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OF THE

MASSACHUSETTS

STATE BOARD OF AGRICULTURE

PART II.

YEAR BOOK.

1916.

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PART II.

STATE BOARD OF AGRICULTURE, 1917.

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HIS EXCELLENCY SAMUEL W. McCALL.
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]
HENRY M. HOWARD of Newton (P. O. West Newton),	1917
EDWARD E. CHAPMAN of Ludlow,	1918
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Members Chosen by the Incorporated Societies.

Amesbury and Salisbury (Agricultural and Horticultural),	A. WILLIS BARTLETT of Salisbury,	1917
Barnstable County,	JOHN BURSLEY of Barnstable (P. O. West Barnstable),	1918
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Hampshire	HOWARD A. PARSONS of Amherst (P. O. North Amherst),	1918
Hampshire, Franklin and Hampden,	CLARENCE E. HODGKINS of Northampton,	1917
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Hingham (Agricultural and Horticultural),	URBAN S. BATES of Hingham,	1917
Hoosac Valley,	NATHAN B. FLOOD of North Adams,	1917
Housatonic,	CHARLES W. FREEHAN of Great Barrington,	1917
Lenox Horticultural,	ALFRED H. WINGETT of Lenox,	1919
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.),	1919
Middlesex South,	JOHN J. ERWIN of Wayland,	1919
Nantucket,	HERBERT G. WORTH of Nantucket	1917
Oxford,	JOHN F. FREELAND of Sutton,	1918

[1] First Tuesday in December.

		Term expires[1]
Plymouth County,	ERNEST LEACH of Bridgewater,	1919
Quannapowitt,	CALVERT H. PLAYDON, D.V.S., of Reading,	1918
West Taunton,	CHARLES I. KING of Taunton,	1919
Weymouth (Agricultural and Horticultural),	HOWARD H. JOY of Weymouth (P. O. South Weymouth),	1917
Worcester,	CHARLES H. ELLSWORTH of Worcester,	1919
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,	LOUIS H. RUGGLES of Hardwick,	1919

Member chosen by the Massachusetts Federation of County Leagues and Farm Bureaus.

	Term expires[1]
L. L. RICHARDSON of Leominster,	1918

[1] First Tuesday in December.

PUBLIC WINTER MEETING OF THE BOARD, AT SPRINGFIELD, JANUARY 9, 10, 11 AND 12, 1917.

The Massachusetts State Board of Agriculture assembled for its fifty-fourth Public Winter Meeting at the municipal auditorium, Springfield, on January 9, 10, 11 and 12, 1917. The meeting was held in connection with the twenty-third convention of the Massachusetts Fruit Growers' Association, the fruit growers' program occupying the whole of the last day; the seventh annual meeting of the Massachusetts Dairymen's Association and the tenth annual meeting of the Massachusetts Milk Inspectors' Association.

The basement of the municipal building was occupied with the usual exhibits of farm products, and there was a large display of manufacturers' supplies, especially in the fruit line.

The Dairy Bureau had offered prizes for a milk, cream and butter show, which was held in co-operation with the allied dairy interests.

The attendance, unfortunately, was rather small, and the people of Springfield did not seem to realize what an unusual opportunity they were having to hear big men along agricultural topics.

On Tuesday, January 9, Secretary Wilfrid Wheeler of Concord called the opening session to order at 10 A.M., and introduced Honorable Frank E. Stacy, mayor of Springfield, who extended the Board a cordial welcome on behalf of the city. After a response for the Board by First Vice-President John Bursley, Mr. H. G. Worth of Nantucket was introduced as presiding officer for the morning session. Mr. Worth introduced Professor James E. Rice of the New York State College of Agriculture, who spoke on "Breeding and selecting Fowls for Egg Production."

BREEDING AND SELECTING FOWLS FOR EGG PRODUCTION.

JAMES E. RICE, PROFESSOR OF POULTRY HUSBANDRY, CORNELL UNIVERSITY, ITHACA, NEW YORK.

The burden of my song to-day will be the efficiency of the hen, but before entering upon the discussion of this subject I want to express my appreciation of the honor and the privilege of returning so many times to speak before your State Board of Agriculture. I think that we have made wonderful progress throughout this country in very recent years in agriculture. We have made greater progress, in my judgment, in the past ten years than in the preceding hundred years, and that is saying a great deal; and truly, poultry husbandry has, for one reason or another, come out of the realm of a side issue or a one-person business on the farm, and has now become a well-established commercial enterprise worthy of the best men and worthy of capital and confidence in the business. In other words, because of our increased knowledge of how to successfully handle poultry enterprises, poultry husbandry is not now, in my judgment, to be considered as one of the risky, hazardous occupations, but one of the well-established, conservative and profitable occupations. As an evidence of this fact we can point literally to hundreds of farms in New York State and in Massachusetts, and literally to thousands of them in the United States, where 1,000 or 2,000 hens or more are being kept profitably, and more profitably than most other branches of agriculture that could be followed in those same districts. I was talking with one of the most successful farmers in our State a few weeks ago, a man who has been so successful that his two sons have been trained especially for farm work and are back on the farm, in partnership with him; a man who has such a big farm and is handling it so well that he has 11 miles of tile

drains on his farm, and who grows many acres of many crops, and who keeps careful accounts, and I asked him the question, "Which branch of your farming do you look upon now as being your most profitable, permanent, reliable, staple standby?" He answered, as quickly as he could get the words out of his mouth, "Poultry and asparagus." Now we cannot get behind those facts; we cannot, in any way, question those statements when men of substantial means and intelligence, men who are capable of handling any branch of agriculture that their fancy happens to take or that the market conditions would warrant, take a position of that sort. A man walked into my office a few days ago, as he has done now for five years in succession, either at Thanksgiving or Christmas time, and laid down on my desk an outline, a financial statement of his poultry enterprise, — a city man with a city wife, who had wanted to get away from the worries of city life, and, having enough means, bought a farm and went into the keeping of poultry. When I saw them branch out into the poultry business I had some misgivings because so many persons have gone into the breeding of poultry who have spent money unwisely and have made failures which have reflected upon the business generally. But at the end of the year, when they came to the college again and showed me the number of eggs they bought, the number of chickens they hatched, the number of eggs they had received in a year and other items of expense, all accounted for, I found they had made the best record of anybody who had ever laid down their accounts before us, and they continued to do it every year right straight along; they have not met their failure yet. This year they reared 94 per cent. of all the chickens hatched, and they have not reared less than 92½ per cent. in the years they have been in the business. They had an average egg production of 133 eggs per hen and 165 eggs per pullet, this past year, for their entire thousand birds.

This man showed me where he had made $2.81 net profit for every one of those hens as his labor income, after paying the interest on the investment and every cost, including labor that they hired, and had made a profit this year of $2,700 and some odd cents from his chickens.

Is he going to keep 2,000 and make twice as much? No.

He is well satisfied to keep what he has and take perfect care of everything he has and make the maximum income per individual. Now, it would take several days to discuss the factors that entered into that man's success, but one of the things that I think has been paramount in his success was the fact that he knew good stock when he saw it, and has bred and handled his fowls with respect to the efficiency of the individual; and that is my text to-day.

Breeding.

With all due respect to the importance of every other important thing in handling poultry, — the feeding, the housing, the incubating, the brooding, the marketing, which are big, strong, important connecting links, — I must say that I feel positive that there is one link that must be stronger than all of the others, and that is the breeding of our poultry. Why? Because everything depends upon the efficiency of the birds that we are handling. If the birds are not what they should be as regards vigor and productivity and productive power, — production of fertile and hatchable eggs and eggs of high quality, — if they are not capable of making use of all of the other factors that we may supply we never can get our reward. Poor hens will not pay in any kind of a system of housing or upon any rations or by any methods of incubation or brooding, nor can we reap our reward by any system of marketing. On the other hand, if we have good, efficient machines to utilize this food, to utilize these buildings and the other facilities that we can provide, frequently a man will succeed if he has not done some of the other things as well as he should, because the birds have been able to manufacture products economically. So I emphasize that we must begin with the foundation principle, that, whatever else happens, we must have the very best stock that it is possible for us to breed and handle. This is particularly true now, when the high cost of feed makes it absolutely certain that a man cannot make money unless he has got good birds, and makes it absolutely sure that he is going to lose money if he has inefficient birds. There is only one blessing coming out of a high food cost situation, as I see it, except to the man who is selling the feed or growing the feed,

and that is the fact that it is going to force people to cut down the number of birds they have got on their farm and keep only the good ones. If it accomplishes this purpose it is going to mean almost a revival of the profitableness of the poultry business.

Another factor looking in the same direction is the high cost of labor, and you people in Massachusetts know better than we do over in New York what it means to compete with the munition factories and other mercantile concerns that are pulling labor from your farms. This means that we must reduce to the lowest number the birds we have, and every one must be a good one, and then increase them as rapidly as we can up to the full capacity, every one a good one. Our objects in breeding should, first of all, be to secure birds that will live, — birds that will have high vitality and will live with us for many years. The greatest weakness of our business is the fact that the bird is a short-lived individual, comparatively; that she is a small individual as compared to other kinds of live stock; and therefore it becomes important that we breed our birds in such a way that we are not going to lose even 3, 5 or 10 per cent. mortality or more per year and have to replace them. It means that when we find a good bird we must be able to keep it for a period of several years for breeding, to establish that factor of a long-lived race. It means that we must have birds that inherit a tendency to produce, an inborn tendency to lay or to grow meat, and to do this better than the average. It means that we must breed those birds to produce a high-quality egg, because the quality of an egg as to its size, color and shape, as well as the number of eggs she lays, is going to measure the money-earning power of the bird. It means that we must breed those birds so that they are going to lay their eggs when they will give us the highest price rather than mere numbers of eggs or quality of eggs. So we have a number of factors there, including also fertile and hatchable eggs, coupled with constitutional vigor, in order that we may reproduce our flocks and get as good or better every year. Those are the main cornerstones of our breeding program.

Now, coming to specific problems, the next step is that we shall have an ideal; that we shall know what we are breeding

for; that we shall have clearly fixed in our minds the difference between good birds and poor birds when we see them, and a person can never expect to make progress in the breeding of poultry if he just has blindly the number of eggs that a hen has laid as his guide. He must have pictured in his mind the kind of bird that will make the profit, and when he has got that ideal he will compare every other chicken with that as his standard, and this standard must be high.

Then he must have a definite procedure in breeding, and the next step in that procedure is that he ought to start where the other fellows left off, rather than to begin at the bottom and have to work up. That means that he should start with some good, pure breed, and he ought to start in a small way rather than in a large way, because if he starts in a small way it does not cost him very much to get a few good individuals, and by waiting a year or two to get his full capacity he will grow and produce from these few and sell them to himself at high prices instead of undertaking to buy himself into the chicken business. Now you will notice that the people who usually fail are the people who have a lot of money and little experience to begin with, and they nearly always undertake to buy themselves into the chicken business from somebody else instead of growing into the chicken business by their own efforts in hatching and rearing and breeding.

Having decided upon our breed, be it Plymouth Rock, Leghorn, Rhode Island Red, or whatever it may be, how shall we know a good bird from a poor one, male or female, when we see them? Now the last word has not yet been said on this subject, but enough has been known and discovered in the past few years so that we are able to tell, with most sensational accuracy, good birds from poor birds when we see them as regards their productive power; and to do this so early in their lives that we can eliminate the poor ones and keep the good ones for the next several years of their profitable lives I want to try to point out to you the differences in at least four or five characteristics between good and poor birds. Fortunately for us there are certain physiological changes, certain external characteristics in our birds, because of their nature, that vary from time to time during the year, and if we understand why

they have occurred and what caused them we will be able to have an insight into the meaning of the thing so that we can read on the outside of the bird what is going to take place on the inside of the bird.

This means that to-day we have a means of improving the quality of our poultry that has never been known before in the ages, and is making it possible for us to now breed our birds as intelligently and as scientifically, nearly, as the man can who has larger kinds of live stock. The great difficulty that the poultryman has had to confront in all these ages, and the thing that has held back the advancement of poultry breeding throughout the country more than any other one thing or all others put together, has been the fact that it has been necessary for us to breed our fowls with regard to their production by flock methods and by flock averages rather than by individual merit. What I mean by that is this, that when a man has $100 invested in hens he has about 100 hens; when he has $100 invested in cows he has only one or two individuals; he can mark and he can know the parentage and the offspring of his cattle, of his sheep, of his horses and of his hogs, but not of his hens. He has known a certain male with a flock, and he has only known that the chickens came from any one of 15 or 20 females, because he has not been able to connect the responsibility for high production or low production with both parents or either parent, and as a result the continuous breeding sometimes of a low line with a high line has held us to averages, and it has only been a gradual and very slow process upward. But with this discovery of certain externals which give us an idea of what is happening inside, we are able to winnow out the good birds from the bad. We can do this without the laborious expense of a daily trap nesting, which has been practically prohibitive because of the fact that it costs in the neighborhood of 50 to 75 cents a year per hen, and it is only here and there that a person has been venturesome enough to undertake the expense and to keep it up. With this method that I am going to try and make clear to you, we only need the trap nest during the months of September, October, November and December, if we have hatched at the proper time; and as a matter of fact, for the use of many farmers and poultrymen it is not

absolutely necessary to have the trap nest at all, as we can certainly make rapid progress by merely judging the birds on their externals. We must realize, of course, that no physical examination of any individual, be it a race horse or a cow or a hog or a sheep or a hen, will always be absolutely correct in predicting the best or the poorest individual, but it will be sufficiently accurate so that, for all practical purposes, a man can eliminate from his flock the unprofitable birds and can keep only the profitable, and can also distinguish between the more and the less profitable.

Points in Selection.

I am going to pass very rapidly over the first step in the selection; after having decided upon our pure breed, it is to recognize those characteristics that indicate the vitality of our offspring or of our stock. We must have good stock to begin with, — strong, healthy, vigorous stock. It is an inherited characteristic to be born weak or strong, and occasionally a bird that is born strong becomes weak by misuse, but whatever the cause may be, it is important that we get rid of any bird that shows weakness at any time in its life from a baby chick up.

As regards the general body shape of a weak chicken you will find that the body usually lacks capacity where there is low vitality; that it has a very tucked-up and rather contracted abdomen; it has a tendency to be hollow-breasted, angular, ungainly and loose-jointed in its make-up. Whenever an individual becomes weak while growing, nature seems to direct its growth towards the enlargement of certain parts and the dwarfing of others. If any part of a weak chicken grows it is its head and beak and feet, and occasionally its wings, at the expense of its body. So you will find a tendency to a rather thin head; a long, thin, flat beak; a rather long, thin neck; thin body; long, thin shanks, legs and toes, and a very poor development of plumage; a sunken, dull eye; a drooping eyelid; a small, pale comb, — all of those external characteristics that indicate poor health, low vitality and a poor appetite. In other words, the bird of low vitality has a weak development of the breast and a poor development of the abdomen, whereas the

strong-vitality bird is strong in those points. Now, if you would compare each of those birds with a triangle you would see that the weak bird, because of its shape, has a tendency to narrow at the shanks, whereas the strong bird has less of a tendency to the triangular form. We say, therefore, that, comparing each of the breeds, of course according to its type, with individuals within that breed the birds of high vitality are those that more nearly approach the parallelogram form than the triangular form, and this is as true of baby chicks as it is of mature fowls, either male or female. If one will get those points fixed in his mind he will be able, with a great deal of accuracy, to eliminate early in the season all of the low-vitality chickens in his flock, sell them alive at whatever he can get for them, and keep only the stronger and more robust individuals in his flock. A person ought to select early in the development of his chickens a few of the strongest, most rapid growing, best birds for future use as breeders, because occasionally birds that do not grow well during the early part of their lives, after they once get well feathered out are more difficult to detect than they are at early stages in their development.

At the college plant last year we selected three lots of white Leghorn cockerels on the basis of the characteristics which I have pointed out. Then we started a series of observations to find out whether there was any difference in the actual breeding value of these three groups, and so they were placed in pens of hens. We had a bunch of 43 white Leghorn hens in pens, and men were stationed in those pens for regular hours during the day. The males were colored with different diamond dyes and the females were marked with different colored paints on their wings, with marks and numbers, and the actual number of matings that took place was recorded to see what the difference in the efficiency of these birds was, based on external characteristics in selection.

This shows that a man must be as discriminating in the selection of his males as he would expect to be in selecting his females, with regard to vigor and productive power, and just because of the fact that you can be more discriminating with your males makes it all the more important why a person

should be. Out of 100 males that a man produces he can eliminate and sell all but about two or three, or four or five; in other words, he has got 95 per cent. more selecting power to get good ones and only good ones, whereas with the hens he cannot reduce them to that extent. He has to keep about 15 to 20 hens for every one male that he has selected; therefore he can be more particular about the quality of his males than of his females. I do not know anything that is more inspiring, I do not know anything that is more worth while, or anything that will tie a man to his business better than to get right into the flock and study those chickens and reduce them by a process of elimination each day or each week as the time comes to sell, throwing out the undesirables until, in the fall of the year, he has a choice bunch of cockerels that money could not buy. And I want to say right here that if a person has not got the love for the business and the love for the stock that will lead him to go in there and help to pick out those birds to fit that ideal that he has established, he never can hope to succeed in the poultry business.

The next step in the selection for breeding is to get uniformity as nearly as possible in the stock that we rear, as regards eggs. We have been making quite a good many studies of the effect of time of hatching on the ultimate producing power of the birds, and you would be surprised to see how such an apparently unimportant matter as a few weeks in the time of the year when the chickens are hatched will affect their ultimate productive value. In other words, it is not simply a question of knowing from which hen or which male our chickens come; it is also a question of knowing when we use those eggs for hatching, — whether it is in March or in April or in May or in June, or earlier or later. And would you believe that, taking the same hens absolutely and hatching their eggs from February on through to July, you get an entirely different result in the laying of those birds for the first year, and frequently also in the next years, due not to the hens or the males, but just to the time you hatched them. A man has no right, therefore, to expect to get the best results until he has learned for himself, with his own breed and in his own section of the country, as to when he should hatch, and that will depend upon the

altitude and latitude and the kind of breed he has. Some breeds develop more rapidly and some less rapidly than others. At the college farm we made observations on three different hatches, — one early, one medium and one late. Whenever a bird began to lay, a mark was placed in the square opposite her leg-band number, and this was continued every day straight throughout the three hundred and sixty-five days that followed the beginning of the observations early in November. About two weeks after the first hatch began to lay the first individual in the second hatch commenced, and about two or three weeks after the second hatch began to lay the third hatch commenced, and by the time the first hatch had all begun to lay nearly all of the second hatch, but not all, had commenced to lay, and in the course of two or three weeks more all of the third hatch had commenced to lay. In other words, the chickens hatched two or three weeks apart in the spring began to lay two or three weeks apart later on in the fall, and so there was a succession of eggs from each of the hatches coming on in about the same proportion as the difference in the time that they were hatched. In other words, we have a new crop of pullets coming on to lay, giving us a new lot of eggs, and these birds that were hatched very late, and therefore did not begin to lay until very late in the fall, had a little tendency to make it up the following spring by laying a little at that particular time when they once got under way, but they did not make up their lost time, and they could not possibly ever make up the handicap in money value that these pullets of the first hatch and the second hatch made by laying eggs in November and December, when they were so scarce and so high.

Our recommendation naturally is that the policy ought to be to have the pullets hatched at such a time that they will lay the most eggs in the first year, and give us the largest possible number in periods of high prices, and we have worked out that for Leghorns in central New York, under our methods of feeding and rearing and handling, there is a time when we can get our largest net yield from those birds, and that is between the 15th of April and the 15th of May. In that length of time we should hatch the bulk of our Leghorns and Rhode Island Reds. With Plymouth Rocks that season ought to be probably just a

little bit earlier, because they are a little slower to develop, and the principle involved is this, apparently, that we need to hatch the pullets at such a time in the spring that they can be reared in cool weather; that we can get maximum fertility and hatching power; that they can get their start and get well feathered before the very hot weather comes on; and that they can reach the laying age, which is about six to eight months, so that the first pullets that lay shall be in their winter quarters and comfortable, and flocked and at home and contented before they lay and before cold weather hits them. If we get that combination they begin to lay in the fall and go through with scarcely an evidence of moult, and give us our largest maximum yield the first year, and are likely to go along and do the same thing for two or three years.

If, however, we have hatched them too early in the spring, then they lay too early in the summer, moult before the fall weather comes on, and they do not give us good production at that time. If we hatch too late, in June, for example, or later, they do not get their full pullet plumages in time to get well feathered and ready for laying in the winter, and they do not lay until towards spring. But what we ought to do is to be medium in this matter; get the bulk of our chickens at the time they will do the best for us, and then hatch a few perhaps a little earlier in order that they may give us eggs before the other pullets have begun and after the hens have mostly ceased; that will enable us to hold up our production, even though we know that they are not going to lay well later in the winter. There is another reason why it is important that we know something about the ages of our birds, and I think we ought to identify them, if possible, either by putting the pullets that are hatched at one time off in certain houses, or marking them so that we will know, in the fall of the year, at what particular time they were hatched.

