affairs as herein provided.

Seventh. — To make loans upon farm lands anywhere within the commonwealth: *provided,*

(*a*) That such loans shall be made for a term not longer than thirty-five years, and shall be secured by a first mortgage on farm lands.

(*b*) That no loan shall exceed fifty per cent of the value of the mortgaged property, the value to be determined by an appraisal by the committee on loans as hereinafter provided.

(*c*) That every mortgage for a period longer than five years shall contain a mandatory provision for the amortization of the loan at maturity, or reduction of the same by annual, semi-annual, or quarterly payments on account of principal.

(*d*) That every loan, for a period longer than five years, or any unpaid balance thereof, may be paid off in whole or in part by the borrower, in accordance with rules to be prescribed by the said bank and approved by the commissioner, at any interest period after such loan has continued for five years.

(*e*) That the total amount loaned to any one individual or corporation shall never at any time exceed ten per cent of the total amount of the then paid-in land reserve fund and surplus.

(*f*) That no loan shall be made by any bank upon the security of its

own land reserve certificates, or the certificates of any other farmland bank.

Eighth. — To issue, sell and trade in its own collateral trust bonds, which shall be known and described as farmland bonds and shall be secured, as hereinafter provided, by the deposit of first mortgage notes on farm lands and the mortgages securing the same.

ORGANIZATION.

Section 4. Farmland banks shall be organized under the provisions, so far as applicable, of sections two to six, inclusive, of chapter three hundred and seventy-four of the acts of the year nineteen hundred and four, as amended by section four of chapter two hundred and four of the acts of the year nineteen hundred and six, and any other amendments thereof, except that the fee for filing and recording the articles of organization, including the issuing by the secretary of the commonwealth of the certificate of incorporation, shall be five dollars.

The provisions relating to supervision by the bank commissioner, so far as applicable, of chapter five hundred and ninety of the acts of the year nineteen hundred and eight and any amendments thereof, shall apply to banks incorporated under this act.

BY-LAWS.

Section 5. The by-laws may prescribe, subject to the provisions of this act, the name of the corporation, the purposes for which it is formed, the location of the principal office, the time and place of holding and the manner of conducting its meetings, the number of shareholders and directors necessary to constitute a quorum, the powers and duties of its directors and officers, the expediency of providing for an executive committee and the number of members thereof and the duties which may be delegated to it, the amount of the treasurer's bond and the expediency of requiring bonds of other officers or directors of the bank, and the amount of such bonds, the conditions under which a new certificate of stock may be issued in place of a certificate which is alleged to have been lost or destroyed, the requisite notice and advertisement when bonds are called before maturity, the method in general of transacting its business, and the manner by which the by-laws may be altered, amended or repealed.

FISCAL YEAR.

Section 6. The fiscal year of every farmland bank shall end at the close of business on the last business day of October.

DIRECTORS, OFFICERS AND COMMITTEES.

Section 7. The business of every bank subject to this act shall be managed and conducted by a board of not less than six nor more than fifteen directors, a president, a vice president, a clerk, a treasurer, a com-

mittee on loans of five members, an auditing committee of three members, and such other officers, committees and agents as the by-laws may authorize. The clerk, treasurer, board of directors, and auditing committee shall be elected annually by ballot by the shareholders. The president, vice president, and committee on loans shall be elected annually by ballot by the board of directors. The president and vice president shall be chosen from the board of directors. Two thirds of the members of the board of directors shall be shareholders, and the remainder shall be borrowers from the bank who are not shareholders, if there is a sufficient number of such borrowers. All officers and the members of the auditing committee shall be shareholders. All officers and directors of the corporation shall be residents of the commonwealth and shall be elected for a term of one year and until their successors are duly elected and qualified. The manner of choosing or of appointing all other officers, committees, and agents, and of filling all vacancies shall be prescribed by the by-laws, and, in default of such by-law, vacancies may be filled by the board of directors, except vacancies in the auditing committee.

POWERS AND DUTIES OF DIRECTORS AND OFFICERS.