It is well to hatch a good many at once, anyhow, not only to make it easier work to take care of them, but to be able in the fall to approximately identify them as to age, and you will see the significance of that in what follows. A pen of birds that were hatched on May 2 laid us 140 eggs the first year; those that were hatched on May 20, 142; those that

were hatched on May 31, 118. We can expect to get our highest fall yield from pullets rather than from hens, and each year, as long as the hens live, they have a tendency to begin later and later in the fall to lay, and then to cease earlier and earlier the following summer, shortening the length of their laying year. Ultimately we find that hens, as they grow older, up to seven years or more, as we have them at the present time in our flocks, have a tendency to lay less and less eggs in the months of difficult production, — of cold weather, — and whatever eggs they do lay, to lay them in the months that are most favorable, — the months of April and May, — and I predict that when these birds have reached ten, twelve or fifteen years or more of age, as some of them undoubtedly will, the only eggs they lay at that time will be in the months of the natural breeding season, — April and May. The pullets lay heavily in the months of cold weather as compared to the production of the same bird in other years, and the tendency for the third year is to shrink away in the fall of the year. And yet all, whether they are hens or pullets, have a tendency to lay about the same number of eggs in the months of May and June.

Now the last step in our program is the matter of selecting our hens with regard to productive power by means of the way in which their external characteristics change throughout the year. The only way we can really understand the philosophy of this thing is to study the inside of a hen as well as the outside, to see what the relation of the characteristics is. Now, the hen lays her eggs according to a certain law of physical development. It is the perfectly natural, normal thing for a pullet to reach the age of sexual development and production at about six to eight months of age. Sometimes they develop abnormally early and are precocious, and then pullets have been known to lay when they were four months of age. I have had hens myself which laid at four months and four days. Sometimes they do not lay until they are nine or ten months old, and we have one hen that did not lay until she was three years old. She only laid three eggs that year, yet she strutted around and made out that she was quite as good as any of the rest of them; she was one of the modern

aristocrats. Tests in the development of the oviduct and ovaries of chickens show that at three months old the oviduct is not more than 4 or 5 inches long, but the development is so rapid that at six months of age, when the pullet is not quite ready to lay but approaching it, there is an oviduct that is a foot and a half long and an ovary that shows yolks of the eggs that are the size of pennies, nearly the size ready to lay. At seven months the hen has taken on the appearance of full maturity in depth of body, size of tail and wings.

When a pullet is eighteen months old, just prior to the close of the laying period, she will begin to go back; her comb becomes smaller and paler; the wattles have shrunk up, her abdomen is contracted; she has not as full a crop and she does not have the activity. She is not as friendly. The pullet that is laying heavily is friendly; the pullet that is dormant is likely to be wild; and you will notice that as you study your birds about you in the pen as well as the change in their shape.

At the close of the first laying season the oviduct is not over 8 or 10 inches long, possibly a foot, whereas only a month or so before, when she was in full laying, that oviduct, without the egg being in it at all, would be 2 or $2\frac{1}{2}$ feet long and greatly congested. In other words, the reproductive system of the hen changes inside of the hen each month of the year as she is productive or dormant, just the same as the udder of a cow is congested and full and large and active when functioning, or shrunken and inactive when she is not productive. Now this change of the reproductive system inside of a hen changes her shape. When this is large and full her abdomen is deep, and when she is laying she is eating a good deal of food and her crop is nearly always full, so that when she is active and laying she is in her best physical condition, and usually carries a good deal of surplus fat in her body; whereas the pullet or hen that is dormant usually has little fat, and the reproductive system is shrunken to its smallest size. We find, also, that whenever the reproductive system is active the external characteristics, the secondary sexual characteristics, the comb and the wattles and the ear lobes all change in accordance with the change that takes place inside; so much so that we can tell

by the texture of that comb, by the way it feels, whether a hen is laying or not, with great accuracy, just because of the sympathetic development of these two functions, — the reproductive system in correlation with these external characteristics.

The hen that is in full moult is still more dormant than the other, ragged in plumage, dry in comb and with pale shanks, and she is in a physical condition of dilapidation, and so for at least three months of her life. That is not always the case with all hens; some hens have so much vitality that they go right on laying during their moult; others cease laying when they begin their moult. When the hen has moulted and begun to lay again her body is taking its new shape of activity and development of the deep abdomen; she has a different carriage, larger comb, brighter color and is now functioning again.

Now that discussion will perhaps serve the purpose of paving the way to a careful, systematic classification of these characteristics of the birds. There are four characteristics that we look for in the birds to judge of their productive power. The first is the texture of the comb; the color is worth something, but it is not as valuable as the texture. The size is indicative of productive power, but it is not as important as texture. Mr. Kent, one of our instructors, discovered this fact a few years ago in making his studies of the birds; that the feeling of the comb, as to whether it is dry and hard or whether it is warm and pliable and velvety and soft, indicates whether a hen is laying or not at the time the observation is made, and so we take five degrees of variation. No. 1 is oily and soft; that indicates that a hen is in a laying condition. No. 2 is very pliable; she may be just getting ready to lay or may have ceased laying for a little while. No. 3 is slightly pliable; this stage indicates that it is about halfway between the very soft, pliable comb of a laying hen and the dry, hard comb of a dormant hen. Then we have No. 4, quite hard, and No. 5, dry, hard and stiff, in the case of the dormant, moulting hen.

The second characteristic is that of the color of the shanks, and in the case of any of the breeds that normally have yellow shanks, — the Plymouth Rocks, Wyandottes and Leghorns, — when the hen is in full health and functioning, then we know

that that color changes quite remarkably as to whether she has laid many or few eggs. By noting the degree of change in color of those shanks we can estimate quite accurately the productive power. There are five degrees in this change of color, — pink or white, cream color, lemon, light orange and orange, — so that when a hen of any of these breeds has been dormant for any length of time the color or pigment comes back until they are full color; whereas, if she has been laying a long while and has laid many eggs she has laid that color out.

The third characteristic is the color of the ear lobe. The Connecticut Experiment Station a few years ago discovered the fact that by noting the appearance and disappearance of color pigment in the white ear lobe of varieties of fowls that have that colored ear lobe, they could estimate whether or not a hen was laying, and, in a degree, how many eggs she had laid in a year, if observations were made at the right time. We have noted that characteristic among our four, and we classify each bird as to whether she has enameled white ear lobes, and if she does she is put down as No. 1; light cream color, No. 2; light lemon, No. 3; lemon, No. 4; light orange, No. 5; and this is so reliable in the case of pullets that if you go into a flock of Leghorn pullets and notice the color of the ear lobe alone, you can tell with surprising accuracy whether this pullet has laid a few eggs, or is just going to begin to lay, or has laid many eggs, or has not laid any eggs at all.

The last characteristic is the moulting characteristic, as to how a hen moults, particularly when she moults. We have defined five degrees of moulting. Go into any flock of hens and pick them out and undertake to score them on their moulting characteristics and you will find one hen that has not moulted at all, and another that is all through moulting, and then there will be gradations between those two which we have classified as follows: No. 1 is the bird that has not moulted at all; that indicates that she is still laying. No. 2, new body feathers 1 inch long indicate that she is starting to moult. No. 3, new body feathers 3 inches long indicate that she has started to moult still more heavily. No. 4, moulting nearly complete, and for a complete moult, No. 5.

Now, if a person will pick up a bird and score the bird according to the comb texture, the shank color, the ear lobe color and the moulting condition, without ever trap nesting his birds at all, and do this at the right time of the year, — in the months of September or October or November, when the bird is susceptible to all these climatic changes that cause her to cease to lay, and when only the good hens will lay, — he will be able to pick out and eliminate from his flock the low-producing birds with surprising accuracy. He can then keep the high-producing birds and classify them in those three groups, as I will show you from the figures that are to follow. I wanted, however, to get this point clear in your mind, so that you can go home and put this thing into practice, if you care to. Now remember that in scoring these birds the lower the score the bird gets the better she is; the higher the score she gets the poorer she is. Whenever you score a bird with those four characteristics, the highest possible score you could get would be 5 in each one of these, which would be 20; the lowest possible score would be 4; she would be 1 in comb texture, 1 in shank color, — that is to say, she would have 1 in comb texture, a very bright red and a pliable, soft comb; she would have 1 in pink or white shanks, indicating that she had laid for a long while and was still laying; if she had ceased to lay the color would have begun to have come back in her shanks again. An enameled-white ear lobe will count one, and if she has all her old feathers that also will count one. That score will show she is a high-producing bird. If, on the other hand, she had a very hard, dry comb, 5; orange-colored shanks, 5; if she had yellow ear lobes, 5; if she had completed her moult and had all new plumage, 5; you could put that hen down absolutely as a very, very low-producing hen.

To prove to you that this method of scoring birds works out in practice, I will give you the figures on three lots of Leghorn yearlings at the college farm which we scored in this way. We had trap-nest experiments on several hundred birds, and we picked out the twelve highest, the twelve medium and the twelve lowest producing birds, according to our office records. Now the egg records of these birds were 210, 207, 199, 198, 188, 188, 200, 208, 188, 193, 188 and 179; and on the points I

have given you, — namely, comb texture, shank color, ear lobe color and moult, using the figure 1 for the best score on each point and the figure 5 for the poorest, — their scores ran along around 4 or 5, with only one bird scoring as high as 7. You see those were all excellent scores, and the egg records show they were excellent birds.

The egg records of the twelve medium birds were 136, 134, 133, 128, 127, 125, 122, 122, 120, 113, 111 and 110, and their score on those four characteristics was 6, 11, 6, 13, 9, 10, 13, 8, 7, 8, 6 and 12.

The egg records of the twelve low birds were 66, 59, 54, 52, 52, 50, 50, 41, 34, 2 and 0. Their scores were 14, 18, 14, 17, 14, 15, 10, 15, 16, 13 and 12.

You see that high egg records and low scores, medium egg records and medium scores, low egg records and high scores go together pretty consistently.

Now suppose a person agrees to go into his flocks at certain times of the year and select these birds with regard to the time they begin to lay and the time they cease to lay, as indicative of their productive power, using those characteristics that I have already pointed out to help him pick out the birds to see whether they are laying or not. Now I want you to get this thing clear, — that you do not have to observe these birds the year round; but if you will only observe the pullets during the fall months to see when they lay the first egg, and mark them, you will never need to observe that pullet again. You do not have to put the record down whether that pullet laid any time during the season after you have once put a band on her leg to know that she has laid in the fall. That is all you want to know. That is not a difficult thing to do. A person can do it by those characteristics that I have stated, with a great deal of accuracy, or, by putting trap nests and trapping them for that short length of time, can find out the age that the pullets are when they lay their first egg; and then the following fall, when these birds cease to lay, put down on your bird, with another leg band, the fact that they were laying or were not laying at a certain time in those same months, in the fall of the year. Now those months are September, October, November and December; and we have now come to the real-

ization of what I believe is the most important clue to the hen's productive power, namely, the length of her laying period, determined by the knowledge of the date she laid her first egg and the date she laid her last egg in her first laying year. By that knowledge you can predict not only what a hen has laid during the year, with great accuracy, but you can predict what she is likely to lay in the next two or three years, under ordinary care. In other words, let me express it in this manner: you have heard the statement made over and over, "Tell me the company a man keeps and I will tell you who he is." "Tell me what a nation eats, and I will tell you who they are." Now we are going to paraphrase that and say, "Tell us the date that a pullet laid her first egg as a pullet and the date she laid her last egg in her pullet year, and we will tell you how many eggs she has laid that year, and how many eggs she is likely to lay if we keep her for several years."

It would not be safe for us to depend entirely on early laying as a guide in selecting our birds, because if we do so we include a good many birds that may have laid prematurely and will not be able to stand up under the heavy production for a period of years, and therefore we need to know when they cease to lay as well as when they commence to lay.

We have kept figures on some of our Cornell birds as to when they ceased laying, with the following results: of a group of 168 birds, 4 ceased to lay before July 1, and they laid 84 eggs; 17 ceased to lay by August 1, and they laid 96 eggs; 52 ceased before September 1, and they laid 117 eggs; 39 ceased before October 1, and laid 142 eggs; 39 ceased before November 1, and laid 166 eggs; 14 ceased before December 1, and laid 182 eggs; 3 ceased after December 1, and laid 189 eggs. Notice how many more eggs are laid by those groups that continue to lay late as compared to those that ceased early.

If a person had marked his birds so that he knew by putting a band on the left shank that these birds had all begun to lay as pullets, and had laid their first egg before they were eight months of age, he would have been able to keep the high-producing birds and discard the low producers. If he also knew, by marking his birds, those birds that laid some time after the first of September, he would have a choice group of

birds, all indicated by the fact that they had a leg band on the left shank because they began by the time they were eight months old, the leg band on the right shank showing that they laid after September 1.

Birds can be classified into four groups, first, those birds that lay by the time they are eight months old and also continue to lay until after September 1, and so have leg bands on both shanks. The second group will be those birds that begin before they are eight months old, and they get a leg band on their left shank, but they cease to lay before September 1 and get no leg band on their right shank. Then we have a third group that are slow to begin to lay, and therefore do not get a leg band on the left shank, but do lay after September 1 and get one on the right shank. Then we have a fourth group of birds that do not begin to lay until after eight months and get no leg band on the left shank, and ceased to lay before September 1 and therefore have no band on the right shank.

By that method of selection we picked 81 birds out of 166 that had leg bands on both shanks, or 48 per cent. of the flock; 44 birds that had leg bands on the left shank only, or 26 per cent.; 13 that had leg bands on the right shank only, or 7.8 per cent.; 28 birds that had no leg bands on, or 16.8 per cent. The first group's production was 166 eggs; second group, 122, — a difference of 44 eggs per hen for the group; the third group, 114 eggs; the fourth group, 90 eggs. In the second year the first group laid 140, the second group, 107, — a difference of 33 eggs; the third group, 129; the fourth group, 107. The record for the third year was 123 for the first group, 95 for the second, 114 for the third, 95 for the fourth group. The average production of three years was 143 for the first group, 108 for the second group, 119 for the third and 97 for the fourth.

And what did this mean in money value? It meant that the eggs sold at commercial prices for the first group averaged to sell for $3.57 per hen per year for three years; the second group, $2.40 per hen; the third group, $2.87 per hen; and the fourth group, $2.18 per hen. How is that for a contrast between the $2.18 and the $3.57 actual money value per bird for those years?

The first laying year for the first group comprised a 303 days' span between the first and last egg; the second group, 245 days'; the third group, 211; and the fourth group, 178. Notice the difference in the length of the laying period. So what would we have accomplished if we had, by this simple method of leg banding, been able to discard 28 birds at the end of the first year as birds that had an average production of 90 eggs the first year, 107 the second, and 95 the third, — an average of 97 eggs for the three years.

These birds were all culls, every one of them. Every one of them lost money for us if we kept them, and if we had wanted to we could have thrown all those birds out at the end of the first fall, or we could have kept them until early spring, when they ceased laying, and let them go at that time. We could have thrown away or could have sold as mere layers both of these groups, and we would not have lost any of our very high-producing birds, and we would have kept all, — practically all, — of our high-producing birds.

Now here comes the practical application of this thing to a color system of leg banding. I want to explain it to you in order that you may get the point clearly, and that is that we have first of all a record of the age of a bird, and then we have in the henhouse a statement when the birds in that house are six months old, when they are seven months, eight months, nine months old, and so on. It is a very easy matter to figure out; you can do it in five minutes on the calendar. Knowing the date they were hatched, have hung right over each of those dates, nailed on, a certain leg band. Let each leg band be of different color; ordinary celluloid bands are used. Then mark those pullets as you see they are laying, either by trap nests or by means of external characteristics that you put on the shank of the bird. For the one that begins to lay before she is six months of age a blue leg band on the left shank; blue bands indicate best quality birds. Any bird that lays between six and seven months, put a red band on the same shank. Any bird that lays between seven and eight months, put a green leg band on the left shank, and on those that lay between eight and nine months put a yellow leg band on the left shank. After they are nine months old a person

does not need to observe them any more; that will be somewhere around the 1st of January or the 1st of February, depending upon how early they were hatched. Any time a person goes into that pen and sees these birds running around he can see instantly what class they fall into by the color of the leg band, but he does not want to stop with that test, as you have seen from the statement and records given you, and I will show you why in a few minutes. Now, suppose he does that and he finds that 4 of them get blue, 71 get red, 50 get green, 22 get yellow and 19 get no bands at all, or perhaps black might be a good color for them, because that stands for mourning, meaning they have got to die, — practically no good. Suppose now we wait until the fall of the year, and if the pullets cease to lay by September 1 the chances are that they are not very good. Birds that began prematurely early to lay, and who ceased to lay a little before the 1st of September, get a yellow leg band on the right shank — a yellow leg band — because they ceased to lay before September 1. In the fall of the year we reverse the process, and the quality always goes with the length of the laying period, so that we begin by using the yellow band for those that ceased before September 1, the green band for those that ceased before October, the red before November and the blue before December. Then we have the birds with the leg bands on the right shank and the left, or with the left only and not the right, and it may be of one color or the other. So we can tell as the birds run around, after spring and fall testing, in which group they belong; and here you can see what the difference in the value of these birds is. Of the 71 birds 22 of them ceased before September 1, 18 between September and October, 22 between October and November and 9 after the 1st of November, making the 71. The birds with the blue leg band average 230, 195, 161, 171 eggs, even though they have been rather late layers, sometimes showing that the lateness which hens continue to lay is a more valuable indication of their productive power, even, than the earliness that they lay as pullets; and not only is this shown in the number of eggs that they lay, but also in the dollars' worth of eggs they lay, figuring up the egg values at the prices which are

true here, no doubt, as they are in New York State, the wholesale price being 45 cents for January, 34 cents for February, 23 cents for March, 23 cents for April, 23 cents for May, 25 cents for June, 29 cents for July, 34 cents for August, etc. The values of the eggs of those early layers were $4.08; those that were hatched between six and seven months, $4.12; those that laid at seven to eight months, $4.29; those that laid between eight and nine months, $2.49; and the 19 birds that did not lay until after nine months, $1.93. Now coming clear over to the three-year record you will find that the birds that began early laid 145 eggs; those that began next, 125; then 123, 112 and 95, and the values of these eggs were $3.64, $3.34, $2.84, $2.15.

Now, suppose we make a rule that Leghorns hatched in the middle of April or early May, and which do not lay by the time they are eight months old, shall get a leg band on the left shank, and those that continue to lay after September 1 get a leg band on the right shank. After studying all these birds in all these different combinations we find that this is the one best rule to go by with Leghorns, and if you do that you will not lose very many good birds. Now, by doing that we found that out of 166 birds 81 of them fell into the class of having two leg bands, one on each shank; they began to lay before they were eight months old, and they continued to lay after September 1. Now, get their production, — 166 eggs. Eighty-one birds out of 166 average 166 eggs per year. Forty-four birds fall into the class of laying before eight months, but ceasing before September 1; they get a leg band only on the left shank. They laid 122 eggs as against 166. Thirteen birds fall into the class of beginning to lay after eight months, but continuing to lay after September 1. They get a leg band on the right shank only. See what they laid, — 114 eggs. Then there are 28 birds that get no leg bands; they began after eight months and they ceased before September 1; they had a very short laying period, so they get no leg bands. They averaged 90 eggs.

A Member. I would like to ask you, Professor, in making this test if there was no mortality among those 166 birds?

Professor Rice. The records would naturally be comparable

on the three-year basis. We could not include the record of birds that die. Some birds always die the first year or the second year, and we studied their records very carefully, and we find that as a rule they are likely to be perpetual producers, but occasionally a very low producer dies because of physical exhaustion.

A MEMBER. In making that test do you substitute another bird?

Professor RICE. No, we have never substituted another bird. We carried the same birds through always, and have not taken into consideration any bird that died in the meantime. It would not affect the principle in the least.

A MEMBER. Could these scores be made by physical tests?

Professor RICE. They could all be made by physical tests; as a matter of fact, however, it will pay to use trap nests, especially for persons who want to sell their eggs. For a farmer who is simply anxious to get results he can use physical tests, but to a poultryman who wants to sell eggs on absolute guarantee, and get high prices, it will pay him to put in trap nests and know absolutely the day that a hen began or ceased to lay.

I can only speak in passing of the importance in the quality of eggs in selecting our breeders, and a person can well afford to take the time to go over every egg that he uses for setting. Take a case of 30 dozen eggs and the chances are, if he uses the proper discrimination as to color, shape and size, he would find it a pretty difficult matter to get 50 eggs out of that case absolutely all right in every way. That is true of Leghorns, and I think true of every breed, and the importance of it is that the color pigment and color, shape and size are inherited characteristics, and we need to be exceedingly careful that we do not use an egg that we do not want perpetuated. One big loss is due to the necessity of having to throw out so many eggs that are not up to standard as to color or shape or size. If we can simply follow that practice, however, of using only the choicest eggs for breeding purposes, we will find our birds growing better and better, and we will see that every year our eggs will grade higher and higher. We have a number of people in our State who are doing this thing and have been doing it for many years, and the results are phenomenal in the

improvement of the quality of the eggs. This is not a new thing to us at all. One year our extension men selected 29,000 hens for breeders. We have case after case in our State of men who will vouch for the fact that our men have gone into their flocks and picked out 200 or 300 hens, and they never got a laying hen out of the bunch, and these were sent off to market or put in other pens and kept there for a while. We have a case near by where Mr. Krum went up and picked some 200 or 300 birds out of about 700 or 800, and the man kept the balance, about 500 in all, the next year, and also carried over about 700 pullets, and that man tells us that he got a higher production the next year from those choice 500 hens that Mr. Krum picked out than he had gotten from the total population during the first year, and more than he got from his pullets. That means that by picking the hens out according to these tests, as I have showed you we could easily do, you can get rid of the non-producers and keep only producers.

As regards this matter of late moulting, I had the experience of speaking at a poultry association at Auburn two or three years ago, and after the lecture was over they said to me, "Come on out now, right into the farmyard and pick out the birds." Well, the farmyard was right there and that is just what we wanted to do, so we all went out together, and I picked out a dozen or 18 hens — this was in the latter part of September — every one of whom I knew was a bird who was laying about 175 or 200 eggs a year, and one of the men spoke up and said, "Why is it you are always picking out those dirty hens?" Well, as a matter of fact, I had not noticed that I was picking out the dirty hens. I was picking out hens that had not moulted; hens that had pale shanks; hens that had full crops; hens that had soft, velvety combs. I had not thought about the dirt on them, and the proprietor spoke up and said, "I can explain that to you. I put disinfectant in the nests — sprayed my nests with disinfectant only a week or so ago, and the only hens that are colored up as you see them here are the hens that are laying." So those high-producing hens, laying late into the fall, had this color or spray on their plumage, and they were the ones that had marked themselves. And you will find it will work out every time.

One of our young men down in New Jersey the other day at a poultry exhibition picked out the two highest Plymouth Rocks in an egg-laying contest, just by looking at them. Now, we are not guessing at this thing at all. Any man with his eyes open and who knows what he is looking at will be able to do that same thing, and do it with the most surprising accuracy.

Afternoon Session.

At the afternoon session Mr. C. E. Hodgkins of Northampton presided and introduced Dr. Charles E. Thorne, Director of the Ohio Agricultural Experiment Station, who spoke on "The Maintenance of Soil Fertility."

THE MAINTENANCE OF SOIL FERTILITY.

C. E. THORNE, M.S.A., DIRECTOR, OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER, OHIO.

The Pioneer Farmer.

Two centuries after the Pilgrim's axe had attacked the primeval forests of eastern Massachusetts, the Pioneer's axe began its similar work in eastern and southern Ohio. In both States alike the first task of the farmer was to clear away the encumbering forest from a little patch of land on which he might grow corn and wheat to feed his family and his animals. With the same crude implements of husbandry which had been in use since man first began to till the soil, both the Pilgrim and the Pioneer laboriously tilled their little fields; both scattered their seed grain by hand, as did the sower of the parable; both harvested it with a sickle like that used in Moab's fields; and both threshed the crop with the flail or by trampling it out with animals, as did that farmer thirty centuries before.

When larger fields were needed more trees were cut down and split into fence rails or burnt in log-heaps on the land, and when the fields first cleared began to show diminishing yields under the superficial husbandry of the day they were turned out to recuperate in weeds and briers, and new clearings were made. Such "worn-out" fields I have seen in Ohio, abandoned after less than half a century's cultivation.

With the gradual increase of urban population, and with the growth of foreign commerce, wheat became a more and more important crop, and in Ohio it became the principal cash crop. The gradually developing avenues of transportation, first by lake and river, later by canal, and finally by numerous lines of transcontinental railway, together with a soil and climate exceptionally adapted to the production of this crop, all combined to favor its production.

At the same time, corn held the leading place in both Massa-

chusetts and Ohio because of its unparalleled value as a food for animals, an acre of corn yielding more potential food than an equivalent acre of any other crop grown in the temperate zones.

But the marvelous growth of the cities in and near Massachusetts during the last half century has necessitated a complete readjustment of the agricultural industry of that State, and the same cause is producing a similar effect in Ohio. No farm product lends itself more readily to transportation than wheat, and none is adapted to a wider range of soil and climate. The center of production of this incomparable bread grain has therefore moved to Kansas, the Dakotas and the Canadian Northwest, while the production of milk and vegetables — products to which long-distance transportation is comparatively unfavorable — is crowding out the wheatfields of the eastern States. Corn may withstand this pressure longer than wheat because of its value for animal food, and wherever milk production is a prominent industry corn will continue to be grown; but recent statistics of crop production show that 25 counties in Ohio are each annually producing more bushels of corn than the entire State of Massachusetts, and each of the 88 Ohio counties is producing more wheat than all of Massachusetts.

The Phosphorus Supply.

The chemist tells us that as the cereal crops mature approximately three-fourths of the phosphorus in the plant is transferred to the grain, while a similar proportion of the potassium remains in the straw and leaves. When grain or hay is fed to live stock the animal abstracts from its food the phosphorus required to build its skeleton, of which phosphorus is one of the leading constituents. We buy bone meal to fertilize our fields for the sake of the phosphorus it carries. If we are feeding for milk production the need for phosphorus is no less urgent, for milk is the natural food of the young animal, and therefore must be abundantly stored with this indispensable element. It follows, therefore, that, whether our system of agriculture have for its chief object the production of grain or of milk, the soil supply of phosphorus will eventually be depleted, relatively to that of potassium, unless some measures be taken to restore the equilibrium.

Twenty-three years ago the Ohio Experiment Station began an experiment in the use of fertilizing materials on crops grown in a five-year rotation of corn, oats, wheat, clover and timothy, on land that had been used for the general production of such crops since its reclamation from the forest seventy years earlier. The next year a duplicate of this experiment was begun on a different soil that had been pastured chiefly by dairy cattle for twenty-five years previously. In 1904 two experiments in the culture of corn, wheat and clover in three-year rotations were begun, the one on a grain farm in southwestern Ohio, the other on a live-stock farm in the hill country of southeastern Ohio, these farms being from 40 to 150 miles apart. The outcome of these tests has been that 100 pounds of 14 per cent acid phosphate, when used alone, has produced an average increase to the value per acre of between $4.09 and $4.85 per acre in each of the four tests, whereas potassium, when used alone or with nitrogen only, has never returned its cost. When potassium has been used with phosphorus, however, there has been a larger gain on the grain farms, both total and net, than that from phosphorus alone, although the potassium remained unprofitable on the dairy farm.

The station has also conducted an experiment in which potatoes, wheat and clover have been grown for twenty-three years in a three-year rotation on land, half of which was cleared from the forest for the purpose of this test, and one in which tobacco, wheat and clover have been grown in rotation for eighteen years, these tests being located in different quarters of the State. In both tests wheat has shown a decided preference for phosphorus over potassium. During the earlier years the potatoes showed a similar preference, but of late phosphorus seems to have largely lost its effect on this crop, while the gain from potassium is steadily increasing. The tobacco crop has not been grown over so long a period as the potatoes, but its preference seems to be for potassium rather than for phosphorus.

The outcome of these experiments is in harmony with those of the Massachusetts Experiment Station, in which truck or similar crops have been largely grown, — crops grown chiefly for their roots or stems and leafy parts rather than for their seeds, and which have shown a larger response to potassium

than to phosphorus in the fertilizer, although even here the best outcome has not been reached unless both phosphorus and potassium were applied.

The lesson from these tests seems to be, therefore, that in respect to these two elements of fertility — phosphorus and potassium — we should study the character and composition of the crop, and especially should remember that neither phosphorus nor potassium is ever wholly absent from any plant, and therefore that the supply of both these elements must be looked after.

It is true that these elements are found in all soils, and apparently in liberal quantity, as compared with the needs of the crop. In the Ohio soils under experiment we find in the upper 7 inches of an acre from 700 to 1,200 pounds of phosphorus, yet it is impossible to grow a full crop of any kind until we add some material containing phosphorus in an easily soluble form. More surprising yet is to find 16 to 18 *tons* of potassium in the same 7-inch acre, and yet so small an application as $8\frac{1}{3}$ pounds of potassium per acre, carried in 20 pounds of muriate of potash, has added 5 bushels of corn to the yield, as a twelve-year average, when added to a dressing of phosphorus.

But what would have happened if the 16 to 18 tons of potassium stored in our soil had been as easily soluble as common salt or muriate of potash? Ages before man came to inhabit the earth the potassium would all have been in the sea. Thus we understand why it is that the great store of potential plant food shown by the chemist to be in the soil may have no practical value for crop production, and why we cannot depend upon chemical analysis as a guide to the use of fertilizers until the chemist shall have discovered some reagent key that will unlock these stores in the same manner as do the vital agencies which are working in the soil. Bryant sang of —

> . . . the sluggish clod
> Which the rude swain turns with his share
> And treads upon. . . .

but we now know that this "sluggish clod" is inhabited by living organisms, infinitely small and infinite in number, upon whose work depends the existence of all living things.

The Nitrogen Supply.

But while the composition of the crop may offer a suggestion as to the balance between the mineral elements of plant food required, the case is different when we come to nitrogen. For example, when we analyze equivalent crops of corn and wheat, as grown under equally favorable conditions of soil and climate, we find that the corn has secured twice as much nitrogen from an acre of land as the wheat; but if we grow the two crops on land of the same character a nitrogenous fertilizer may produce twice as great a proportionate increase in the wheat as in the corn. And while neither of these crops can be grown to perfection on a nitrogen-hungry soil without the addition of some source of nitrogen, a perfect clover crop may be grown on such a soil if only the mineral elements — phosphorus, potassium and especially lime — are provided in available form and in sufficient abundance.

The superior ability of corn over wheat to obtain its nitrogen supply is explained by the fact that the corn crop is grown during the hot months, when the process of nitrification, by which the inert organic nitrogen in the soil is converted into available form through the action of the nitrifying micro-organisms, is most active, while the wheat is grown chiefly during the cooler months; but clover, as is well known, owes its advantage to the action of the bacteria which inhabit the nodules on its roots.

In Broadbalk Field, at the Rothamsted Experimental Station, wheat has been grown continuously since 1843. Starting with an average yield of 17 bushels per acre for the first ten years the yield has fallen to 10 bushels for the ten years 1903–12, averaging 12.6 bushels for the sixty-one years 1852–1912. When a mineral fertilizer, made of 342 pounds acid phosphate, 200 pounds sulphate of potash and 100 pounds each of the sulphates of soda and magnesia, has been used the yield has been 14.5 bushels, a gain for this large dressing of minerals of less than 2 bushels of wheat. When to this dressing of minerals 43 pounds of nitrogen has been added in ammonium salts the average yield has been increased to 23.2 bushels. Doubling the ammonium salts has increased the yield to 32.1 bushels, and

trebling the ammonium salts, to 36.6 bushels, while 16 tons of barnyard manure applied every year has produced 35.2 bushels.

This experiment has demonstrated the possibility of maintaining the largest yield of wheat, considering both amount and duration, of which the world has any record, by the use of chemicals alone, without any addition of organic matter or humus-forming material except the roots and stubble of the wheat itself. But the increased yield of 24 bushels has cost $34, — $8 for the minerals, assuming the sulphates of soda and magnesia to have been unnecessary, and $26 for the nitrogen. Evidently some cheaper source of nitrogen must be found than chemical fertilizers if wheat is to be grown altogether on chemicals. Nor is there much more encouragement for dependence upon manure alone, as it has required 16 tons of manure to produce 23 bushels of wheat.

Crop Rotation.

At the Ohio Experiment Station corn, oats and wheat have each been grown continuously for twenty-three years. Where no fertilizer or manure has been used the yield of corn has fallen from 26 bushels per acre for the first five years to 7½ bushels for the last five years; that of oats from 28 to 20 bushels, and that of wheat from 10 to 7 bushels.

The only treatment which has maintained the yield of the continuously grown corn without reduction has been the annual application of a fertilizer carrying 50 pounds of nitrogen per acre in nitrate of soda, together with 160 pounds of acid phosphate and 100 pounds of muriate of potash, the whole costing over $13 per acre annually. This treatment has maintained an average yield of 46 bushels per acre for twenty-three years, at a cost of about 40 cents for each bushel of increase over the unfertilized yield; but with less than one-half this quantity of the mineral fertilizers, and without any fertilizer nitrogen, corn has been grown on the same land and for the same period in rotation with other crops, including clover, and the yield has been 43½ bushels, costing only 10 cents a bushel for all the fertilizers required to produce a bushel of grain.

Comparing the two systems for the twenty-three years we find that in continuous culture we have produced 1,057 bushels

of corn at a cost of $300 for fertilizers, and in rotation we have produced 959 bushels at a fertilizer cost of $40, so that the extra 100 bushels of corn produced in the continuous cropping has cost $260, or $2.60 per bushel.

The chief difference between rotative and continuous cropping is that in continuous cropping we must furnish all or nearly all the nitrogen required by the crop, whereas in rotative cropping we may secure a large part of this nitrogen through the clover crop without cost.

I have already said that in Broadbalk Field a sixty-one-year average yield of wheat of 36.6 bushels per acre has been maintained by chemical fertilizers alone, but at a cost for fertilizers, including nitrogen, equal to the value of the crop, saying nothing about rental of land, seed and labor.

At the Ohio Experiment Station the same average yield of wheat has been maintained for twenty-three years in a rotation of potatoes, wheat and clover on each of three different tracts of land, and of 37.8 bushels on each of three other tracts, in which the increase of potatoes and clover has more than paid all cost of fertilizing, leaving the increase in wheat as clear gain.

In this experiment the potatoes are grown on clover sod, which seems to furnish all the nitrogen required by the potatoes, but the wheat has been able to use a little more nitrogen than that left over by the crops preceding it. In short, our experiments indicate that clover cannot be expected to furnish much more than enough nitrogen for the crop immediately following it, if the hay is removed and only the roots and stubble are left, and that if more than this is required the entire crop must be plowed under or else nitrogen must be provided from other sources. Under some conditions it may be justifiable to plow under the clover crop, but ordinarily much more may be made of it by feeding it to live stock and returning the manure to the land.

Barnyard Manure.

The latter method is the one followed in one of the Ohio station's experiments, which has been in progress for eighteen years, the manure being applied to corn in a three-year rotation of corn, wheat and clover. The outcome has been that

when 8 tons of manure has been taken directly from the stable to the field and spread on an acre of land in January, to be plowed under in preparing the land for corn the following April, it has increased the three crops — corn, wheat and clover — by a value equivalent to an average of $3.60 for each ton of manure. When 40 pounds of gypsum has been mixed with the ton of manure before spreading, the increase has been worth $3.76, after taking out the cost of the treatment. When kainit has been used instead of gypsum the net value of the increase has been $4.04; when raw phosphate rock has been used the net value has been $4.80; and when acid phosphate has been used the net value has been $5.40, the reinforcing materials being used at the rate of 40 pounds per ton of manure in every case, and the cost of treatment being deducted. Corn is valued in these estimates at 50 cents a bushel, wheat at $1 and hay at $10 a ton, no account being taken of stover or straw. By this treatment the yield of corn has been raised to an eighteen-year average of 66 bushels per acre, and that of wheat to 27 bushels.

Parallel with these tests, on another series of plots, manure has been used in the same quantity as weighed from the stall, but it has been allowed to lie in flat piles in the barnyard, after being weighed out in January and treated with the reinforcing materials, until the land was ready for the plow in April, when these lots were spread and plowed under. The outcome has been an average loss of 74 cents on each ton of the exposed manure as compared with that which went directly from the stable to the field.

The large effect of the phosphates used in the reinforcement of the manure has no doubt been due to the hunger of this soil for phosphorus and to the kind of crops grown. On a soil used for crops requiring potassium more urgently than phosphorus it is to be expected that kainit would produce a relatively larger effect.

In the Ohio station's tobacco-wheat-clover rotation, however, fresh manure reinforced with acid phosphate has produced increase to the net value of $7.45 per ton of manure, as against $6.63 for untreated manure, this larger value per ton being due to the high acre-value of tobacco as compared with the cereal

crops. In this experiment the kainit treatment has not been repeated.

These experiments have demonstrated the possibility of increasing the effectiveness of raw rock phosphate by incorporating it with manure, but even after this has been done the acid phosphate has usually been the more economical material to use. Where we have used acid phosphate and raw phosphate rock side by side, as direct applications to the land, the difference in outcome has more than covered the entire cost of the acid phosphate.

Fertilizing Truck Crops.

Thus far I have discussed the question of fertility maintenance from the standpoint of the farmer whose chief product is the cereal grains, and this farmer represents the average Ohio farmer. But even in Ohio there is a considerable and constantly increasing class of farmers whose chief interest is the production of the vegetables required by our rapidly growing cities, which already contain more than half the total population of the State, while in Massachusetts the production of the cereals sinks into insignificance when compared with that of vegetables and fruit.

It is true that the great farm product of Massachusetts is milk, no other single product equaling it in value, and the production of milk probably exhausts the phosphorus supply of the soil quite as rapidly as that of the cereal grains.

The Massachusetts dairyman is a large purchaser of oil meals and similar feeding stuffs, some of which, especially the wheat offals, carry a considerable percentage of phosphorus. It would require, however, a daily ration of 6 or 7 pounds of wheat bran or cottonseed meal to carry into a ton of manure as much phosphorus as has been added in 40 pounds of acid phosphate. Moreover, the manure used in these experiments has been produced by fattening cattle, fed a ration high in this element.

Phosphorus, however, is not the only important element in which the soil may be depleted through an uninformed system of agriculture. The Ohio Experiment Station has been conducting a series of experiments in the feeding of milch

cows under such conditions that the income and outgo of all the elements of the food is accounted for, the outcome of which indicates that under ordinary management a cow giving a larger flow of milk will lose calcium, the basic element of lime, more rapidly than she is able to absorb it from ordinary feeding stuffs. Calcium and phosphorus are closely associated in bone and in the phosphatic rocks which are employed in the manufacture of fertilizers, and this work in feeding, which is supported by our twenty-year experiments in the production of field crops, indicates that under dairy husbandry a soil may be depleted of its lime quite as rapidly and as completely as of its phosphorus.

Liming the Land.

In planning these field experiments no provision was made for the use of lime, but it very soon became apparent that this thin soil — which had been under cultivation for three-quarters of a century, the last third of the time under tenant husbandry — was very inhospitable to clover. The seed would be sown in March in the wheat, and at harvest there would be a complete stand of clover plants, but they were small and weak, and by the next season would have largely disappeared, their place being taken by sorrel.

In the spring of 1900 one-half the land was dressed with fresh burnt lime, used at the rate of a ton to the acre, the lime being spread across one end of all the plots, fertilized and unfertilized alike. This treatment was continued until each of the five tracts of land included in the experiment had had one application, after which ground raw limestone was substituted for the caustic lime and has been used since, using first 1 ton of the limestone dust per acre, but later increasing the dressing to 2 tons.

The outcome of this treatment has been an average increase in value of the crops of the rotation amounting to three times the cost of the liming. The statement has been made that corn does not need lime, but in this test the liming has produced an increase of 20 per cent in the corn yield on the unfertilized land and on that receiving acid phosphate only, and 9 to 15 per cent on that receiving a complete fertilizer or barn-

yard manure. Part of this increase is no doubt due to the secondary effect on corn of the largely increased clover crops, but a very considerable gain became manifest from the first application of the lime and before the clover had had opportunity to produce its effect. Moreover, the great corn lands are those well supplied with lime.

Oats has shown the least effect, varying from nothing on the land receiving a complete fertilizer, with nitrate of soda as the carrier of nitrogen, to 18 per cent on the unfertilized land.

Wheat has been increased by 8 to 10 per cent after the complete fertilizer and manure, and 27 per cent on the unfertilized land.

Clover has shown the greatest increase, the gain in yield of hay ranging from 27 per cent on the manured land to 44 per cent on the unfertilized land and that treated with acid phosphate. These figures do not tell the whole story respecting the clover crop, however, for a large proportion of the hay on the unlimed land has consisted of sorrel, plantain and other weeds.

Timothy, the fifth crop in the rotation, has shared in the general prosperity, giving a yield 12 to 25 per cent greater on the limed than on the unlimed land.

It seems probable that the relatively low effect of the liming on the oats crop is due to the management of the land. The lime is applied to the surface after plowing for corn, and harrowed in. The corn stubble is plowed under for oats, thus burying much of the lime below the reach of the oat roots. The oat stubble is plowed for wheat, bringing the lime to the surface again, where it is in the best situation to benefit the clover and timothy which are seeded on the wheat in the spring.

Lime performs a double function in the soil. In the first place, its two mineral constituents, calcium and magnesium, are included in the small list of those elements which are indispensable to the living organism. Every living cell, whether of plant or animal, contains these elements. For this purpose we would not need to use lime in any larger quantity than we use other fertilizing materials; in fact, our ordinary phosphates, which are combinations of phosphorus with calcium, would contain enough calcium, at least for most conditions.

But the function of lime which concerns us most is that of neutralizing the acids which appear in many soils that have been long under cultivation, and which render the soil inhospitable to clover.

An erroneous idea has sometimes been entertained respecting soil acidity. People talk of "souring" the land by turning under a green crop, but the acid developed by this treatment would be carbon dioxide, or carbonic acid, a gas any excess of which would very soon escape from the soil. The acid which causes the soil to redden blue litmus paper and causes clover to fail to grow is not an evanescent gas. The work of the micro-organisms which convert the organic matter of the soil humus into nitric acid would give a plausible explanation of soil acidity, for unless the nitric acid formed by these organisms is removed or neutralized it must eventually accumulate to such an extent as to become toxic to the organisms producing it. If there is an abundance of lime in the soil this acid will combine with the lime, forming nitrate of lime, a neutral salt.

Indirectly, therefore, lime increases and conserves the nitrogen supply by encouraging the growth of clover and other nitrogen-gathering crops, and by forwarding the processes by which the organic nitrogen of the soil is made available.

Returning to the fertilization of truck crops, while the same fundamental principles apply to all crops, yet it may sometimes be justifiable to neglect some of these principles. For example, a crop may have such a high acre-value, and land suited to its cultivation may be so limited, that as a business proposition it may be more profitable to purchase all the nitrogen required for its production than to attempt to secure the nitrogen through the growing of leguminous crops.

Take the onion, for example. A crop of 1,000 bushels would contain 100 pounds of nitrogen, and a crop of clover that would make $2\frac{1}{2}$ tons of hay would furnish this quantity of nitrogen in its tops, and half as much more in its stubble and roots; but there may be conditions under which the rental value of land that would produce such a yield of onions would be so high that it would be better business to buy the nitrogen outright than to hire the clover to steal it.