Section 8. The board of directors shall exercise all the powers of the corporation, except as is otherwise provided by law or by the by-laws of the corporation. A bank may, in its by-laws, provide for an executive committee to be elected by and from its board of directors. To such committee may be delegated the management of the current and ordinary business of the bank, and such other duties as the by-laws may prescribe. The duties of the officers shall be defined in the by-laws. Officers of the bank shall be sworn to the faithful discharge of their duties. The treasurer shall be required, and any other officer entrusted with the property of the bank may be required, to give a bond in such sum and with such sureties as the by-laws may prescribe. The clerk shall record all votes of the corporation in a book to be kept for that purpose.

COMMITTEE ON LOANS.

Section 9. The committee on loans shall approve in writing an application for a loan before the same shall be granted. Every application for a loan shall be made in writing and shall state the purpose for which the loan is desired. No loan shall be made, except as is hereinafter provided, unless the committee on loans is satisfied that it tends to benefit the borrower and to develop agricultural resources, nor unless it has received the approval in writing of a majority of the members of the committee, who shall certify after an examination that in their best judgment the loan to be made does not exceed fifty per cent of the value of the property. An applicant for a loan which has been refused by the committee on loans may appeal to the board of directors, who are hereby given authority to approve and authorize loans on appeal from the committee.

AUDITING COMMITTEE.

SECTION 10. The auditing committee shall inspect the securities, cash and accounts of the bank, and shall employ accountants, authorized by law to examine savings banks, to audit the books, records and accounts, and may do so without previous notice to the directors or officers and with such frequency and at such times as they deem necessary or expedient. At the annual meeting of the shareholders the committee shall submit its report, including the results of audits made during the year, and such recommendations as it may desire to make. At any time it may, by a majority vote, call a meeting of the shareholders to consider any violation of this act or of the by-laws, or any matter relating to the affairs of the bank which, in the opinion of said committee, requires action on the part of the shareholders. The committee, unless otherwise provided in the by-laws, shall prescribe the method of keeping the mortgage register, of holding and preserving the mortgages and other securities, of crediting payments on mortgages, of cancelling mortgages, and of releasing the liens of mortgages. The committee shall also ascertain that all mortgages, deeds, assignments and other evidences of title to real estate have been duly recorded according to law, and, in the event of failure on the part of the proper officers to record any such instrument, the auditing committee shall certify such fact upon the records of the bank, and such officers shall be liable in damages to the bank for any loss sustained by reason of the failure to record such instrument. The auditing committee shall fill vacancies in its own membership until the next annual meeting of the shareholders.

MEETINGS.

SECTION 11. The annual meeting of the corporation shall be held at such time and place as the by-laws shall prescribe, but it must be held within thirty days after the close of the fiscal year. Special meetings of the shareholders may be called by the president, or by a majority of the directors or of the auditing committee, and shall be called by the clerk upon written application of three or more shareholders who hold at least one tenth part in interest of the capital stock, stating the time, place and purpose of the meeting. Meetings of the board of directors shall be held at least quarterly. Notice of all meetings of the shareholders and of the board of directors and of committees shall be given in the manner prescribed in the by-laws, but at least seven days' notice shall be given of all meetings of the shareholders, which notice shall state the purposes for which the meeting is called. Meetings of the shareholders may be held without notice if all the shareholders waive notice in writing and such waiver is filed with the records of the meeting. Meetings of the board of directors may be held without notice if all members thereof waive notice in writing and such waiver is filed with the records of the meeting. Meetings of committees may be held without notice if all members thereof

waive notice in writing. All meetings of the shareholders and of the board of directors shall be held within the commonwealth. If, by reason of the death or absence of the officers of a corporation or other cause, there is no person duly authorized to call or preside at a legal meeting, or if the clerk or other officer refuses or neglects to call it, a justice of the peace may, upon written application of three or more of the shareholders, issue a warrant to any one of them, directing him to call a meeting by giving such notice as is required by law, and may, by the same warrant, direct him to preside at the meeting until a clerk is duly chosen and qualified, if no officer of the corporation is present who is legally authorized to preside.

QUORUM AND PROXIES.