This point is forcibly illustrated in the culture of vegetables

under glass. Something may certainly be gained by rotating leguminous crops, but with land costing $2,000 an acre and upward, and crops worth as much or more than that amount annually, the growth of a crop merely as a nitrogen gatherer is not to be thought of.

The same general principles apply here, however, as to field culture, namely, that the soil supply of nitrogen, phosphorus, potassium and lime must be maintained, and that in proportion as we understand and apply the principles governing the economical maintenance of this supply, in that proportion will be our success in crop production.

Mr. TROUT. I would like to ask the professor — he stated that he lost a corn crop by plowing in the rye; would a shower have saved that corn crop?

Mr. THORNE. I think so, but we are subject to those mid-summer droughts in Ohio, and it is not safe to depend on rain; plowing in the rye earlier and turning the ground down would have obviated the danger.

A MEMBER. Has the effect of nitric acid for acidity been tried on other soils?

Mr. THORNE. Yes, we have tried it on different types of soil. The Ohio River is fringed by one or two hill counties and much of the surface has washed away, and the underlying rock is largely sand rock, although we run into the limestones. On all soils of this kind we find that apparently the nitrogen is the thing first needed, but the phosphorus is needed to complete the fertilizer.

A MEMBER. Do I understand that the corn crop is inclined to dislike lime?

Mr. THORNE. The application of lime increases the corn crop on an average about 8 bushels per acre.

A MEMBER. If you are planting corn for silage, would it have the same effect?

Mr. THORNE. Yes, it would.

A MEMBER. Do you consider burnt lime equal to ground limestone?

Mr. THORNE. Yes, in burning lime you burn out half of its weight, and all that is of value in the lime is the calcium.

Mr. Howe. I would like to ask the professor one question in regard to applying any chemicals, — is there anything we can apply which will make available the potash in the soil to tide us over this time when we cannot buy any potash? If we put on an additional amount of lime will that have any effect in making the potash in the soil available?

Mr. Thorne. We find that when we use, on our Ohio soils, phosphorus or phosphorus and nitrogen we always make some potash available; that is, we always get an increase of crop, and that increase must have phosphorus to give us the increase, so that our advice to our Ohio farmers is to use nitrogen in some form — not nitrate of soda, because that is too costly, but in manure or clover — more liberally than ever before, and acid phosphate more liberally than ever before. This assures them that they will get an increase of crop and not suffer from the loss of potash for a year or so.

A Member. On our Massachusetts soil, would you advise using ground rock or acid phosphate?

Mr. Thorne. Acid phosphate.

A Member. About how much?

Mr. Thorne. Well, we are using all the way from 80 pounds to the acre up to 200 or 300, and we can get a profitable return from every application.

A Member. At what season of the year do you apply it?

Mr. Thorne. Well, we put it on just before planting the crop. In this connection, however, I would advise you to consult your own station, because it is better acquainted with the peculiarities of the Massachusetts soil than we are in Ohio. For Ohio farmers I would say use the acid phosphate; for your State I would advise you to consult your own station. Both our station and yours would advise you, with all the urgency we could, that you save and care for all the animal manure. A ton of barnyard manure carries 10 pounds of potash; you cannot buy it in any other form as cheaply as in the form of barnyard manure. I am buying barnyard manure and paying 75 cents for it in town. It cost about $2 a ton by the time I got it into my orchard for fertilization.

A Member. How far do you have to haul it?

Mr. Thorne. A mile and a half, up hill. I have been taking all I could get.

Mr Brooks. I wonder if I could take about two minutes? I want to express the great pleasure I have had in listening to Director Thorne, and there are very few things that he has said to which I would take any exception, — practically none. He has advised you to study your own soil conditions. What I have to say is simply intended to emphazise that point. If you should apply acid phosphate to most of our soils without potash you would find the clover would not follow it; you must have potash on all the soils of this particular section of the State; of this I feel perfectly sure. We have tried it repeatedly. This is a very serious question, which all men interested in crop production are asking themselves, — what is going to be the result of another year without potash? Can you afford to risk it? Unfortunately, I do not know. We got very good crops last year without potash, but I want to call attention to this one thing: in such experiments as I have tried, where potash has been used in connection with nitrogen and phosphorus enough to make it possible for it to have its full effect, it has usually given an increase in the staple crop of 50 to 60 bushels. Now it is a question whether you cannot afford to pay even the $5 per unit if you can count on getting anywhere near that increase in staple, because the potash is very important; but the money value of the increase is so much less that I should say, without hesitation, I will risk corn without potash, although I know the potash will help it, and at ordinary prices it would be richly profitable. I have no disposition to detract from the emphasis Director Thorne attaches to phosphorus. I made a little calculation in writing a bulletin which was published about a year and a half ago, which will interest you, perhaps, in what he said about milk. He said that milk contained a large amount of phosphate of lime, and probably dairy farmers would do well to pay particular attention to it. The milk of twenty cows for one year, allowing them to give 6,000 pounds of milk each in the year, would contain 100 pounds of phosphorus. The feed which the average dairyman would buy, — wheat bran, gluten, cottonseed, etc., — in figuring conservatively, would contain something like 600 pounds of phosphoric acid, so that under the dairy practice common in this State I see no possibility that your soils are becoming impoverished in phosphorus. On the contrary, I think they have been growing richer and richer in

phosphorus year by year. It is worth while remembering that manures that have been exposed to the weather lose potash a great deal, but lose relatively little of the phosphates they contain. Still another important thing is that the fertilizers we have been using for the last forty or fifty years have always, all of them, been rich in phosphoric acid. The situation here — Director Thorne fully recognized this — is different, and it should be taken into account in considering and applying what Director Thorne has said.

A MEMBER. Could I ask the professor one more question? He mentioned in his lecture that millions of pounds of fertility was being lost by the Ohio farms and going down into the river valley; is your station making any effort to prevent that waste, and if so, in what line is it working?

Mr. THORNE. That matter I alluded to very briefly in our treatment of the manure. We are trying to show the value of manure if properly handled under our Ohio conditions, and we are doing all we can to persuade farmers, by our teaching, that manure is too valuable to allow it to waste in the barnyard. That is as far as we can go. We are trying to show the farmer how valuable the manure is and how it may be conserved.

A MEMBER. Have you told them to put in cement pits to preserve this manure in?

Mr. THORNE. Oh yes, we are doing that. We discourage the separation of the solids from the liquid. We want them both kept together on cemented floors in the stable or in properly constructed manure receptacles outside. A pit is not absolutely necessary, though it is a convenience; but we have shown that in six months' feeding the loss from a lot of cattle fed under shelter on a dirt floor, as compared to the loss of an equivalent lot of cattle fed in the same stable with a cemented floor, may be sufficient to pay half the cost of cementing the floor. We have done that in a very elaborate series of experiments.

Following Dr. Thorne's address, Vice-President Bursley introduced Mr. Nathan B. Flood of North Adams as presiding officer, and Mr. Flood in turn introduced Mr. Henry K. Hannah of New York, who spoke on "Advertising Agricultural Products."

ADVERTISING AGRICULTURAL PRODUCTS.

HENRY KING HANNAH, NEW YORK CITY.

Somebody has reminded us that the first advertising of which we have any record occurred in the Garden of Eden, when the serpent held forth to Mother Eve about the great benefits to be derived from eating a certain fruit which grew there.

Thus when we come to talk about advertising farm products we can well claim that farm products were among the very first things to be advertised. Somebody has been unkind enough to suggest that if this is the first authentic piece of advertising, then the devil was the first advertising man, and that all the evils which came from this Eden episode can be laid at the door of the susceptibility of woman to the wiles of the advertising man.

But let me remind you that new theology has come to our rescue, and, in claiming that the fall was in reality a fall upward, provides for us advertising men a convenient way of escape. It says that to eat bread in the sweat of one's brow is the only dignified way to eat it. I rather think so myself.

But there is one question which can be introduced here, and one on which I want to venture an opinion. It is now somewhat the fashion for advertising men to argue that advertising lessens the amount of sweat which the consumer must exude in order to get the necessary money to pay for his living, and that advertising lowers the price of goods. The theory is that advertising creates demand and demand increases the output, making it possible for the manufacturer to reduce cost, and this he passes on to the consumer. If business was a philanthropy and the average business man a philanthropist this might happen, but, as a matter of fact, it does not happen. Now there are certain advantages which the purchaser of trade-marked goods does get. The quality of advertised goods

is generally high and uniform, but that the consumer pays less for them than for goods of equal quality which are not advertised is not true. A little investigation will easily show that advertised goods are the highest priced goods on the market, and if life is to be reduced to terms of mere dollars and cents, then it would have been better had the first advertisement never been written, and by it men forced to buy something they did not want, for in that case they could have lived more cheaply.

But all civilization has been the forcing on mankind something different and better than it already had, regardless of cost. Indeed, cost of any kind is the real stimulus to effort, and luxury is not measured by any material standard whatever. Somebody has said, "Give me the luxuries and I can dispense with the necessities of life," meaning, I take it, that as humanity progresses, what at one time seemed luxuries become necessities through the gradual cultivation of taste through the imagination. Civilization is but the story of how the race has gradually builded unto itself luxuries and made them necessities.

Now advertising increases the cost of living for the consumers because the very argument for advertising is that it has the power to create a monopoly. I am here to talk to you about the value of advertising farm products, and my whole argument will be based on the idea that advertising has the power to so gain and hold attention and move men in given directions that it takes away, if you will, their power of choice. In other words, it creates a monopoly; but if you give them the worth of their money, then it is justified.

Although myself an advertising agent, and making my living by attempts to create monopoly by advertising, I still watch with rather jealous eye the power of advertising over my own household. I suggested not long since to the general manager of my household the idea of buying cereals in bulk. She did so. Nothing was said beforehand to indicate the change to a more sensible, because more economical, régime, but with the first mouthful my youngest son began to look puzzled and then to dig for something that annoyed him. Soon others were doing the same thing. It seemed to me a

good deal of fuss to make about a little inoffensive hull, and I so expressed myself. I was the only one who did not find fault. In fact, I detected rather a good flavor to the cereal, but I swallowed all the hulls and we are back to advertised trademarked oatmeal.

I bought an automobile this spring. Being of more than average length, the particular machine appealed to me because it had plenty of room back of the stearing post for my legs. It had been painted not to the liking of the general public, and so the price was cut $200. It looked like a good car, and experience has proved that it is a good car. It suits me all right except in one particular, nobody knows about this particular kind of car. I start out riding with some friend and he begins by asking me, "What make of a car is this?" I reply, "This is a Snyder." "A Snyder? A new make?" "No, not a new make," and for fifteen or twenty minutes I am on the defensive. I am doing what a little advertising would have done. I have to justify myself in buying and driving a car that nobody ever heard of. There is one car which uses as a slogan, "Ask the man who owns one," but nobody has to do that with a car well advertised, and I think when I come to buy another car it will be one that others have heard about. Even if it costs me a couple of hundred dollars more, it will be worth the difference in peace of mind.

One more illustration. Some few years ago I bought an old house and built it over. Wanting to live in it, I put 80 per cent of the expenditure on the inside and 20 per cent on the outside. Since then there have been occasions when I should like to have rented this house furnished, but the real estate agents of my town tell me that it is difficult to get prospective renters to stop and go inside the house. They look at the outside and pass it by. The outside is the advertising side, and I neglected it to my own loss. My conclusion here is that we live in an age of advertising, and, while it adds to the cost of living, it is not something we can dispense with if we are to be at home with the age in which we are compelled to live.

Advertising is essentially a part of our business life — largely if you will — because it appeals to the imagination, and the want of imagination is what distinguishes a savage from

a civilized man. The more civilized a man is the more active his imagination, and the more his physical taste is dominated by that part of his mind called his imagination. The advertising man comes in here. I will bet a nice red apple that some advertising man invented that name "Sunkist," but the name "Skookum," like Topsy just growed. Now, you can argue to yourself all day that there was never an apple or an orange that ever grew that was not brought to proper maturity and color by the direct actions of the sun's rays, and you can argue the same way with the American people, but, after a year or two of advertising, the same public will say, "Yes, that's true. Please give me a dozen Sunkist oranges." The dealer will say, "Well, we haven't any Sunkist oranges to-day, but here are some just as good." "Well, why haven't you the kind I want?" (explanation and more argument) and the dealer says to himself later, "Well, I must have some of these oranges wrapped in Sunkist paper just to save me an argument." There may be — there undoubtedly are — other oranges just as good as Sunkist, but I tell you the man who eats an orange in the morning marked "Sunkist" eats it with his imagination alive, — with that poetic figure of Old Sol and the orange under the mistletoe, or the orange blossoms, — and the orange is sure to taste good.

I suppose the Maiden Blush Apple was named before the days of advertising men, but the man who so named it had the making of either a poet or an advertising man. Skookum apples may be very good, but the name is a hindrance rather than a help.

Now, I think New England has rather the advantage of any other section of the country in its power of appeal to the imagination. It starts with certain advantages, — with a reputation for honesty and fair dealing for one thing, which is important.

Then the natural beauty of New England is a tremendous asset, — its infinite variety and charm, the wilds of Maine, the mountains of Vermont and New Hampshire, the hills and valleys, orchards and farms of Massachusetts and Connecticut. You get the finest summer climate of any section of the United States, and you may expect many millions to come to New

England within the next twenty years, and these people just live to get back here.

Then consider how broadcast over the United States are the people who within a generation or two emigrated from New England. These all with one accord give attention when you talk about New England, for I take it that there are two sides to this advertising proposition about which we are thinking. Sometimes in the advertising business we dangle our bait over one fish in order to catch another. There are what we call the direct and the indirect results of advertising.

Much money is spent in advertising that never results in any direct increase of business. Of course, millions of dollars are wasted every year in advertising, but that is through stupidity. There never was any advertising properly done that did not accomplish results more or less beneficial, and, if you were to decide to advertise New England farm products, the first result would be to call the attention of the farmers of other sections to the fact that New England can raise farm products. A transformation has gone on in the farm situation in the great farming States of the west. Land has become so high in price that the small farmer can no longer afford to own it. He is selling out to the big farmer, who has the capital to farm on a big scale. Where can these men go? A few of them are going to Canada to settle in the wilds of the Northwest, some of them 500 miles from the nearest railroad. A few are coming back east as far as Pennsylvania and New York State, but more of them should come to New England. As a matter of fact, New England must bring them back, and if Massachusetts, for example, will back up the kind of work your State secretary is doing, it will fetch them back, and the abandoned farm will read like a fairy tale. You must have farmers to have a healthy community. It is quite fashionable to abuse Germany just now because of her so-called militarism. To say that the German people are nothing but an army in disguise is a great mistake. No nation of Europe, unless it be France, has been so careful to keep among her people that healthy balance between those who work at manufacturing and those who till the soil, and in no country in Europe has the farming industry been so adequately developed as in Germany.

You are all familiar with the history of agriculture, but one thing cannot be too often repeated with a warning, — the economic balance must be restored by bringing farmers to New England. I think the secretary of your State Board has said that Massachusetts alone sends out of the State every year $300,000,000 to pay for products which she could raise on her land that now lies fallow. No community can import its raw materials for manufacturing and then import the food of its workers and compete with other sections. The larger the quantity of raw manufacturing products it imports the greater the necessity for raising its own food. To do that you must have farmers. To get them, the easiest way is to advertise. Massachusetts could well afford to pay $100 for every new farming family moving within its borders, and yet I believe that with proper advertising they could be gotten here for about $25, and I would do it indirectly. I would do it by a campaign of advertising New England farm products.

The first requisite necessary to any successful advertising campaign is to have your product and have it in marketable condition. To get your product in marketable condition and in quantity to advertise it profitably, the individual farmer must associate himself with others, all of whom must submit their product to certain standardizing conditions. In some New England products this has already been done. I understand that the cranberry growers of Massachusetts have a selling organization, and I take it for granted that this means that the product submitted for sale is standardized and, in a way, guaranteed as to quality. I have been told that this selling organization has eliminated many evils of which complaint was made under the method of commission house sales, and that prices have been more uniform and generally better. Now the missing element in this cranberry situation is the element of advertising, for I take it for granted that inasmuch as the cranberry originated on Cape Cod the quality of fruit gathered there is better than that harvested anywhere else. Cape Cod cranberry growers tell me this is so, and I believe them. Now, if I were the manager of this association of cranberry growers I would move heaven and earth to get an appropriation of

money for the purpose of showing people that cranberry sauce tastes about as good at other times as on Thanksgiving Day, and fits roast chicken about as well as roast turkey; and, what is equally important, no turkey or chicken ever came to the table quite so content as when it knew that the sauce was made from berries grown on Cape Cod. A Vermont or Rhode Island turkey always requires a Massachusetts cranberry, as a matter of course, but all others should be given the same pleasure. I would not advertise, expecting by such advertising to increase the product and lower the price, but rather to increase the price or, at least, to maintain the price year after year at a level yielding a fair profit.

Speaking of Cape Cod leads me to call your attention to the strawberry industry. From what I see growing down there, and the quality and size of the fruit, I would not be surprised if Cape Cod could be made the home of small fruits, and a demand created in this whole eastern country for Cape Cod strawberries, blackberries and raspberries. These growers are likewise organized for selling purposes, and the next step ought to be some advertising, pretty well organized too, and quite loyal to the rules of their organization.

Now, while I believe advertising would be a good thing for the cranberry or strawberry growers of Cape Cod, I would not relish the job of trying to extract from them the money it would require to do it. Farmers are pretty "set" in their ways, and the profits of farming do not look large enough for them to see much of it go for co-operative efforts along lines that do not yield pretty easily seen returns.

Some years ago, — not so many, — through the efforts of a young lawyer in a certain Kentucky town, the growers of Burley tobacco organized an association, and by means of it forced the tobacco trust to pay better prices for tobacco. I think the returns for one year, at least, were something over a million dollars better than the year before. The young lawyer charged the association $10,000 for his year's work. In these days a man who could increase the selling price of a firm's product $1,000,000 a year for that salary would be classed as a Simon-pure philanthropist, but not so with those Kentucky farmers.

To them this young lawyer's salary looked too big and they fired him. He probably shortened his life several years just getting them organized.

Not to name all the things that could be exploited to the advantage of New England, — there are Maine potatoes. Advertising could place them in a better position than they occupy to-day. I am told that there is something in the soil and the climate of New England that makes it the best apple section of the United States. A couple of years ago I had sent me a box of apples. I kept this box in my office in New York, and when I had a caller who looked like an apple eater I would take off the paper from one and hand it to him. After looking at the color and size, and sampling it, he would probably say, "Well, those people out in Oregon certainly know how to grow apples, and they are getting a better flavor all the time. What part of Oregon did this apple come from?" I would then spring my little joke by showing him the end of the box, or the paper wrapping, marked Fitchburg, Massachusetts. He then might say, "Why, I thought they only raised cooking apples up in New England, called Baldwins."

Now, that man in Fitchburg knows how to raise apples. If there were 500 such men in Massachusetts and each of them raised 2,000 boxes — 1,000,000 in all — they ought to bring about $2 a box wholesale, or $3 to the consumer, that is, by the proper amount of advertising.

Somebody might say, "Why, I can buy nice apples for $2.50 a box." True enough, but those are Oregon apples. These are New England apples. "Grown in New England" on a box, bag or package would stop all argument.

If you would like something tangible to think about and discuss, here is my proposition: give me $100,000 a year for five years, and be ready to supply the products in marketable condition, and I will increase the income for New England farm products in those five years at least $20,000,000, and, as a by-product, I will bring into New England in that time 10,000 families who will devote themselves to farming. If each of these families creates $1,000 a year profit, their wealth-creating capacity will be at least $10,000,000 and this will continue for many years beyond the five-year period, and so will the out-

side demand for New England products continue long after the advertising has stopped.

Another important thing such a campaign of advertising would do would be to create a new spirit among those who are now New England farmers. Very often one of the first appreciable effects of advertising is its influence on the officers and employees of the company doing the advertising, in changing their attitude toward their business and toward the public. They see their own business in a new light; they take on new ambition to push it to new achievements.

Advertising would give new dignity and importance to agriculture in New England in the eyes of those who now practice it. The rank and file of farmers would push in to join your association and get into the tide of improvement. It would appeal to the farmer's imagination and make him feel that he was an important member of a great forward movement. It would increase his efficiency and his output. Does this sound like a fairy story? Has another serpent gotten into Eden? I am speaking words of truth and soberness, really underestimating the results than otherwise.

Do I ask you to look upon me as a miracle worker? Am I a modern Joshua commanding the sun to stand still? Well, something like that. I do confess to believing that for the right man doing certain things in a certain way the sun does stand still. I saw the sun stand still once myself. Some years ago I was on my way from Boston to Newport. About 6 o'clock in the afternoon the train came out on a stretch of track running for some miles along the shore of Narragansett Bay. The setting sun stood a round red disk on the brow of the hill over toward the west. Glancing up a few minutes later from a book I was reading, and expecting to find the sun half hidden behind the hill, I saw it poised in full view. When I looked the third time out of the window and saw the sun in the same place I began to realize that I was seeing something quite unusual, and for a full half hour the sun stood still with its lower rim resting just on the brow of the hill across the bay. I crossed the car to see if I could find an explanation of this extraordinary phenomenon. Once seated where the car window did not frame for me a small section of the view, and where

the whole stretch of country could be seen, the explanation was clear. A long hill skirted the water for miles, with its highest point back at the head of the bay where I first saw the sun, and tapering to a point some miles ahead. My train was traveling about 30 miles an hour, so that the setting sun, the declivity of the hill, and the speed of the train all combined to make the sun to all appearances literally stand still.