Section 12. Unless the by-laws otherwise provide, a majority in interest of all shares issued and outstanding shall constitute a quorum at a meeting of the corporation, and a majority of the members shall constitute a quorum at a meeting of the board of directors or of any committee. No corporation shall, directly or indirectly, vote upon any share of its own stock. Shareholders shall have one vote for each share of stock owned by them. Executors, administrators, guardians, trustees or persons in any other representative or fiduciary capacity may vote as shareholders upon shares held in such capacity. Shares owned by any corporation may be voted by any duly authorized officer or agent thereof. Shareholders may vote either in person or by proxy. No proxy which is dated more than six months prior to the meeting named therein shall be valid, and no proxy shall be valid after the final adjournment of the meeting for which it was issued.

LAND RESERVE FUND.

Section 13. The capital stock of a farmland bank shall not be less than fifty thousand dollars nor more than five hundred thousand dollars and shall be held by the bank as a separate fund, to be known as the Land Reserve Fund.

The par value of shares in the Land Reserve Fund shall be five dollars or any multiple thereof not exceeding one hundred dollars.

No person shall directly or indirectly hold or own more than ten per cent of the shares in a farmland bank exclusive of any shares which he may hold as collateral security.

Any bank, at a meeting duly called for the purpose, by vote of the majority of its shares outstanding, may amend its articles of incorporation to authorize an increase or a reduction in the amount of its capital stock, and in the case of an increase may determine the terms and the manner of the disposition of such additional stock, but in no event shall the capital stock be increased to an amount exceeding five hundred thousand dollars, nor reduced to an amount less than fifty thousand dollars. If an increase in the total amount of the capital stock shall have been authorized by vote of the shareholders in accordance with the provisions hereof, the

articles of amendment shall also set forth the total amount of capital stock previously authorized and a statement that the increased amount of capital stock has all been paid in in cash, and the bank commissioner shall in no case approve a certificate showing an increase of capital stock until he is satisfied that such payment in full has been made to the bank. If a reduction of the capital stock shall have been authorized by the shareholders in accordance with the provisions hereof, the articles of amendment shall also set forth the total amount of capital stock previously authorized, the amount of the reduction and the manner in which it shall be effected, and a copy of the vote authorizing the reduction. No reduction of capital stock shall be lawful which renders the bank bankrupt or insolvent, but the capital stock may be reduced, if the assets of the bank are not reduced thereby, by the surrender by every shareholder of his shares and the issue to him in lieu thereof of a proportional decreased number of shares and such reduction shall not create any liability of the shareholders of such bank in case of the subsequent bankruptcy of such bank.

WHO MAY BE SHAREHOLDERS.

SECTION 14. Any person, firm, association, society, or organization, and any co-operative bank, credit union, trust company, or other corporation may purchase and hold shares in any farmland bank, subject to the provisions of any laws expressly prohibiting or restricting investment therein by any such corporation, association, society or organization.

LAND RESERVE CERTIFICATES.

SECTION 15. Every shareholder shall be entitled to a land reserve certificate in a form approved by the commissioner, which shall be signed by the president and by the treasurer of the corporation, shall be sealed with its seal, and shall certify that the holder is the owner of the number of shares represented by the certificate. Land reserve certificates may be transferred upon the books of the corporation in accordance with the laws relating to the transfer of stock in general business corporations. The directors of a farmland bank may, unless otherwise provided by the by-laws, determine the conditions upon which a new certificate may be issued in place of any certificate which is alleged to have been lost or destroyed.

BONDS.

SECTION 16. Farmland bonds in a farm approved by the commissioner may be issued by a bank by vote of its board of directors whenever the bank holds as mortgagee farm land mortgages of a term longer than five years in amount sufficient to secure such issue. Each issue of bonds shall constitute a separate series and shall be so designated, the first series being designated as "Series One of Farmland Bonds of the Farmland Bank", and subsequent series accordingly. No series shall be issued for less than an aggregate sum of ten thousand dollars nor for more than