I thought of Joshua, and when I got the chance to read the story I saw that something of the same thing must have happened. Joshua, so the story says, was pursuing his enemies down the valley of Beth Horon. It was probably in the evening. He must have seen the sun across the valley just over some tapering hill, somewhat as I saw it. He was going so fast and the lay of the land was such that the sun seemed to stand still, and, being a man of imagination and needing more time to accomplish his job, he commanded the sun to continue doing what it seemed already willing to do. The busy, resourceful man always makes the sun stand still; always lengthens every day by putting more into it.

Now, I think this a fair picture of what happens to some business men. To most men in business — even the business of farming — the land always lies just so; the sun sets on a certain day at a certain time; in other words, economic or business conditions always seem fixed and unalterable. Such and such things have always been done just such and such ways, but now and then along comes some Joshua whose rate of progress down the valley of business never allows the hill of tradition or prejudice or fixed condition to get between him and the daylight. The consuming public is shifting its position every minute, and this man, by keeping alert and moving, keeps himself from eclipse. And very often this modern Joshua is a man who has come to see the value of advertising.

There are yet some kinds of business, like farming dead to the value of this miracle-working power in modern business. Progressive in methods of agricultural procedure, the business side of your life has been anchored to one spot for years, while over to the west is the old landmark sometimes known as the commission merchant, the jobber or the retailer, who owns the trade. Up to a certain point you prosper; you are warmed and

fed by the sun of public favor; but ever, at a certain point, the sun gets behind these trade obstacles and you are kept humble and subservient. However, now and then some one individual or association more enterprising, more alive, active and pushing than the rest, bids farewell to the old way, gets aboard the train of consumer advertising and starts down the valley of progress. A miracle happens. The sun of public favor — the interest of the buying public — which used to set at 5 o'clock keeps blazing away until 6, because, between the progressive business farmer and his buying public, the old hill of fixed trade conditions suffers so sharp a decline that long before sunset it has tapered to a point and vanished away.

It is that kind of a miracle that I believe advertising would work for you New England farmers. Why not try it?

Secretary WHEELER. I would like to ask if Mr. Hannah thinks there would be any possible way of working out a per capita or per package tax on packages which are sold by an association, so that that money could be used for advertising? I understand that in some places they do something like that; that is, charge every member of an association a cent or 2 cents or 3 cents or 5 cents a package, according to the amount of the business that is done, and that money is used for advertising that particular product.

Mr. HANNAH. It certainly could be done if you can convince the members of your association that advertising is something that will help their business; that is the first thing to do. Whether you could get an association to consent to that as a preliminary, I do not know. There are a great many concerns that have a fixed rule of spending a certain proportion of their income, their gross income, for advertising. I should think that in an association of farmers you would probably have to demonstrate in some way what advertising would accomplish for the advertised product. Of course, the general feeling as to the value of advertising is beyond discussion any more, if it is done in the right way.

Secretary WHEELER. Don't you think that would be a good way to get an association started that really is producing a pretty good product?

Mr. HANNAH. Yes, I should think it would be.

Secretary WHEELER. We figured out in our Asparagus Association that if we taxed ourselves 5 cents a package, the town of Concord alone would have about $2,000 for advertising, and that of course would help us a good deal in disposing of our crop. We are getting to the place in the asparagus business where we have got to do something to increase consumption. The asparagus business is now being controlled a good deal by the South, and we have got to do something to impress upon the consumers that asparagus from Massachusetts is better than asparagus from New Jersey and Pennsylvania and the south, and we have thought of that method.

Mr. HANNAH. Why, any way to get the money. I am rather surprised to hear your Vice-President say that the cranberry growers of the country have spent $100,000 around Chicago; that looks like a lot of money to spend in one section for a product like cranberries. What is the total output of cranberries in this country?

Vice-President BURSLEY. I am sorry that I haven't the figures, but the statement was made to me by Mr. Makepeace of the Cranberry Association. I am not sure what the amount of money was, but the slogan was "Eat More Cranberries."

Mr. HANNAH. I am glad to hear that. I think that when Mr. Makepeace heads an association that will spend $100,000 around Chicago, it is quite an important matter.

Mr. BROOKS. I cannot give the details, but I know that the method Mr. Hannah suggests was adopted by the Cranberry Association. Whether the practice will be continued will depend on the income; the cranberry crop in this State fluctuates a great deal. It is sometimes as much as $2,000,000 annually, but it is more likely to be $1,500,000 in the Cape Cod cranberry district.

The CHAIRMAN. I am familiar with one concern that produces a large amount of butter which is handled on that plan. I am told that they sell in the State of Connecticut more butter than is produced by all the creameries in Connecticut.

Evening Session.

At the evening session the presiding officer was Mr. Alfred H. Wingett of Lenox, and Mr. Loring Underwood of Boston and Belmont gave a very interesting lecture on "Old New England Gardens," illustrated by stereopticon slides.

Second Day.

The second day's session was called to order at 10.30 A.M. with Mr. Henry M. Howard of West Newton in the chair. Mr. Howard introduced Mr. R. H. Garrahan of Kingston, Pennsylvania, who spoke on "Market Gardening."

MARKET GARDENING.

R. H. GARRAHAN, KINGSTON, PENNSYLVANIA.

Market gardening is the great American lottery. It is often a case of "heads, you win; tails, I lose."

To be successful in this business one should be a good loser — he should be an optimist. A pessimist asks, "Is there any milk in the pitcher?" while an optimist says, "Please pass the cream." He is looking for the cream, and he usually gets it. We have our troubles, to be sure; every one has; the manufacturer has his labor troubles, and the laborer has troubles of his own. Conditions are such that we will be compelled to make our operations more efficient. We must use labor-saving tools wherever possible, and eliminate a lot of the unnecessary risks that we are taking every year.

Farming is not an exact science, and in the growing and selling of perishable produce we must take a lot of chances. We must take our own chance with the weather, with the seed we use, and a long chance on the price we get for our produce. But do we not often take a lot of unnecessary risks? We may be preparing a piece of ground for a certain crop, and a few hours' more work would put it in ideal condition, but we are in a hurry and — well, that is good enough, let it go at that. We know that Bordeaux mixture is a fairly good preventive of certain plant diseases, but — it looks like rain, and if we put it on it might wash off, or we have something else to do, and we put it off for a more convenient season; as a result, that celery develops a fine case of blight.

On a great many market gardens there are opportunities for irrigation which are neglected, — either a creek, pond or underground water. Sometimes one good wetting at the right time makes the difference between profit and loss. Then, again, we are not always as particular as we might be regarding the source

of our seed supply. I have known gardeners to send a list of their seed requirements to different seedsmen asking for their lowest bid. They were looking for something cheap, and, as a rule, they got what they were looking for.

We have been led to believe that there is something very mysterious about seed production, — that vegetable seeds could be produced only in certain favored locations. That may be true of some varieties, but I do know that you can raise, right here in Massachusetts, as good seed of cabbage, tomato, onion, beets or celery as can be raised in any other part of the world. We have been raising — for a number of years — our own cabbage, tomato, sweet corn and celery seed. This year I raised 20 pounds of celery seed on less than one-thirtieth of an acre.

I thought it might be better to tell you something of our crops, and methods of growing them, rather than theorize about the business. I am not very long on the theory, anyway. I have been working in vegetables all my life. As a kid I crawled for miles and miles and miles, on my hands and knees, weeding onions, with the summer sunshine playing tattoo along my back. I know what it is to cut cabbage all day in the rain, or to pull sweet corn with the thermometer at 110° and no air stirring. And I know what it is to get up in the wee small hours of the morning, and take the produce to market and sometimes sell it for less than it cost to grow. And yet, after all, there is something mighty fascinating about the business. I would not trade jobs with the fellow in the bank who is locked up in a cage and put under bonds.

We are situated in the northeastern part of Pennsylvania, in the historic Wyoming valley. The soil consists of river bottom, and varies from a light sandy soil to a heavy clay. We raised this year more than a million early vegetable plants, mostly cabbage, tomato and celery. We had 14 acres in asparagus, 27 acres in celery, 20 acres in tomatoes, 15 acres in early cabbage, 15 acres in onions, 6 acres in sweet corn, 8 acres in beets, 6 acres in spinach, 2 acres in carrots.

Every market gardener should have, at least, a small greenhouse and enough sash and cold frames to raise all the plants needed for his own use. The soil used for plant raising should

be of a loose, porous nature, to allow perfect drainage. Leaf mold is nature's seed bed, and probably the best substitute is made by using sods and well-rotted manure. We usually put down about a foot of sods, then add one-half foot of manure, and so on until we have sufficient for our own needs. In about a year's time the sods will be thoroughly rotted. The pile is then turned, and, after the addition of lime, is ready for use.

All our early plants are raised in flats, as we can produce better plants by use of flats than by putting them in beds. We prefer to transplant the seedlings before the rough leaf appears. It has been my experience that we get a more uniform stand of plants by using them when quite young. A little practical experience is necessary in order to grow good plants. It is hard to say, without being on the job, just when to ventilate or how much water to apply, and watering and ventilating are the important points in plant raising. As a rule, the beginner is liable to coddle his plants too much; as a result he will have a lot of weak, poorly rooted plants. One should avoid extremes of heat or cold while the plants are young, aiming to develop a slow, steady growth. The greatest loss in plant raising is caused by the damping-off fungus. This disease usually attacks the seedlings, causing the stems to turn black and rot off. Since using sterilized soil we have had little trouble with this disease. The plants are left in the greenhouse until they have struck root; they are then shifted to cold frames. Most of our frames are steam heated, which has proved perfectly satisfactory, and is much cheaper than protection by straw mats.

There is no better test of one's ability as a market gardener than the quality of the plants he raises. If he is painstaking enough to grow a supply of strong, healthy plants, it is a safe bet that his field operations will be equally successful.

The asparagus we grow is the Palmetto variety. It is planted 2 by 4 feet and 5 or 6 inches deep. Success, to my mind, depends upon the selection of a well-drained soil supplied with abundant plant food, and the use of well-grown plants from high-grade seed. It is a mistake to start an asparagus bed on poor ground. The future of the bed will depend a great deal upon the condition of the soil when the field is set. If possible, choose a field where onions, or a similar crop, has been raised

for a few years previous. Asparagus is a crop that requires heavy feeding. Before the war we applied a ton of 6–8–10 fertilizer per acre, part of the nitrogen in the form of nitrate of soda, the balance in tankage. The fertilizer is applied early in the spring, just before the first shoots appear. About every third year we apply a heavy coating of manure, after the cutting season. When asparagus becomes weedy — during the cutting season — we ridge it up on a Saturday with an old-fashioned moker. This smothers out all the weeds and saves the expense of hand-pulling. After the cutting season the field is thoroughly disk-harrowed; and at the last cultivation, when the asparagus is laid by, it is again ridged up. In the spring these ridges are cut down by the use of a ridging cultivator. For this purpose the disks are put close together on the cultivator and arranged so as to throw the dirt between the rows; the small plows are fastened behind the disks. This arrangement levels the ridge and leaves the surface over the row free from weeds and stubble.

Onions.

Both the early and late onions have proved profitable with us. There is no crop that responds more readily to decent treatment. It pays to put the ground in good shape for all crops, but with onions it does not pay to plant them unless the land is first put in the best of shape. Under most conditions I think it would be preferable to manure the ground in the fall, and plow just before the ground freezes; then in the spring prepare the ground with cutaway, acme and meeker harrows. As our land is liable to overflow from the river, we prefer to plow in the spring.

Before plowing, the ground is gone over two or three times with a four-horse cutaway. We are able to stir up the soil with the cutaway when it would be entirely too wet to plow. The action of the cutaway loosens the surface of the soil and allows the air and sun to penetrate, thus permitting us to plow a week or ten days earlier than we otherwise could. A few days after cutawaying, depending upon the condition of the soil, the field is worked over with an acme harrow to break up any lumps that may have formed. After plowing, 30 or 40 tons of well-rotted manure is applied per acre, and worked in with

the cutaway harrow. The ground is then harrowed over with the acme and plank-drag until it is in the best condition. The finishing touches are then put on with the roller and meeker smoothing harrow. Time spent in preparing land for onions, or any other crop, is not wasted. Some people have an idea that if land is plowed and harrowed over it is fit to plant.

If the ground is very dry at the time of sowing we roll down the rows after seeding with a heavy 4-inch iron wheel, rigged up something like a wheelbarrow, in order to firm the soil over the seed. This takes the place of "the use of the feet in sowing," as advocated by Peter Henderson a generation ago. About 5 pounds of seed is sown per acre, depending upon the percentage of germination. We have been raising the Southport Yellow Globe and the Ohio Yellow Globe. They are both good varieties. We have tried two makes of weeders, — the Brunner we sent back over the Border; the Golden we still have. But as long as we can get Polish women at $1.25 and children at 60 cents per day, I believe we will stick to the hand work.

For early onions we use sets, the so-called "new method," which consists of using plants started in a hotbed, having proved unsatisfactory. We find it important to grow our own sets, as the commercial ones are very often raised from inferior seed. Yellow Strasburg, a small flat onion, is generally used by the growers in production of sets, as a flat onion always makes a better shaped set, whereas the globe-shaped onion will produce one that is bottle shaped. As appearance is not what we are after we use the same variety and the same grade of seed as in the production of large onions.

We also grow considerable Prizetaker sets. This variety matures about two weeks later than the Southport Yellow Globe, but will yield a much larger crop. We have found the Prizetaker sets just as easy to grow and as good a keeper as the ordinary variety of onions. About 50 pounds of seed per acre is used. This is sown as early in the spring as possible, on well-enriched sandy soil. When the onions begin to mature they are pulled and laid on the ground for a few days to dry. They are afterward picked up, part of the top twisted off, and stored in shallow, slat-bottomed crates. In planting the sets we often

skip every third row. These skipped rows are afterwards planted with celery. The yield per acre is usually less than from seed, but the price is often higher, and the onions are out of the way for a later crop.

Cabbage.

Early cabbage has always been one of our standbys. It is a comparatively cheap crop to grow. Some years we have to sell it at rather a low figure, but, one year with another, it is a money maker.

We have settled on three varieties, — the Wakefield, either Early Jersey or Charleston, Copenhagen Market and Glory of Einkhausen. They make a combination that is hard to beat. We make the first sowing of cabbage seed about the middle of January. The early varieties are transplanted in flats, 2 inches apart. The later varieties we set $1\frac{1}{2}$ inches apart. Cabbage is a rank feeder and requires well-prepared soil and heavy fertilization. To my mind, there is no room in a cabbage patch for lettuce or radishes, or any other intercrop. If possible, we prefer to have the ground intended for cabbage sowed to rye the fall previous. Before sowing the rye we apply about $1\frac{1}{2}$ tons hydrated lime per acre. We have had less trouble with wireworms where we have plowed under a heavy growth of rye. The cabbage plants are set in rows $2\frac{1}{2}$ feet apart. The Wakefield varieties are set 15 inches apart, and the Copenhagen and Einkhausen 18 inches apart, in the row. Early cabbage should not be set deep; keep the roots near the surface where the ground is warm. The early varieties, which are grown 2 inches apart in the flats, are cut out with a knife in order to retain all the soil possible, and are planted by hand. We never use a dibber in setting cabbage plants. A few days after planting we apply a small amount of nitrate of soda around each plant, say from 100 to 200 pounds per acre. The after-treatment consists in keeping the field well cultivated, and hoed often enough to keep the soil loose around the plants.

When the cabbage is ready to cut, a row of barrels is placed through the field every twelve rows. Two men cut the heads, each man cutting six rows. As the cabbage is cut they toss the heads to another man or boy, who places them in the barrels.

The filled barrels are hauled out with wagons. Some heads are destroyed, especially when turning the ends, but the loss is nothing in comparison to the expense of carrying the cabbage out by hand.

Tomatoes.

Tomatoes are an important crop with the market gardener. As the early tomato produces greater returns per acre, it is the one that receives more attention from the grower. The condition of the plants at the time of setting has a great deal to do with the profitableness of the crop. The plants should be about ten weeks old when set in the field. I would rather have a plant that is showing bud nicely than one that is in bloom. Tomatoes should be transplanted at least twice before they are ready for the field, the idea being to develop a stocky plant. This can be accomplished better by withholding water than by exposure to low temperature. A stunted tomato plant is worthless. An oversupply of nitrogenous fertilizers will prove detrimental; it will force top growth at the expense of the fruit. On many market gardens, where the area is limited and the soil has been receiving heavy applications of manure and fertilizers, it becomes necessary to stake and prune the vines. Staked tomatoes produce the bulk of the crop earlier and the fruit is smoother and less liable to crack, but they are more likely to suffer from drought. Where one is making a specialty of staked tomatoes, it is important to have facilities for irrigation at the critical time. All the large growers that I know of have developed a strain of tomatoes that they consider the best in the world. I believe they are right. After a few years of careful selection one has a type that is peculiarly adapted to his local environments. We use Earliana and Chalk's Jewel. Earliana has proved the money maker with us. Chalk's Jewel is used for later crop.

Celery.

Celery is another of our hobbies. For early celery we use White Plume. The quality is poor, but consumers down our way are willing to pay good money for it early in the summer. It is a rapid grower, and is not nearly so liable to heart rot as most other varieties.

There is a variety that has been on the market for several years that, as it becomes better known, will take the place of White Plume and Golden Self Blanching. This variety originated with a Mr. Meish of New Jersey, and was first sold by Berlieu, the French seedsman of Woodhaven, New York, as "Meish's Green." Later it was offered by Francis Brill as "Sanford." Then Henderson took it up and offered it under the name of "Easy Blanching." Most seedsmen have it listed now, each one calling it by a different name.

This is a remarkable celery in many respects, — a strong, vigorous grower, with a compact heart; it will bleach as quickly as White Plume or Golden Self Blanching, is almost blight proof, and the quality is superior to any other early variety. Another desirable feature is the fact that it is a fairly good winter variety, and if put away green will keep until spring; in fact, one of our Philadelphia seedsmen offered it this year as a new late keeping variety. There have always been two types among this celery, at least ever since I have known it. The one type has long stems and bleaches up white; the other type has shorter stems and bleaches up with a yellow heart. Last spring we received some seed from Farrel Brothers, Philadelphia market gardeners, who have been saving their own seed of this variety for a number of years, and have been selecting for seed purposes only those specimens which show a yellow heart. As a result, they have to-day the best strain of this variety in the market. There is one undesirable feature about this celery, — it will very often get pithy when stored for winter, especially if the weather is warm after trenching. We have found that if trenched as late as possible in the fall it will seldom turn pithy.

We have tried, at one time or another, practically all the different varieties of celery that have been offered. Golden Self Blanching is not adapted to our conditions; it will heart rot in hot weather and get pithy when trenched. Columbia is a celery of superior quality, but a poor keeper, and more liable to rust than any variety I know of. Winter Queen is a good reliable celery, one of the best known late keeping varieties. The only objection I have to it is that it does not have a full heart; quality is fairly good. Winter King is probably a selection from the Winter Queen. It bleaches out with a yellow heart,

and is very popular among the Philadelphia growers. The Giant Pascal probably heads the list in regard to quality, but with us is a poor keeper, and on account of extreme brittleness is more expensive to handle.

French's Success, introduced a few years ago by the Joseph Harris Seed Company, is one of the most uniform varieties of celery we have ever handled. It is a slow-growing, compact variety, and should be planted earlier than some of the taller growing kinds. It is the best keeping variety we have ever tried, and is very full hearted. I have counted as high as fourteen shoots starting in the heart, while in the Giant Pascal only two or three would be visible. The quality is good, but not equal to Giant Pascal. We have found this variety best adapted to our conditions.

The seed for the early crop is sown about March 1. I prefer to sow celery seed in solid beds rather than in flats. The soil is sterilized by saturating it with a solution of formaldehyde, 2 quarts to 50 gallons of water. And, on the principle of "making assurance doubly sure," we sterilize the seed by washing it in a solution of 2 ounces copper sulphate to one-half gallon of water. When the rough leaf appears the seedlings are transplanted $1\frac{1}{2}$ inches apart in flats, and are kept in the greenhouse until they begin to grow nicely. Before shifting to the cold frames they are given a thorough spraying with Bordeaux mixture, and are also sprayed two or three times while in the frames. Celery plants should be kept growing nicely, without a check; ventilate freely and avoid too much water. Do not attempt to harden them as you would cabbage plants, but treat them more as you would tomato plants. They are not set in the field until the latter part of May or the first of June.

When the celery is large enough to bleach, the boards are hauled in the field, two adjacent rows are put up, then we skip four or six rows, put up two more, and so proceed. When the celery is bleached the boards are taken down and put up to the adjacent rows. Before the war we used the following fertilizer per acre: 400 pounds soda, 600 tankage, 600 acid phosphate, and 400 potash.

It is customary to plant late celery after some early crop, as beets, cabbage or spinach. But where land is available, or where irrigation has not been installed, it is a good plan to

plow the land intended for late celery as early as possible, and harrow it over occasionally in order to kill the weeds and conserve soil moisture, similar to the dry farming of the west. With this method we lose the use of the land early in the season, but are almost sure of a good crop of late celery. And one good crop sometimes pays better than two poor ones.

The plants are set 6 inches apart, and rows 3 feet apart. Celery should be cultivated almost constantly, and the cultivator run quite deep, early in the season, while the plants are small.

Along in the latter part of September we begin to bank or hill up the celery. If the celery is small it is first necessary to handle it, but if it is a foot high all that is necessary is to loosen the soil between the rows with a cultivator, and follow up with the celery hiller. We commence trenching the latter part of October, or first of November, depending upon the weather. Trenches are dug about a foot wide and deep enough so that when the plants are placed in the trench the tops will stick out about 2 inches. The celery is dug up by an attachment similar to an onion set harvester, which is fastened to a two-horse cultivator. The celery is then pulled out, all the dirt possible is shaken from the roots, and a few of the outside leaves pulled off. It is then carried to the trench where it is packed in firmly in an upright position. The boards used in blanching the early crop are nailed together "V" shaped, and placed over the trench to keep out the rain and prevent the celery from drying out too much. After severe cold weather sets in manure is spread over the boards to keep the celery from freezing.

A great many growers make the mistake of trying to raise everything in the catalogue. We have found it a better plan to raise a few different kinds, and hit them hard. Find out what crops are adapted to your particular soil, and then go to it. Try and arrange your crops so they do not interfere with one another, either in the growing or selling.

The reason many growers fail to get a decent price for their produce is the fact that they do not ask enough. If you once get the reputation of being cheap, it is a hard matter to ever get a good price.

I am reminded of an old fellow who once worked for us. In order to eke out an existence on the meager wage he received

he took in a boarder. He told me one day that he thought things would go better now as they got $10 a month from the boarder. "Huey," I said, "there is not much profit in boarding a man at $10." "Well," he said, "I reckon the board ain't worth much more."

A MEMBER. Do you have access to all the stable manure that you want?

Mr. GARRAHAN. Well, I wouldn't say that we get all that we want, but we are in some ways very fortunate about that; we are right in the center of the anthracite coal region, and we get plenty of mine manure from the mules used in the mines, and that makes ideal soil for our work. We have a contract with some of the mining companies there to take all the manure that certain mines will furnish.

A MEMBER. When do you begin to market this early celery?

Mr. GARRAHAN. The latter part of July or the 1st of August.

A MEMBER. What kind of a hiller do you use?

Mr. GARRAHAN. We use two. We have what is known as a Bonnie Banker, which was invented by Walter Bonnie of Batavia, New York, and is used on muck soil; it is a two-horse hiller that sweeps on each side. The other is the Bank Junior one-horse hiller.

A MEMBER. Is the two-horse hiller more effective than a Bank hiller?

Mr. GARRAHAN. Yes, but you have to have your rows a little further apart.

A MEMBER. How far?

Mr. GARRAHAN. With a two-horse Banker you ought to have rows at least 4 feet apart.

A MEMBER. When do you begin to harvest that celery for the winter crop?

Mr. GARRAHAN. Put it away for winter, you mean?

A MEMBER. Yes.

Mr. GARRAHAN. Well, that depends on the weather a good deal — along about the 1st of November or the last week in October.

A MEMBER. How do you bank your celery?

Mr. GARRAHAN. Well, the variety that we expect to take out early we bank as high as we can — get it as much bleached as we can before putting it away, and the celery that we want to keep until February we bank just enough to hold the leaves straight.

A MEMBER. How do you dig the trenches for your celery?

Mr. GARRAHAN. We put a little attachment on our riding cultivator this fall that helped somewhat in digging those trenches. We took the rolling coulters from the riding plow and fastened them on the riding cultivator and stretched our string down to have something to go by, cutting the side of those ditches to these straight discs; that saved the expense of cutting down with spades.

A MEMBER. Do you put boards over that celery?

Mr. GARRAHAN. We nail into a V-shape the boards that are used for blanching the early celery, and those are put over the trenches. Later on in the winter or fall, if the weather becomes very severe, we put some manure over those boards. It is a good plan, though, not to be in too much of a hurry about putting on manure. The celery will stand a good deal of freezing without hurting it, and we put on the first application of manure, just the least little bit, to cover up the cracks at the ends, and later on, as the weather becomes cold, we put on enough manure to keep it from freezing.

A MEMBER. What is your extreme temperature?

Mr. GARRAHAN. Why, I've seen it go down to 20 degrees below zero, but that's very unusual; usually 6 or 8 or 10 degrees below — that is cold weather when it gets down to there.

A MEMBER. In selecting a site for this trenching you have to select a site by the water, do you not?

Mr. GARRAHAN. No, we drench the celery right where it grows — take the ends of the celery and put them in right alongside where they were growing.

A MEMBER. Do you bank the rows wide enough so that you don't let any surface water get in?

Mr. GARRAHAN. Sometimes, yes. I don't like it to get in, but we can't help it sometimes. We have got to raise the celery in the kind of ground we have. I would prefer keeping celery

on ground that would drench, but we have never had a great deal of loss. Our celery usually lasts us up to the middle or 20th of February, and by that time we want to get rid of it, anyway. We have no trouble at all keeping it up to that time. This year, so far, I don't think we have thrown out a dozen stalks of our celery.

A MEMBER. Do you grow any winter crops in your greenhouses?

Mr. GARRAHAN. Two crops of lettuce and one of cabbage.

A MEMBER. Did you ever try freezing your houses instead of sterilizing?

Mr. GARRAHAN. No, because we have the lettuce planted early in the fall, and when we get that crop off another crop comes on, and about the time the lettuce is all cleaned off we need the houses for the cabbage plants.

A MEMBER. Where do you sell your crops?

Mr. GARRAHAN. Largely in the city markets. All our crops are sold practically in the local markets of the city of Wilkes Barre. Wilkes Barre is a city of 70,000, and we have a population within a radius of 9 miles of 250,000. We have Scranton, — only 18 miles away, — and the Scranton suburban population runs close on to 200,000. We have the cities of Hazelton and Pottsville and other surrounding cities, and we ship out in the winter a good deal of celery to the outlying towns, but practically all our early stuff is sold right down in our local markets.

A MEMBER. What is the price of the best celery at this time of the year?

Mr. GARRAHAN. We have been getting $1.20 for early celery up to last week, when I raised the price to $1.40 per dozen.

A MEMBER. How many heads in a bunch?

Mr. GARRAHAN. Three to four stalks in a bunch, depending on the size of the celery.

A MEMBER. How much will those bunches weigh per dozen?

Mr. GARRAHAN. Well, that will vary a good deal. I don't know exactly. Take in the summer time, when you get the big heavy White Plume, a dozen of them will make an armful, so I could hardly say what they weigh.

A MEMBER. Do you figure at about from 2 to $2\frac{1}{2}$ cents a plant?

Mr. GARRAHAN. Yes. The price depends on what the tariff will stand. When we find out that somebody else has sold out all their celery, or celery is getting a little bit scarce, we don't hesitate to boost the price. We put the price up every opportunity we have. I think a man is entitled to all he can get for his vegetables. He never gets more than he asks for them. [Laughter.] Honest confession is sometimes good for the soul.

A MEMBER. You didn't mention the Boston Market celery. Have you tried that yet?

Mr. GARRAHAN. No, I haven't.

A MEMBER. Have you tried the White Rock that Mr. Henderson is putting out?

Mr. GARRAHAN. No, I haven't tried that. Is that an early celery?

A MEMBER. It is in season from Thanksgiving to the 1st of January.

Mr. GARRAHAN. Well, we found that Henderson's so-called Easy Blanching carries us nicely up to the holidays.

A MEMBER. The quality of that Easy Blanching is worse in this State than the Golden Self-Blanching, — a good deal worse. I call it just on a par with Winter Queen. I call that about the worst we grow, barring the White Plume.

Mr. GARRAHAN. I didn't think there was anything worse than the Golden Self-Blanching.

A MEMBER. Do you think Self-Blanching is far superior to White Plume?

Mr. GARRAHAN. That depends a great deal upon the soil on which it is grown. If you have a heavier soil — one with more or less clay in it — you get a better quality of celery than you will on muck soil or lighter, sandier soil.

A MEMBER. Do I understand you don't grow any Paschal?

Mr. GARRAHAN. No, we don't raise Paschal. We wouldn't get any more money for it, I believe. Of course, the quality is better, but as long as they won't pay for it, what's the use of giving it to them? We're in the business for the dollars and cents that's in it, not to educate the public. I am willing to

give them what they are willing to pay for. That may be a wrong principle, but it takes money to make the mare go sometimes.

A MEMBER. Do you store your celery in trenches because it is easier and cheaper than it is in cellars or pits?

Mr. GARRAHAN. I don't know what it costs in pits. I have seen that done around Boston, but I believe the trenching method would be a whole lot cheaper. Do any of you gentlemen know what the cost of trenching in those pits is as a rule?

A MEMBER. It costs us now — of course, it depends on the help we have — about $20 to $30 an acre to put it away for the winter. It is almost impossible, though, to get help enough at that season of the year to build your houses, but if you build your pits two or three weeks earlier, before you put in your winter crops, then you can store your celery very fast with comparatively a small gang. Some gangs put in a couple of acres — 3 acres almost — a day.

A MEMBER. How many rows would you advise?

Mr. GARRAHAN. That will depend on the size of the celery; anywhere from 10 to 14 to 16 rows.

A MEMBER. How do you take the celery out of those trenches?

Mr. GARRAHAN. It isn't a very serious matter to take the celery out of those trenches, and digging trenches doesn't bother us a great deal. We usually do that in the morning when it's wet or when it's frozen a little bit. It saves a lot of carting if you just dig them and lay them out where they are, and it saves handling the celery a good deal too.

A MEMBER. Do you thin that celery any before you put it in these trenches?

Mr. GARRAHAN. Yes, we take off all outside broken or decayed leaves.

A MEMBER. Do you put any dirt on the root of that celery as you put it in the trenches?

Mr. GARRAHAN. We knock every particle of dirt off.

A MEMBER. When do you begin to spray? How often do you spray your plants?

Mr. GARRAHAN. After they begin to grow nicely in the flats.

A MEMBER. What do you spray with?

Mr. GARRAHAN. Bordeaux mixture.

A MEMBER. What proportion?

Mr. GARRAHAN. The standard formula. Four pounds of lime and 6 of copper sulphate.

A MEMBER. Do you keep this up through the whole season?

Mr. GARRAHAN. Yes, sir.

A MEMBER. What is the date of your last spraying — after what time would you consider it unprofitable to spray, or unnecessary?

Mr. GARRAHAN. Well, I have seen celery blight pretty late in the fall — real late, and I think as a preventative measure I would spray as long as there is any danger of blighting. We usually stop the latter part of November.

The CHAIRMAN. Do you keep plenty of figures on the cost of producing an acre of celery, so that you know the margin of profit in $1.20 a dozen?

Mr. GARRAHAN. Yes, I did have it figured out.

The CHAIRMAN. Are you willing to give them to us?

Mr. GARRAHAN. Well, I don't know offhand whether I could give the exact amount — I would hate to do it. I meant to bring it along with me this morning, but forgot it. We have a little method of keeping account of the cost. Of course, it's pretty hard work in a market garden, where you have a half dozen different varieties, and where you go from one job to another, to keep the exact cost of every crop, but we try to. For instance, when we are preparing the ground for celery, cabbage, or whatever it is, we will put down how much it cost to prepare that ground. But as far as early celery is concerned if I remember right, I think our figures run up to $385, counting the manure, fertilizer, the cost of hauling manure, applying manure, applying fertilizer, the use of the boards in blanching, the spraying and the irrigation.

A MEMBER. What do you consider the gross receipts from celery?

Mr. GARRAHAN. Well, we figured on at least 600 bunches to the acre — we sometimes get more than that, and the price will vary — with the early celery anywhere from $1.80 up, very sel-

dom less than that. The ordinary prices start in at about $1.50, and run quite a while at $1.50 a dozen, but we haven't this year sold any celery, and we didn't last year, at less than $1.20 a dozen.

A MEMBER. Did I understand you to say that you couldn't grow the Golden Self-Blanching celery?

Mr. GARRAHAN. No, it doesn't pay. They can raise it back in the country further — up on the hills where there is better drainage. I've known farmers back in the country to have a few plants in their garden, and they did well, but we are in the valley, and it doesn't pay. We find it will blight and heartrot.

A MEMBER. Did you ever try any sulphur sprays of any kind?

Mr. GARRAHAN. No, not on celery.

A MEMBER. Do you have the commercial onion sets?

Mr. GARRAHAN. We don't grow them in our section. We have had so much trouble with the commercial sets. The commercial sets are raised from the little yellow Strasburg. It doesn't make a big onion, and they usually use an inferior grade of seed, but our yield from sets will run on an average of about 400 bushels to an acre, but with the late onions we consider 600 bushels a fairly good crop. We have had it run over that and we have had it run less. This year our late onions run about 500 bushels.

A MEMBER. How much spraying are you doing on tomatoes?

Mr. GARRAHAN. Not any. Some one asked me a while ago about a sulphur spray. I tried that one year on tomatoes, — Sulphurcite, I think it was called, — but it must have been too strong as it knocked off all the blossoms. Possibly we had it too strong, but we went according to the formula given by the manufacturer.

A MEMBER. Do you have any particular mode of setting tomatoes?

Mr. GARRAHAN. Practically the same as setting cabbage. We cut them out with a butcher's knife with as much dirt as possible retained on the root. Those plants are grown in flats about 4 inches apart, say for two weeks before we want to plant

them in the field. We score them and cut them out each way with a butcher's knife; that has a tendency to make the close root grow. When we transplant them the second time we like to have them $3\frac{1}{2}$ inches deep, the same as cabbage.

A MEMBER. Do you think it pays to pot tomato plants?

Mr. GARRAHAN. Why, yes, if you're careful enough to water them and don't get them stunted.

A MEMBER. How do you fertilize the tomato?

Mr. GARRAHAN. That depends altogether on the soil condition of the crop or condition of the ground, or how it has been handled previously. In most of our soil it is just simply acid phosphate. There have been times when we applied a little nitrate of soda early in the spring — a very small pinch — to give them an early start if the weather happens to be cold at that time.

A MEMBER. Do you use any potash?

Mr. GARRAHAN. I think we have been putting on too much potash, and I don't know but what most market gardeners put on more fertilizer and manure than is necessary — every year, year after year, 50 or 60 tons of manure to the acre, as some of us do, and then fertilizer besides. I sometimes question whether it is the right way to handle ground.

A MEMBER. Is there no demand for lettuce and spinach in your market?

Mr. GARRAHAN. The spinach demand is very limited. What we raise is raised for a canning factory. We sell a little spinach, but most of what we raise is for canning purposes.

A MEMBER. How is the lettuce market in the city of Wilkes Barre?

Mr. GARRAHAN. The lettuce market is good — leaf lettuce mostly; there is some head lettuce, but not very much.

A MEMBER. What variety of leaf lettuce do you grow?

Mr. GARRAHAN. Grand Rapids.

A MEMBER. Do you raise any carrots?

Mr. GARRAHAN. Yes.

A MEMBER. What variety?

Mr. GARRAHAN. Danvers.

A MEMBER. Any asparagus?

Mr. GARRAHAN. Yes, 14 acres. I tried one year grading that asparagus, putting a tape on it. We took out all the smaller stuff and tied the rest up with a nice ribbon, and we got a little better price for it. Then the other fellows all started doing the same thing and prices got back to the old level. So we all got together and said, "What's the use of buying this blue ribbon for them? — We'll use jute, that's a good deal cheaper."

A MEMBER. Do you find jute cheap now?

Mr. GARRAHAN. I doubt if it is now. I happen to have a ton on hand, but I guess it is $18 or $20 now.

A MEMBER. What do you consider a good income from an acre of asparagus?

Mr. GARRAHAN. Well, I haven't those figures here. I would hate to say.

A MEMBER. What is the size of your bunch?

Mr. GARRAHAN. The size of the bunch varies a good deal according to the demand. It sometimes weighs a pound and a half, and sometimes it's pretty small. Sometimes it's easier to cut the loaf than it is to raise the price, and if we find a pretty big demand for asparagus, and the weather a little cold, we cut the bunch in proportion.

A MEMBER. About 15 ounces?

Mr. GARRAHAN. Something like that.

A MEMBER. All green?

Mr. GARRAHAN. Yes, all green.

A MEMBER. How about the maggot — are you troubled with that?

Mr. GARRAHAN. No, we are not troubled with the maggot for some reason or other.

A MEMBER. Do you irrigate?

Mr. GARRAHAN. Our conditions are a little peculiar. You see our land is low and it is liable to overflow. It's impossible for us to have the irrigation pipes up on posts, as is customary, so we put them on tripods, where we've got enough pipe to spray at one time, probably 4 acres or a little over, and by moving these tripods and moving the pipes we connect the pipes in about 100-feet lengths.

A MEMBER. You didn't give us the price of your asparagus bunches.

Mr. GARRAHAN. I was trying to think if we sold anything for less than 20 cents a bunch this year. Yes, we did, — some — I shipped a good deal of it to Scranton, and that averaged, I think, pretty close to $2 a dozen. At one time it went down to $1.50, but in our own local markets we didn't break the price below 20 cents. Yes, the price was good.

A MEMBER. Ever do it before for the whole season?

Mr. GARRAHAN. Yes, we've done it before that. The only trouble we have is earlier in the season. If it turns warm early, and that rush of asparagus comes on all at once and the market is stocked with some southern stuff, in combination with ours, that makes trouble.

A MEMBER. How often do you consider it safe to put cabbage on the same land?

Mr. GARRAHAN. We don't put it in oftener than every three years — not any oftener.

A MEMBER. Have you had any trouble with the root knot or club foot?

Mr. GARRAHAN. Why, not recently; but we have had.

A MEMBER. Is there anything you can do for it?

Mr. GARRAHAN. Lime is somewhat of a preventative; that is why we always apply more or less lime.

A MEMBER. What do you follow cabbage with?

Mr. GARRAHAN. Sometimes late celery; sometimes late lettuce. Last year we seeded it down for rye; it depends on the season a good deal.

A MEMBER. Do you use hydrated lime altogether?

Mr. GARRAHAN. Yes.

A MEMBER. How often?

Mr. GARRAHAN. Oh, only about once in two or three years. I have found it an advantage to use lime on celery. I have known cases where the ground was such that it didn't show any results of acidity on using litmus paper, and yet an application of lime made a big difference on the celery. A neighbor of mine had some celery out this year, and he applied some lime. When he turned at the end of the rows with his lime machine the

celery at the end got a double dose, and you could see the spots where it had twice as much lime, although his ground wasn't sour at all.

A MEMBER. How early in the spring do you plant those cabbages?

Mr. GARRAHAN. Just as early as we can get on the ground — just as soon as the ground is soft, no matter how early. If the cabbage is planted a day or two I don't care how cold it gets afterward. If the cabbage plant is well grown it will stand 20 degrees.

A MEMBER. Do you plow rye under in the spring?

Mr. GARRAHAN. Yes.

A MEMBER. And the manure on top of the ground, or manure before you put the rye on it?

Mr. GARRAHAN. Before, if we get to it; if we don't, we put it on in the spring. If the rye is heavy you can't make a good job of putting manure on top, but, as a rule, for the first crop, like cabbage, we want to get our manure on the fall previous, and then depend on a little fertilizer in the spring; it takes so much time hauling to get manure out in the spring.

A MEMBER. Do you use a machine for setting cabbage plants or do you set by hand?

Mr. GARRAHAN. Set by hand. A machine won't place them close enough together.

A MEMBER. How close do you set the Copenhagen?

Mr. GARRAHAN. Eighteen inches, and the rows $2\frac{1}{2}$ feet apart. We put Wakefield 15 inches apart and the rows $2\frac{1}{2}$ feet apart. Are there any other questions?

A MEMBER. Couldn't you set cabbage plants as well as you set the tobacco plant — with a machine?

Mr. GARRAHAN. It will set cabbage plants, but I don't think you can get a machine or tobacco planter that will put them 15 inches apart. I know Tyson Brothers down in Adams County, Pennsylvania, the big fruit growers, who have 300 acres for fruit raising, and they use a machine for planting, a tobacco planter, but they tell me they can't get them very close together, and that they found two weeks' difference in the time

of cutting where they used the machine and where they planted by hand.

A MEMBER. Which was the earlier?

Mr. GARRAHAN. The machine planting. They told me it made about two weeks' difference.

A MEMBER. Now in those plants that you cut out, how long before you set them do you water them?

Mr. GARRAHAN. We soak them up thoroughly right before planting.

A MEMBER. Just before?

Mr. GARRAHAN. Yes.

A MEMBER. What do you use for a cultivator? A horse or motor power?

Mr. GARRAHAN. We have been using horses altogether, but I think the day of the small tractor is close at hand. I expect to get one this spring. They are making them now so that I think they can be used on the small farm to advantage. I was looking at a tractor in Chicago last fall, where they cultivate cabbage, onions and such things with them, but it didn't look good to me. It was a small gasoline motor.

A MEMBER. Why?

Mr. GARRAHAN. Well, it was too low for one thing. You couldn't cultivate onions with it, except when they were very small, but when they got up good and high I don't believe you could get through with it. It is all right going between rows for tomatoes or cabbage, or something like that, but I think those machines are not to be compared to hand work for such things as onions. I believe that motor machinery is yet in the experimental stage, but a tractor for plowing I believe will be a profitable machine.

A MEMBER. Do you ever subsoil when you plow?

Mr. GARRAHAN. Yes, we have some soil that is of a pretty heavy clay nature that we subsoil.

A MEMBER. Do you get better results from your Skinner system on your light soils or heavier soils?

Mr. GARRAHAN. That would depend on the drainage. If you had your heavy soil properly drained you would get just as good results. It is probably better on the heavier type of soil.

I think the heavy type of soil, other things being equal, will produce better crops than light soil.

A MEMBER. Do you prefer ground that is underdrained or naturally drained?