ninety-five per cent of the amount of the mortgages against which it is issued. Bonds may be issued in denominations of fifty dollars or any multiple thereof, but no bond shall be for a larger amount than one thousand dollars. Bonds may bear such rate of interest as may be determined by the directors, but not exceeding five per cent per annum. They shall be payable on a date specified and shall be subject to call by the bank at two per cent above par with accrued interest at any interest period after the date of issue, or after a date specified in the bond, after such notice and advertisement as may be provided in the by-laws, or, if no provision is made in the by-laws, as shall be approved by the commissioner. Mortgages pledged as collateral security for bonds of any series shall be kept at all times in the possession and under the control of the bank, or, upon direction of the commissioner, shall be deposited with a trustee who shall be appointed by the bank with the approval of the commissioner, and shall hold the mortgage notes and mortgages for the bond holders. As the amortization payments are received and credited upon the mortgage notes so deposited as security, the bonds issued by the bank and secured thereby shall be called and paid, or purchased in the open market and retired, to the extent of the payments received, and credited upon the mortgage notes held as security therefor, under rules and regulations adopted by the bank with the approval of the commissioner, or the payments so received may be deposited by the bank, or, if a trustee has been appointed, shall be paid over to the trustee, to be deposited at interest as an amortization fund to meet the payment of the notes at maturity. Only mortgages for a period longer than five years shall be pledged as collateral for farmland bonds. Bonds issued by any bank in accordance with the provisions of this act shall be a legal investment (1) for any savings bank or trust company to an amount not exceeding one fifth of the deposits of such savings bank or trust company; (2) for trust funds and estates and for funds and estates under the jurisdiction of or administered by any of the courts of the commonwealth; (3) for insurance companies as defined and prescribed by section thirty-seven of chapter five hundred and seventy-six of the acts of the year nineteen hundred and seven, and any amendment thereof; (4) for surplus funds of co-operative banks in addition to the investments authorized by section eleven of chapter one hundred and fourteen of the Revised Laws; (5) for the sinking funds of the commonwealth or of any county or city or town thereof.

INVESTMENTS.

SECTION 17. The land reserve fund, and the surplus fund to the amount of one fourth of the land reserve fund, shall be invested only in (1) first mortgages upon farm lands, which shall have the approval of the committee on loans or the board of directors as herein provided; (2) bonds and notes which are at the time of their purchase legal investments for savings banks in this commonwealth; (3) investments, other than real estate and mortgages upon real estate, which shall be approved by the commissioner:

provided, that the surplus fund, when other funds of the bank are not sufficient, may be expended in meeting the accruing obligations and necessary current expenses of conducting the business of the bank. Any uninvested portion of the land reserve fund or the surplus fund may be deposited, pending investment, in any national bank or trust company in the commonwealth.

HOLDINGS OF REAL ESTATE.

SECTION 18. A farmland bank may purchase and hold real estate only as provided in this section:

First. — It may own the building in which its offices are located, and may lease such portion of the building as may not be required for the business of the bank: *provided*, that no part of the land reserve fund or the surplus fund required by the provisions of this act shall be invested in the purchase of such building.

Second. — It may hold real estate acquired by the foreclosure of mortgages owned by it, or by purchase at sales made under the provisions of such mortgages, or upon judgments for debts due to it, or in settlements effected to secure such debts, but all such real estate shall be sold by the bank within five years after the title thereof is vested in it, unless the commissioner upon petition of the committee on loans of such bank for cause shall grant additional time for the sale of such real estate.

LOANS.

SECTION 19. Loans shall be made only upon security of first mortgages upon farm lands. The rate of interest upon loans shall in no event be more than six per cent, but an additional charge to the borrower may be made, to be applied to the cost of administering the affairs of the bank, which charge in no case shall exceed one per cent of the amount unpaid on the loan and shall be paid in annual, semi-annual, or quarterly payments at the same time that the interest is paid. The rate of interest upon loans for a period longer than five years shall not exceed the rate of interest upon the bonds secured thereby by more than one per cent annually upon the amount unpaid on the loan.

Upon loans for a period longer than five years amortization payments shall be made in such amounts as shall be stated in the mortgage note and mortgage, which amounts shall be sufficient to pay the principal in full at maturity and shall be payable in equal annual, semi-annual, or quarterly payments at the same time that the interest is paid. A borrower may pay the amount of his mortgage loan or any part thereof on any interest day by surrendering at par and accrued interest bonds of the series for which his mortgage is pledged as security.