Mr. GARRAHAN. Either one. As a rule, you'll have more trouble with lack of drainage on your heavy type of soil than than with your lighter ones. I have had it before now on our celery ground, where we had tiled drainage. I have had water come down over the top right through the drain. I think when we first started to use that Skinner system we developed a good deal of blight by a little too much watering. I remember I was in Boston at the time we had the National Convention there, and I noticed this, that the fields of celery with the Skinner irrigation had more blight than the ones that had no irrigation at all.

A MEMBER. Do you use Skinner in the daytime, at night or any time?

Mr. GARRAHAN. Any time, but I prefer the evening or night. You get twice as much water on at night as you do in the daytime with the wind blowing; a good deal of moisture is taken off by the air.

A MEMBER. You haven't seen any damage from day watering, have you?

Mr. GARRAHAN. Only just loss of water. I couldn't say I have ever seen any damage done with day watering, yet I always prefer it at night. It doesn't look sensible to me to water right out in the blazing hot sun.

A MEMBER. What do you use for a covering for most of your early celery?

Mr. GARRAHAN. Boards.

A MEMBER. Boards altogether — no paper?

Mr. GARRAHAN. No paper.

A MEMBER. What do you use to keep the boards in place?

Mr. GARRAHAN. Wire. We use No. 8 or No. 9 galvanized wire, and it takes two of those clamps to hold up a board.

A MEMBER. What do you get for lumber — spruce?

Mr. GARRAHAN. Most of our lumber is hemlock, but the last

we got was spruce. We split the boards to nail little half-inch strips at each end.

A MEMBER. You have more trouble with hemlock than you would with spruce on splitting?

Mr. GARRAHAN. Yes, but the grade of hemlock we have been getting has been very good, and that's why last year we bought spruce; we can't get that same grade of straight hemlock.

A MEMBER. How wide are the boards?

Mr. GARRAHAN. About a foot wide.

A MEMBER. Do they keep from one year to another?

Mr. GARRAHAN. We have those that we've been using for twenty years.

A MEMBER. Tell us how you put that celery in the trench, how many rows and just how you place it — the late celery.

Mr. GARRAHAN. The trenches are not over a foot wide; the narrower your trench the better your celery keeps.

A MEMBER. Do you stand it up?

Mr. GARRAHAN. Yes, stand it up straight; shake off all dirt from the roots. We judge a good deal how tight to have it by grabbing the top by the hands, and if you go to pull up some of that celery and it is in so tight that the leaves break off, it is too tight. You want it so you can pull it out if you had to. It is pretty hard to say how tight to put it.

A MEMBER. In regard to your tomato plants, how do you set the Earlianas and Chalk Jewel? I believe you said you put them about 4 inches apart each way in the flat, and cut them out with a knife a week ahead of the time you were going to use them so that you would increase the root growth. If the plants were just in bud or in blossom or with fruit on how high do those plants stand? Do you nip out the center so as to get the branches started?

Mr. GARRAHAN. They are planted 4 by 5 feet.

A MEMBER. And the Chalk Jewel that you grow, are they of the same stocky nature?

Mr. GARRAHAN. Yes, they are.

A MEMBER. How far apart do you put those?

Mr. GARRAHAN. We don't give these Chalk Jewels quite as much room, but I believe it would pay to do it. Late crop Chalk Jewels are planted 2 inches apart in flats. Sometimes if we have an opportunity we replant them before putting them in the fields. It pays to replant, even if they are not replanted more than two weeks.

A MEMBER. Do you ever compare Bonnie Best with Jewels?

Mr. GARRAHAN. The Bonnie Best is a little too small with us.

AFTERNOON SESSION.

Mr. George E. Taylor, Jr., of Shelburne called the afternoon session to order at 1.30 P.M., and introduced Mr. R. A. Hayne of Chicago, who spoke on "The Improvement of Live Stock."

THE IMPROVEMENT OF LIVE STOCK.

R. A. HAYNE, AGRICULTURAL EXTENSION DEPARTMENT, INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS.

We all agree on the great fundamental truth, that the soil is the foundation on which depend all material things. All industries, all enterprises, all the doings commonly known as business are activities based on the use or abuse of the providential gifts called natural resources.

When these activities and manipulations are analyzed and followed they are found to be ultimately dependent on the one great resource, — the soil. Take away the soil's productivity, make it barren, and the world's business will stop. Great, because from it directly and indirectly come the food and clothing for mankind. Great, because it is one resource we can use and still keep.

Take the coal and iron out of the earth and they are out for good. Cut off the forests that are counted as resources, and in this generation and the next we cannot grow more trees like them; but the soil was here three hundred years ago when the "Mayflower" landed at Plymouth Rock, waiting for the settlers to clear away patches and begin growing crops, and it is still here through years of neglect and abuse, still growing crops. In some places it has grown thin and the crops light, but that is the fault of the tillers, not of the soil.

It is not my purpose to sharply criticize the methods, or the people who employed them, that have depleted the soil's fertility in the older parts of the United States. The deed is done; we cannot change the past. The first settlers played their part well, better perhaps than we would have done in their places. Criticism of the past will not accomplish good like effort to make best use of the present. We have the situation to meet. We are the keepers of the soil.

In times past the keepers, — or, may I say, the wasters of the soil, — because of mistakes and unorganized effort on their part, have not always been recognized as keepers of the world, yet the fact that they are remains, and some day, not many years away, they will be recognized as such, and the keeper's greatness will be measured not only by the amount and quality of the necessities of life he offers the world, but by his ability to maintain and increase the fertility of his soil, and by the condition in which he hands it to another generation; and this leads me to what I have to say. In the present day it is criminal to follow any longer a plan of farm production that depletes soil fertility, when it has been clearly shown that by a right system and rotation crops can be grown year after year, perhaps indefinitely, and at the same time maintain and increase fertility. And the most practical system of doing this, as we see it, from a scientific and humanitarian point of view, is one in which the crops grown, or at least a large share of them, are fed to live stock, and by the live stock transformed into food and clothing products, while the waste or manure is returned to the fields to help keep up and increase fertility.

We admit that it is possible to farm without live stock, keep up soil fertility and get a fair wage for labor expended, but it is not as practical as the live-stock method for two or three reasons which we will give later.

It does not follow that live stock is a panacea — a cure-all; a bad system of live-stock farming is as bad as a poorly managed system in any other business; the farm can be eaten up and the fertility wasted with live stock as quickly as without it. There is a combination of conditions that must be met before live-stock farming is all that it should be. First, we must have good stock, — stock fitted to environment of location, crops, markets and to the tastes of the farmer; then the feed for the animals must be grown, or at least most of it, on the farm. Profitable stock husbandry is not founded on the purchase of feeds. The feed and care must be supplied intelligently, so the cost will not overrun the income; and perhaps the greatest of all the requirements, the manure must be carefully returned to the soil. When these conditions are met a long step has been taken to care for the fertility; the crops

find a sure and safe market; the farm is put on a business basis, making a factory of it, running the year round, turning out a finished product, keeping the farm force employed winter and summer, — with the steady employment of labor bringing a year-round income that is far from the least of the advantages.

We must have good live stock. In the discussion of live stock the first point I would make is that farm animals are or should be transformers converting vegetation into more useful products; and it is only live stock that does this best that we can afford to have.

The only true value that an animal or breed can have is based on its utility, and not upon some fancy point that has no connection with usefulness. I would say here that when a breeder or organization of breeders spend time and energy developing in their live stock characteristics to gratify an idle whim, something that is no use to humanity, they are on the wrong track; their names will not be listed with those of useful men; and we would say the same to all fair, record, test or breeders' associations. This is a practical world and growing more so. There might be some popular whim that for the moment could be catered to with profit, but such a thing can only be temporary. Because there are ladies who are willing to pay $5 or $100 for a fuzzy dog with burnt cork eyes, one that she can wash and fondle and blanket, is not sufficient reason for any one going into the breeding of such dogs as a life's work. It is men who have lived a life of usefulness that are remembered. I once saw a stallion, a mediocre individual, with exceptionally long mane and tail. His owner rolled the long hair on spools. A circus manager offered $500 for him — it was a great deal more than he was worth. The offer was indignantly refused; the owner was going to start a breed of long-haired circus horses. That horse is dead; there is no breed of long-haired circus horses; the man is dead; his name is not written in history; he was following an idle whim.

We have a present-day example of a horse whim — as far as we Americans are concerned — in the hairy legs of the British draft horses. With all their good qualities they have been rejected by most American horsemen because British

breeders have insisted on adorning their horses' legs with something that is of no use to us. I have seen Jersey cattle bred so fine and fawn-like that they were small, delicate and failed to make good at the pail. A man once grew enthusiastic over starting a breed of five-toed chickens. He purchased a common speckled rooster, giving $6 for him, for no reason except that he had five toes. That man is not in the chicken business to-day.

There is a streak in human nature that makes us sometimes prone to go after fads. The pig must have the white feet, and the ear and tail must hang just so. It is nice to have the unessential things, but the useful pig is one that comes from a big litter of thrifty shoates that can convert feed into profitable pork. Whether the black and white color of the cow is in the right proportion and her nose of the right hue should be secondary to her ability to consume much feed and manufacture it economically into milk.

The live stock of any section can be divided into two general classes, — the everyday grade that does the work and supplies the general market, and the pure bred that is developed for the purpose of furnishing blood to improve common stock. These two classes can be divided and subdivided, and one class merges into the other, so a discussion of improvement applies to both.

All live-stock improvements have been brought about by selection, coupled with feeding and care. This combination must be relied upon for future developments. Breeding and selection will not accomplish much without feed and care, and *vice versa*.

When the improvement of live stock is mentioned we at once think of introducing new blood by selecting, buying, importing or bringing from some other section animals that are superior to those we have in our neighborhood. We think and talk about the pure bred, the registered sire, and look to him for our salvation, and it is well that we develop that interest; but let us be sure when the pure-bred sire, the high-priced animal, is introduced into the herd that the chances are, as far as we can determine, in favor of the desired result.

Let me ask, what is a pure-bred animal? A pure-bred animal is one whose ancestors for many generations have all been selected for the same purpose. And if it is to be a valuable animal for the breeder, the ancestors must not only have been selected for that purpose, but they must have accomplished what they were selected for.

The animal is, as far as nature can make it, a combination of its ancestors; it is the ancestors boiled down to one individual. Of course all the characteristics of all the ancestors cannot be pronounced and visible, yet they are likely to be there, dormant, somewhere in its make-up, ready to crop out in the offspring when the right condition or mating occurs.

I do not care to enter into a discussion of Mendel's law in heredity, because to the practical breeder — and it is the practical folks who have to feed and clothe the world — Mendel's law offers but little help. We would emphasize the importance of having as far as possible the ancestors of pure-bred stock on both maternal and paternal sides, — individuals of the type we are aiming to produce. This not only insures uniformity in the pure-bred families, but makes the pure-bred animal better able to stamp his likeness on the offspring when used in the grade herd; in other words, it makes for prepotency. That is a wonderful word in the live-stock world. Prepotent animals — animals that can be relied upon to reproduce themselves — in a measure take away the uncertainty in live-stock production, and after all, that is the real work of pure-bred animals and test and record associations. Take the uncertainty out of any deal and it at once becomes a good deal; we know what to do with it. Many a so-called pure-bred animal has proven a disappointment because in his pedigree there were too many kinds of ancestors and too much inferior quality.

We need to get a better vision of the value of pedigrees. A pedigree is a family history; and the meanest mongrel in New England has as much, perhaps more, family history than the best pure bred. A pedigree to add worth to an animal must be more than a string of names on a sheet of paper, accompanied by a certificate of registration. It must be a family history showing that the animal had ancestors of merit and that they came from flocks and herds of honest men.

I would not enroll myself with the knockers, yet I would refer again to mistakes that are every day being made in the live-stock world. One is spending good money, paying long prices for breeding stock because of a family name or reputation, rather than because of real merit in the animal purchased. Exceptional individuals are produced in all breeds, — individuals that have in a marked degree the qualities the fanciers of the breed are striving for. They fall into good hands, are developed and win prizes or make records; they are often purchased at attractive figures by men who are good boosters, good advertisers; and the lesser lights, the smaller breeders, are much inclined to scramble for an animal carrying the blood of this famous individual, often accepting an inferior specimen in order to introduce the blood and name into their herd. It is well to have great individuals. If they reproduce themselves they are blessings, but remember that their descendants have another side to their ancestral line that may wreck the good that comes from the great head of the family.

In one of our campaigns for better farming we met in South Dakota a young horseman who was eager to show his recent purchase, — a Percheron stallion, a grandson of Carnot. Carnot is a great horse, a winner in France; a winner in America; proven beyond doubt a wonderful sire. His owner is a booster, a good advertiser, and Carnot blood is much sought for. This young man showed a stallion with the Carnot style and grace; a beauty at a distance, but with a pair of crooked, boggy hind legs, weak in one place where draft horses should be exceptionally strong. He had purchased him from a dealer, and I learned was given his choice between this toppy, bad-legged colt and a smooth, solid young stallion with faultless legs and feet that was the product of several generations of careful breeding by a corn-belt farmer who was not given to boasting or printer's ink; his horses were not known. The young man had spent his money and taken chances on the grandson of Carnot — with perhaps generations of bad-legged mothers in his family — just to get the glamor of reputation and advertising, while the solid colt with a quiet carefully built history was no doubt worth many times more as a reproducer.

A would-be dairyman exhibited the head of his herd, calling special attention to the fact that his bull was a son of one of the famous dairy sires. He was all that, and at the same time he was the offspring of a common low-grade cow that had been mated with the great sire. There is a belief, and it is worthy of consideration in the selection of sires, that sons inherit and transmit in a larger measure the characteristics of their mothers than they do of their sires. Whether this is true or not, the fact remains that constructive breeders pay much attention to the maternal side. I have often heard Mr. A. J. Nicholl of New York say that were he selecting a sire for his grade dairy herd, and could not get a pure-bred bull whose dam was a better producer than the best-grade cow in his own herd, he would surely use the son of his best-grade cow.

Another mistake often made by stockmen is sending into a far-off State for sires and new blood, when in the next county, or a little way down the road, there may be a breeder whose stock has blood and individuality equal to, perhaps better than, that secured after a long journey. Oftentimes, after the transportation charges are settled and the animal is installed in its new home, the purchaser is painfully surprised to find how ordinary is his new pig or calf or colt.

Let me mention, too, the mistake — often followed by regrets — of selling a sire before his worth is known. This applies especially in dairy breeding.

A bull's worth, as a breeder, is not definitely known until his daughters have freshened the second time. This means the bull must be at least five years old before he can be discarded as a failure. Not many dairy bulls reach that age. They go to the butcher and are replaced by untried sires. The error is too often made of registering and offering as improvers all the young stuff in pure-bred herds. Not all of the increase of any herd is fit for registration. Registration, when thus abused, is really a hindrance to stock improvement. This practice is not carried on in all herds — far from it; but it is done enough so that young and inexperienced stockmen sometimes buy inferior animals because they have pedigrees and certificates of registration attached, only to find their mistakes

later. Such work embitters the new breeder and keeps the quality of pure-bred stock at a low average.

In live-stock improvement let not the selection for individual excellence and breeding overshadow the importance of an equal consideration of feed and care. Let us not forget that improved live stock, as we have already indicated, is the product of good breeding, strongly coupled with good feeding. The improved animal is an overdraft on nature, the old stock being transformed to meet artificial conditions; and it follows that to retain and continue improvement these factors must not in any way be neglected. When the improving influences are discontinued the tendency is to revert to the ancestral type, and the characteristic last acquired is apt to be the first lost; for example, the dairy cow that we are so proud of is not many generations removed from the wild cow that could fight her way for life and feed, and gave enough milk to keep her calf alive until it was four months old and then went dry. By bestowing feed and care, together with careful selection, we have improved her to her present excellence in milk production; but turn her out, let her fight her way again, and if she does not die in the transformation her year-round milking inclination will vanish and her descendants will take on the type of the old-time cow.

The tendencies are against improvement. For this reason live-stock improvement is an upstream proposition. It is a task for men of intelligence, judgment and character.

A MEMBER. There is one phase you haven't touched on that is of interest to all of us. What encouragement can you hold out to us here for a market for beef?

Mr. HAYNE. There's one thing we can't get away from, and that is the fact that as land goes up in price and gets scarce, and the population increases, the beef industry just sort of gives way to the dairy industry; that's the idea. The best place to grow profitable beef is on cheap land.

A MEMBER. I know a man who's growing beef in Ohio and Illinois on land worth $300 an acre. We've got plenty of land in New England from $10 to $20 an acre.

Mr. HAYNE. Is it good grazing land?

A MEMBER. It can be made into good grazing land.

Mr. HAYNE. Can't you sell beef cattle here?

A MEMBER. Yes, for about half what it is worth. We've no market for beef cattle here; they've all gone out west.

Mr. HAYNE. If you positively can't sell them for what they are worth I wouldn't grow them.

A MEMBER. I want to know if we do grow them how can we sell them.

Mr. HAYNE. It seems to me that you can pay transportation on all your beef to places where it will be sold, if you would rather do that than create a market for your beef at home. The place to grow beef is on cheap land where you can grow it very largely with grass. There's one thing sure though, and you'll find it as the country grows older, that the dairy business is taking the place of raising beef cattle. I know that's true in Iowa, where they used to furnish so much of our beef. Of course, there'll be a place for the beef herd, no doubt of that, and men who will stick to the beef business will somehow or other manage to make money out of it.

A MEMBER. Isn't it true that one of the largest troubles and one of the dangers is this, that the words "pure bred" are often applied to common scrub animals, and there is no gain to be had from purchasing them?

Mr. HAYNE. You mean by that just what we undertook to discuss a while ago, — recording animals that weren't really fit to be recorded. Uneducated buyers — the same as that young man who bought the stallion — who buy just because of family name will often get a lot of scrub animals. They don't raise the average at all. That pedigree wants to be more than just a string of names on a piece of paper with a certificate of registration attached; it wants to show that that animal had family history, — had ancestry that had real worth and came down to us through flocks of honest men, and then we want the animal to have the individuality himself to match up with it. Let me just call your attention, however, to the fact that the breeding and the selection, as I have already indicated, will not get very far without the care and feeding with it. That's the way we've

improved our pure-bred stock. We've improved them to meet artificial conditions, and if we drop off either one thing or another that helped to bring them up to that state of perfection they will deteriorate accordingly.

Following Mr. Hayne's talk Mrs. Sarah Elizabeth Belt gave an illustrated lecture on "Canning Foods in Glass."

Professor O. F. Hunziker of Purdue University Experiment Station, Lafayette, Indiana, was scheduled to speak on the "Pasteurization of Market Milk," but owing to illness he was not able to deliver his talk. In his place Professor W. P. B. Lockwood spoke on this subject. Professor Hunziker had prepared a paper, which was as follows.

PASTEURIZATION OF MARKET MILK.

O. F. HUNZIKER, LAFAYETTE, INDIANA.

In order to convey to you the full significance of pasteurization of milk, I desire to call your attention for a brief moment to the importance and usefulness and greatness of the product which this pasteurization is all about. I mean milk.

You have heard the great virtues of sour, or fermented, milk discussed. Possibly you have read such books as "The Prolongation of Life," by the late Dr. Metchnikoff of Paris, or the book entitled "Old Age Deferred," by Dr. Lorand of Vienna. These eminent scientists suggest the possibility that the liberal consumption of sour milk stimulates and prolongs the activity of the thyroid gland and of other ductless glands and organs, thus keeping the body from showing signs of age, keeping it physically young, and possibly prolonging the cycle of life. To substantiate their statements these savants cite individuals of countries where sour milk forms the basic part of the daily ration, and who have lived to a very ripe old age, in some instances one hundred and fifty years old and over.

I am not questioning, nor am I trying to belittle, the beneficial influence on the physiological functions of the body, of the lactic acid and of the lactic acid bacteria which are present in this sour milk; but I am equally convinced that the fundamental virtue of that sour milk does not altogether lie in the fact that it is sour, but rather in the fact that it is milk, with all its inherent life and growth-giving properties, — milk which is the foundation, the God-given product. While the acid, in a similar manner as pasteurization, is a secondary attribute only, it is the decoration rather than the product which it decorates, — it is man-made, incidental. If we have a full understanding of the true importance and value of this founda-

tion product, milk, then we are in a position to readily understand the great value and indispensable need of pasteurization.

Milk has no equal as a food for man, and its equivalent cannot be purchased at as low a price in the form of any other animal food, nor can its combined beneficial properties be found in any food which mother earth offers to man.

Milk is a complete food for the sustenance and for the growth of the human body. It contains all the necessary food elements, and nature has placed them there in the proper proportion for young and old. The food elements in milk are present in such form that they are more digestible and more easily assimilated than the same food elements in other forms of food products.

The fat of milk, which is largely found in the cream, is the most digestible fat nature provides. It not only produces heat and energy as do other fats, but it is capable of yielding vital properties which build up the nervous system, and of aiding in the ready digestion and assimilation of other foods.

The protein of milk contains the elements that produce blood and furnish the necessary material for the upbuilding of the muscular tissues of the body. It is the most digestible form of protein found in any food. It is not only easily digested and assimilated, but it contains physiological and vital properties which make for larger growth of muscle and bone than do proteids from other sources.

The sugar of milk furnishes the necessary heat that keeps the body warm and the energy that is needed to perform the cycle of the vital fluids, — to pump the blood from and to the heart, to expand and contract the lungs so they may purify the blood and circulate it throughout the body, stimulating the vital organs to maximum activity and nourishing and building up the tissues. The sugar of milk is the most digestible energy producer available; it is found nowhere else in nature except in milk.