Fines may be imposed upon borrowers for failure to pay interest or amortization payments promptly, but such fines shall not exceed one half of one per cent per month upon the unpaid part of the loan for the time that the default continues. In no event shall fines for more than six months upon any one default be collected.

DIVIDENDS AND SURPLUS.

SECTION 20. The directors may from time to time declare dividends to be paid out of the profits of the bank, but no dividend shall be declared unless the combined amount of the land reserve and surplus funds is equal to five per cent of the par value of the bonds outstanding at the time the dividend is declared. No dividend shall be declared exceeding six per cent per annum upon the par value of the land reserve certificates outstanding, except as is hereinafter provided. Net earnings in excess of the dividend declared shall annually be carried to surplus until the surplus fund shall equal twenty-five per cent of the land reserve fund. Dividends shall be cumulative only after the surplus fund shall have been established and maintained equal to twenty-five per cent of the land reserve fund. Any profit not required to maintain the land reserve and surplus funds, and to pay cumulative dividends not exceeding six per cent per annum, may be carried in amount not exceeding fifty per cent to surplus until the surplus fund shall equal the land reserve fund, and any amount not carried to surplus shall be annually divided in equal shares of which one half shall be placed to the credit of the borrowers in amounts in proportion to their loans unpaid at the time of such distribution, and the remaining half shall be paid as an extra dividend upon the outstanding land reserve certificates.

EXEMPTION FROM TAXATION.

SECTION 21. All property of a bank incorporated under the provisions of this act, except real estate, and all land reserve certificates and farmland bonds issued by the bank, shall be exempt from state and local taxation, except legacy and succession taxes.

ARTICLES OF AMENDMENT.

SECTION 22. No amendment for alteration of the agreement of association or articles of organization shall take effect until said articles of amendment, signed and sworn to by the president, treasurer and a majority of the directors, shall have been approved by the commissioner and filed in the office of the secretary of the commonwealth. The fee for filing and recording such articles of amendment shall be five dollars.

DISSOLUTION.

SECTION 23. A farmland bank may be dissolved by vote of its shareholders, representing two thirds in amount of the shares issued and outstanding, at any meeting called for the purpose after due notice to all shareholders in accordance with the provisions of the by-laws. The bank shall be dissolved in accordance with rules and regulations prescribed by the bank commissioner. In case of dissolution, after all obligations of the bank have been paid, or due provision made for their payment at ma-

turity, the remaining assets of the bank available for distribution shall be distributed between the borrowers and shareholders in the manner hereinbefore provided for the distribution of surplus earnings of the corporation between the borrowers and shareholders. In the event that the original borrower has sold the mortgaged premises and the purchaser has assumed and agreed to pay the mortgage, the purchaser, by assuming the mortgage, shall succeed to all rights of the borrower and shall be entitled to receive any share of the borrower in any distribution of surplus, and in any distribution of assets of the corporation in dissolution. [*Approved May 6, 1915.*

CHARGES FOR DAIRY INSPECTION PROHIBITED.

General Acts, Chapter 109.

An Act to prohibit charges for the inspection of live stock, dairies or farm buildings.

Be it enacted, etc., as follows:

Section 1. It shall be unlawful for any state or municipal inspector or other officer to charge any fee for the inspection of any live stock or of any dairy, barn or stable on any farm in which milk is produced for sale.

Section 2. This act shall take effect upon its passage. [*Approved March 27, 1915.*

DESTRUCTION OF GYPSY AND BROWN-TAIL MOTHS.

General Acts, Chapter 124.

An Act relative to notifying owners of land infested with gypsy and brown tail moths.

Be it enacted, etc., as follows:

Section six of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five, as amended by section four of chapter two hundred and sixty-eight of the acts of the year nineteen hundred and six, and by section two of chapter five hundred and ninety-one of the acts of the year nineteen hundred and eight, is hereby further amended by inserting at the end of the first paragraph the following: — The publication of the notice in newspapers published or circulated in the city or town at least three times during the month of October shall be deemed a compliance with the law, if in the opinion of the mayor or selectmen such publication will be a sufficient notice, — so as to read as follows: — *Section 6.* The mayor of every city and the selectmen of every town shall, on or before the first day of November in each year, and at such other times as he or they shall see fit, or as the state superintendent may order, cause a notice to be sent to the owner or owners, so far as can be ascertained, of every parcel of land therein which is infested with said moths; or, if such notifi-

cation appears to be impracticable, then by posting such notice on said parcels of land, requiring that the eggs, caterpillars, pupæ and nests of said moths shall be destroyed within a time specified in the notice. The publication of the notice in newspapers published or circulated in the city or town at least three times during the month of October shall be deemed a compliance with the law, if in the opinion of the mayor or selectmen such publication will be a sufficient notice.

When, in the opinion of the mayor or selectmen, the cost of destroying such eggs, caterpillars, pupæ and nests on lands contiguous and held under one ownership in a city or town shall exceed one half of one per cent of the assessed value of said lands, then a part of said premises on which said eggs, caterpillars, pupæ or nests shall be destroyed may be designated in such notice, and such requirement shall not apply to the remainder of said premises. The mayor or selectmen may designate the manner in which such work shall be done, but all work done under this section shall be subject to the approval of the state superintendent.

If the owner or owners shall fail to destroy such eggs, caterpillars, pupæ or nests in accordance with the requirements of the said notice, then the city or town, acting by the public officer or board or such city or town designated or appointed as aforesaid, shall, subject to the approval of the said superintendent, destroy the same, and the amount actually expended thereon, not exceeding one half of one per cent of the assessed valuation of said lands, as heretofore specified in this section, shall be assessed upon the said lands; and such an amount in addition as shall be required shall be apportioned between the city or town and the commonwealth in accordance with the provisions of section four of this act. The amounts to be assessed upon private estates as herein provided shall be assessed and collected, and shall be a lien on said estates, in the same manner and with the same effect as is provided in the case of assessments for street watering.

The public officer or board of any city or town designated or appointed as aforesaid, or any agent or employee of such public officer or board, may at any time enter upon any parcel of land within the limits of such city or town for the purpose of determining whether or not such parcel of land is infested with said moths, or the extent to which such parcel of land is so infested. [*Approved March 31, 1915.*

ARSENATE OF LEAD FOR MOTH WORK.

General Acts, Chapter 80.

An Act to authorize local moth superintendents to furnish arsenate of lead to towns.

Be it enacted, etc., as follows:

Section 1. Section one of chapter six hundred and five of the acts of the year nineteen hundred and thirteen is hereby amended by striking out the words "now receiving aid from the commonwealth in suppressing the said insect pests", in the third and fourth lines, — so as to read as follows:

— *Section 1.* For the purpose of assisting in the extermination of gypsy and brown tail moths, the local moth superintendent in any city or town is hereby authorized to furnish, at the cost thereof, arsenate of lead to any owner of real estate situated within the limits of such city or town. Material purchased under the provisions hereof shall be used only for the suppression of gypsy and brown tail moths and only upon land of the purchaser.

Section 2. This act shall take effect upon its passage. [*Approved March 18, 1915.*

ARSENATE OF LEAD TO BE FURNISHED BY TOWNS.

General Acts, Chapter 171.

An Act to authorize cities and towns to purchase arsenate of lead for the purpose of suppressing insect pests.

Be it enacted, etc., as follows:

Section 1. For the purpose of assisting in the extermination of insect pests the city forester, local moth superintendent or tree warden in any city or town may obtain from the state forester, at the cost thereof, arsenate of lead. Material purchased under the provisions hereof shall be used only for the suppression of gypsy and brown tail moths, the tent caterpillar, leopard moth and elm beetle, and only upon lands owned or controlled by the city or town. The cost of said material shall be certified by the state forester to the treasurer of the commonwealth, and shall be collected by him as an additional state tax upon the city or town making such purchase.

Section 2. This act shall take effect upon its passage. [*Approved April 16, 1915.*

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