The mineral matter, or ash of milk, furnishes the material that builds up the bony structure of the human body. It represents a most complete combination of minerals, salts and acids. It is present in the form most easily digested and assimilated by the organs of the body.

But the great value of milk as a food is by no means confined to the actual food nutrients which it contains, and to their high degree of digestibility. Milk is more than a mere food of high nutritive value; it has properties of physiological and biological value which are not found in many other food nutrients, and which give it the precedent over all human food. Milk has vital substances which mean more to the living and growing body than mere food nutrients. The presence of these vital properties has been demonstrated in feeding experiments conducted with various classes of animals in experiment stations in this country and in Europe.

The addition of milk to the feed rations of pigs and hogs produces larger hogs, a larger bony structure and a heavier carcass than when these same food elements are secured from other sources.

Calves do better, develop faster and grow larger and heavier on milk as a part of their food ration than on a ration without milk.

Beef animals excel in quality of beef and show-ring performance when milk forms a part of their ration.

Chicken feeders are unanimous in their claim that milk, skim milk or buttermilk increases weight and produces a grade of meat that is unequaled by any other feed.

Experiments with laying hens have demonstrated that the feeding of milk, buttermilk and skim milk may increase egg production from an average of 40 eggs per hen per year to an average of 140 eggs per hen per year.

Many additional similar instances could be cited if time permitted, but these facts should suffice to unmistakably show the life-sustaining and growth-producing properties of milk. They furnish ample proof that milk is an indispensable food for the welfare, health and preservation of the human family. The infant cannot exist without it; the growing child needs it for its best and greatest development; the adult requires it for the proper maintenance of the body and for the maximum performance of mental and physical work; it is essential in the diet of the nursing mother in order to satisfy the baby at her breast; the invalid and the convalescent need it to regain their strength; it invigorates the aged and prolongs the cycle of life.

Business men, and men whose nervous system and mental force are taxed by the daily strain of mental work and worry, are learning more and more to appreciate the advantage of milk in their daily diet. Clearness of thought and activity of mind are jeopardized by heavy food and overeating. Too much of their energy is consumed in the digestion of a heavy meal. The blood that should nourish the brain is monopolized by the stomach. The adoption of milk and bread as the mid-day meal largely removes this handicap. Such a diet is economical, simple, easy to digest; it does not rob man of the energy which he needs for work, it does not produce a sluggish mind, it is nourishing and refreshing and stimulates mental activity.

We would all be better off physically, and could have more available net energy for the performance of our work, if we consumed more milk and less of the other, often less suitable and usually more expensive, foods. There would be less indigestion, more real nourishment and a smaller monthly board bill for the human family.

In consideration of the indispensableness of milk for babies and children, and its beneficial effect on people of all ages, in view of the fact that liberal and increased consumption of milk is urged by all persons honestly interested in the raising of a healthy race of stalwart men of large stature and healthy women and useful citizens, and because the consumption of milk by the public actually is rapidly increasing, it is of the greatest importance that this milk which forms so basic a part of the diet of the human family, and especially of our babies and growing children, be free from agencies of disease.

The experience of those who have given the best part of their lives to the effort of eliminating the contamination of milk with germs of milk-borne diseases are unanimous in their admission that our best known and most up-to-date methods of production and handling of milk, and our most efficient systems of inspection, are inadequate and fail to furnish the public with a reliable guarantee for the safety of its milk supply from the health point of view. The government, State and municipal laws and ordinances concerning the production of sanitary milk, the testing of our dairy herds for tuberculosis, the inspection of

dairies, the examination of milk in the city laboratories, — all these activities are helping to reduce the danger of infected milk and to minimize the occurrence of epidemics of milk-borne diseases. But their service, after all, is not general, it is limited; the task is too immense, the expense involved too great, and the results too uncertain for the adequate protection of the public. The milk furnished to any one of our larger cities comes from thousands of farms; it is produced by tens of thousands of cows and handled by tens of thousands of persons.

The difficulty of complete supervision and protection is further augmented by the frequent change of cows and personnel on the farms. New cows enter the herds, new employees take the place of old ones, all of which may happen between periods of inspection. The virulence of some of the disease germs is such that infection occurring to-day may spread disease to-morrow. Perfectly healthy employees may serve as carriers of the germs of disease, so that protection is beyond the power of the inspector.

The hope that certified milk, which is milk produced under the supervision of a medical commission, and which, from the sanitary standpoint, is regarded as the most ideal milk, may ultimately solve the problem of a sanitary milk supply is no longer cherished. Even certified milk is not an absolute safeguard against infected milk. But assuming that it were, its high cost of production limits its output, and its high price to the consumer confines its availability to the wealthy classes only. The great army of milk consumers, therefore, must look elsewhere for a safe milk supply, and right here is where pasteurization comes to the rescue.

By pasteurization of milk is now understood the exposure of milk to temperatures high enough and for a sufficient length of time to destroy the great majority of the living germs it may contain without impairing its digestibility and marketable properties. Bacteriological analysis of milk and cream show conclusively that pasteurization, properly executed, is very efficient; it is capable of destroying on an average 99.9 per cent of the bacteria present, and it eliminates from the milk entirely the germs of such milk-borne diseases as tuberculosis, typhoid fever and diphtheria, etc.

The Lederle Laboratory of New York City, under the direction of Dr. H. D. Pease, tested out the pasteurizing efficiency by inoculating milk before pasteurization with large numbers of virulent germs of tuberculosis, typhoid and diphtheria. The experiment was conducted in a commercial milk plant, under good average conditions in such plants. Their results, which were conclusive and unmistakable, show that pasteurization of milk under commercial conditions, using temperatures ranging from 142° F. to 147° F. for a fraction of a minute, and by additional holding of the pasteurized milk for thirty minutes to temperatures ranging from 143° F. to 145° F., is sufficient to insure total destruction of large numbers of pathogenic bacteria such as tubercle bacilli, typhoid bacilli and diphtheria bacilli, which through contamination, might be present in raw milk. This, then, means that pasteurization at 145° F., and holding for thirty minutes, destroys all the germs of the most common milk-borne diseases. Similar results with the same species of bacteria, as well as with other organisms of milk-borne diseases, have been obtained and reported by other investigators who rank high in the world of science, such as Russel and Hastings of Wisconsin, Theobald Smith and Rosenau of Harvard University, Marshall of Michigan, Burri of Switzerland and others. These important facts leave not a shadow of doubt that pasteurization, when properly executed, is a reliable and effective means to free the milk from germs of disease, and to supply the consuming public with a safe milk.

From the time of its inception pasteurization has had its enemies as well as its friends. Like other innovations of similar nature, pasteurization has run the gauntlet of public and professional opinion. In its early days and in its cruder form its advocates were few, and its progress was impeded by distrust of the conservative, quarrels of the faddist and abuse by the pessimist. As the process attained greater perfection, and its principles and good results became better known, the process gained in favor, its merits and usefulness could no longer be denied by men of intelligence and progressive mind, suspicion changed into appreciation and abuse into eulogy. To-day, while there still exists some apparent division of opinion, the great majority of thinking men, interested in the permanent

progress of the dairy industry, and seriously considering the physical welfare of the consuming public, look upon pasteurization as a logical and essential part in the process of the production and handling of market milk and the manufacturing of other dairy products.

But while the dairymen, milk dealers and consumers who believe in the benefits of pasteurization of milk are to-day in the great majority, there are too many individuals who still persist in looking upon pasteurization with suspicion and distrust.

There are those who claim that all pasteurized milk is not free from disease germs, and who point to unscrupulous dealers who sell so-called pasteurized milk for the purpose of defrauding the public. It is true that there have been and that there unfortunately still are some shiftless and unscrupulous individuals and firms who offer for sale so-called pasteurized milk, in the manufacture of which all principles of thoroughness and sanitation are ignored. While such milk is no better and no safer than the ordinary run of raw milk, these scavengers of the milk business are after all in the great minority. They are the exception and not the rule. Their fraudulent use of the word "pasteurized," however, can be no reflection on the true value of properly pasteurized milk, and because of a few black sheep we should not condemn the whole flock.

Others claim that pasteurization is not a complete protection against disease because it fails to destroy the spores of micro-organisms. Here it should be clearly understood that the usual germs of milk-borne diseases do not form spores, and that the destruction of spores does, therefore, not enter into the problem of rendering milk safe.

It is now generally conceded that the holding process of pasteurization, in which the milk is heated to 145° F. and held for twenty to thirty minutes, is by far the most efficient process which guarantees freedom from disease germs and at the same time does in no way impair the cream line. The continuous or flash process at higher temperatures falls short of maximum germ killing efficiency because, if temperatures were used in this method high enough for the maximum destruction of germs, the cream line would suffer or disappear entirely.

When the milk is not pasteurized in the final container the greatest care also should be exercised to guard against recontamination of the milk after pasteurization and before it is sealed in the consumers' package, — the bottle. This means clean pasteurizers, pumps, conveyors and bottle fillers, clean and sterile bottles and caps, machine capping instead of hand capping, etc. When in-bottle pasteurization is practiced the danger from contamination after pasteurization is largely removed. When the pasteurization and packing of milk is regulated and supervised by State and municipal health officers, as should be done and as is now being done in most of the larger cities, these details are largely taken care of. The time has passed when pasteurization can be justly termed a mere makeshift, or, as others have said, an unreliable remedy for an uncertain danger.

Another very popular objection to pasteurization has been that it puts a premium on slackness and shiftlessness in the production and handling of milk, and that it therefore results in a postponement of the day when clean and pure milk shall arrive on our markets. This is a time-worn argument, and it represents a fabric largely of the theorist. While there may have been isolated cases when it applied, experience has shown it to be largely illusory; what happens to the milk after it leaves the farm is of very little concern to the average milk producer. The chances are that he does not know whether his milk is subjected to pasteurization or not, and even if he did, such knowledge would not induce him to modify his way of handling. Again, milk that has not received the proper care on the farm often cannot be pasteurized at all, because such milk does not survive the process of heating and would not be marketable after pasteurization. For this reason pasteurizing plants are automatically compelled to use greater care in the inspection of their milk at the platform, than dealers who do not pasteurize, and milk unfit for pasteurization is rejected.

Another objection frequently heard is that the heating destroys the lactic acid bacteria which in reality are beneficial, and that putrefactive types of bacteria are left intact, which, when relieved from the restraining action of the acid bacteria, develop and form products injurious to health. Mr. Rogers

of the United States Dairy Division has done some very extensive work along this line covering a period of seven years, and has found that, while this objection may have been true in the earlier days of pasteurization, when very high temperatures were used, milk pasteurized at lower temperatures, such as 145° F. with the holding process, as now is almost universally practiced in market milk plants, sours normally and in a similar manner as raw milk. This shows that enough of the lactic acid bacteria survive to remove this objection. My own experiments on pasteurization of cream, conducted during the last five years at Purdue University, further show that the putrefactive germs are killed at the same ratio as the lactic acid bacteria, and that properly pasteurized cream is, therefore, much freer from these undesirable germs.

It has been further argued that pasteurization does not destroy poisonous products already present in the milk before pasteurization. While this is perfectly true, it is equally true that pasteurized milk is no worse than raw milk in this respect inasmuch as these products are obviously also present in the raw milk.

Another very widely argued claim has been that pasteurized milk is less digestible than raw milk; that the soluble albumen becomes insoluble; that part of the ash, and especially the valuable lime salts, are precipitated; that the casein is altered in its physical make-up; and that the enzymes which aid in digestion are rendered inactive. These changes do occur, to a limited extent at least, in milk heated to temperatures near the boiling point (212° F.). But the fact that they do take place does by no means prove that they render milk less digestible. Comparative experiments, conducted by nutrition experts in this country and abroad with babies in hospitals and also with calves, dogs, cats, rabbits, rats and other animals, do not uphold these assumptions. In fact, the bulk of the now available evidence on this subject is favorable to the digestibility of pasteurized milk. Even the precipitation of the lime salts by heat does not render the mineral matter of the milk less digestible, the lime in the heated milk being utilized, digested and assimilated quite as well as the lime of normal raw milk. The important protein compounds of milk, such as

the amino acids which are so essential for the growing child, and the presence of which in milk places it above all other foods at equal cost with reference to its ability to stimulate growth, both of the bony and muscular structure, are not affected by heat; they remain entirely normal and unchanged. I say, even if these changes of the physical and chemical properties of the milk constituents do occur, it does not necessarily follow that the milk so changed is less digestible than raw milk.

But these changes are possible only when heating to temperatures near the boiling point. Boiling milk and pasteurizing it are two different processes. Boiling is not pasteurizing. Pasteurization as now understood and practiced refers to heating to 145° F. and holding for twenty to thirty minutes. At this temperature these changes do not occur, or, at the most, only to a very slight extent, nor is the activity of the enzymes at this temperature destroyed. Pasteurization properly executed, therefore, does not impair the digestibility of market milk and does not render such milk less suitable for infant feeding.

Commercially the greatest objection to pasteurization of market milk has been that the pasteurized milk loses its cream line. Since the consumer judges the richness of the milk largely by the depth of the layer of cream that forms in the neck of the bottle, and since many families desire to use that cream separately on the table, by pouring it off the top of the bottle, the cream line is a commercially important feature that cannot be overlooked. Its absence loses trade. The fact that pasteurization at temperatures near the boiling point does cause the cream line to disappear has led to the popular conclusion that all heating diminishes the cream line. This is erroneous. Heating to very high temperatures does retard, if not destroy, the formation of the cream line. This is an established fact. But heating to 145° F. and holding for twenty to thirty minutes does not diminish it, but actually enhances its formation, and tends to produce a deeper cream line if anything. This point was experimentally demonstrated by Dr. Burri of Switzerland, whose results conclusively showed that up to 145.4° F. the cream line formed more rapidly and was deeper than in the raw milk of the same batch.

The reason for this lies in the well-known fact that heat destroys the viscosity of the milk. It makes milk more fluid. The greater fluidity gives the fat globules greater freedom of motion. They encounter less resistance in their upward passage, and, true to the law of gravity, they promptly rise to the surface, forming the cream line. The reason why, at higher temperatures, — those above 145.4° F., — the cream line fails to form rapidly, and possibly entirely disappears, must be attributed to the fact that at temperatures above 145.4° F. the albumen begins to coagulate abundantly, and this coagulation, though invisible to the naked eye, hinders, or entirely blocks, the upward passage of the fat globules. They do not come to the top and the cream line does not form.

In order to preserve the cream line, therefore, the milk should be heated not to exceed 145° F., and the temperature of the heating medium should be but a few degrees higher, otherwise the milk that comes in direct contact with the heating surface may be exposed to heat sufficiently high to damage the cream line.

There are other more or less incidental factors which influence the cream line, such as the nature and amount of agitation to which the milk is subjected, the nature and age of the milk, the period of lactation, etc.; but these are local details, and can be taken care of locally in the case of each individual plant.

With a clear understanding of these simple facts and principles, therefore, it is obvious that the proper pasteurization of market milk does not destroy nor retard the cream line, but that its formation may actually be enhanced by it.

Summing up, then, it is reasonable to state that proper care in the handling and production of milk minimizes danger of infection, but that no amount of care can insure the public against infection of the cleanest milk from unrecognized carriers of disease. While milk from private dairies, kept under most ideal conditions, often does surpass in quality, though not necessarily in safety, milk from the average pasteurizing plant, the pasteurizing plant furnishes a far safer product than the average private dairy and milk peddler.

Pasteurization, properly executed, is an efficient and practical

means to protect the consuming public against the danger from infected milk. It makes possible the commercial handling of large volumes of milk which is necessary in order to supply the consumer in our large towns and cities. It impairs neither the wholesomeness, digestibility nor the marketable properties of the milk. It retains all the important advantages and benefits, and is free from the dangers of raw milk. Pasteurization furnishes to-day the most logical, practical and workable solution of the perplexing problem of supplying a safe and wholesome market milk to the ever-increasing population in our towns and cities.

At the evening session Edward Howe Forbush, Massachusetts State Ornithologist, gave a very interesting lecture entitled "Pleasure and Profit in Birds for All;" this was illustrated by stereopticon and was followed by motion pictures of wild birds. Following this lecture some motion pictures of the Glacier National Park were shown. These were provided by the United States Department of the Interior.

Third Day.

The presiding officer at the opening session of the third day was Mr. A. Willis Bartlett of Salisbury, who introduced Mr. J. C. Gilbert of the Office of Markets of the United States Department of Agriculture, to speak on the work of that department.

THE FEDERAL OFFICE OF MARKETS AND RURAL ORGANIZATION.

J. C. GILBERT, OFFICE OF MARKETS AND RURAL ORGANIZATION, UNITED STATES DEPARTMENT OF AGRICULTURE.

To provide for a study of effective and economical methods for distributing and marketing farm products, Congress during the spring of 1913 appropriated funds by means of which the Office of Markets of the Department of Agriculture was established and operated. The authority conferred by Congress in appropriating funds for the maintenance of this office provides "for acquiring and diffusing among the people of the United States useful information on subjects connected with the marketing and distributing of farm and non-manufactured food products, and the purchasing of farm supplies," and the study of co-operation among farmers in the United States. So far as marketing work is concerned, the activities of the office, therefore, are limited to the *collection* and *distribution* of information. For example, it has no authority to prosecute cases of alleged dishonesty on the part of producers, carriers, dealers or buyers. It has nothing whatever to do with the problems of production.

The work of the Office of Markets and Rural Organization has several distinct branches: marketing and distributing of farm products; rural organization and investigation; investigations and demonstrations of cotton standards and cotton testing; the enforcement of the United States cotton-futures act; the enforcement of the United States grain standards act; and the enforcement of the United States warehouse act.

For convenience in attacking the problems, and in order that there may be a minimum of waste and misdirected energy, several of these divisions are further subdivided into specific projects. Those under marketing and distributing farm products are as follows: —

Co-operative purchasing and marketing.
Marketing business practice.
Market grades and standards.
Market surveys, methods and costs, together with collecting and distributing market information.
Transportation and storage.
Marketing by parcel post and express.
City marketing and distribution.
Marketing live stock, meats and animal by-products, together with market reports on live stock and meats.
Marketing dairy products.
Marketing grain, hay and seeds.
Marketing cotton seed and its products.
Cotton handling and marketing.
Cotton warehousing investigations.
Investigation of foreign markets for and development of export trade in farm products.
Miscellaneous problems in marketing and co-operation.

Most of these projects are self-explanatory. A brief outline of the work in some of the newer projects, however, may be of interest.

Market News Service.

A large part of the work of the past season pertaining to fruits and vegetables dealt with the collection and dissemination of telegraphic market news on a number of the more important perishable crops.

The experimental market news service which was inaugurated during the spring of 1915 has been gradually expanded to include several new crops, an additional number of stations in producing territory, and an increased number of permanent city offices.

During the season just closing, 54 temporary stations were established in important producing districts, for the purpose of furnishing the latest market news to the growers of perishable commodities. Permanent branch offices have been located in 11 of the most important markets and consuming centers of the country. Temporary arrangements were made to receive market reports from 20 other cities. The field of action covered more than half of the States, and the reports were issued on radically different types of commodities, ranging from the

highly perishable strawberry crop to the semi-staple onion and potato crops.

Daily reports on the crops were issued from 11 city offices, which have mailing lists ranging from 100 to 3,000. Far more numerous reports have been sent out from field offices in producing territory, thus bringing the information closer to the shipping public.

In short, the object of this work is to collect and distribute, by telegram, mail or otherwise, timely information on the supply, commercial movement and market prices of fruits and vegetables, thus assisting shippers in securing better distribution of perishable products. Daily telegraphic reports are obtained from common carriers of the number of cars of each crop shipped from certain producing areas, together with their destinations. These reports, with the number of cars offered and the prices prevailing on each of the principal markets, are summarized daily during the heavy shipping season for redistribution to producing districts, markets and the press. During the past season daily market reports were issued free of charge from the Boston office on the following commodities: —

Apples.
Cantaloupes.
Grapes.
Onions.
Peaches.
Strawberries.
Tomatoes.
Watermelons.
White potatoes.

Marketing Live Stock, Meats and Animal By-products.

This project is just beginning the daily issue of news concerning the market prices and distribution of live stock and meats. The railroads have begun reporting daily all carload shipments of live stock, giving their destinations. Information is gathered from stock men, live-stock associations, stockyards, commission firms, live-stock exchanges and others relative to the number of head of marketable live stock, especially cattle, hogs and sheep, in the principal live-stock feeding and growing sections. Representatives of the office are stationed at the principal centralized live-stock markets and in consuming centers for the purpose of forwarding daily to the Washington office information relative to

the commercial movements and prices of live stock and meats of various classes and grades, particularly market receipts of fat cattle, hogs and sheep, and prices of the same, wholesale prices of dressed beef, hog products, mutton and lamb, and at stated intervals retail prices of meat and meat products. Summaries of this information will be distributed for publication at stated periods, and will be wired to persons willing to pay the cost of such services. In connection with the work standard classes and grades of live stock and meats will be determined, and steps taken toward the unification of such standards in different live stock markets and consuming centers.

The office issued the first report of the stocks of frozen and cured meats held in the United States on December 1, 1916. This report will be issued about the 8th of each month hereafter.

City Marketing and Distribution.

Investigations under this head are carried on in many of the larger cities of the country. In studying the problems involved in the provisioning of municipal populations, public markets operated by municipalities are being compared with those privately owned, with a view to determining the absolute and relative advantages of each system; direct dealing between producers and consumers in the city markets is being promoted where practicable; the advantages of the various forms and systems of city distribution are being investigated. Methods and costs of construction and operation of municipal markets are being studied, and upon request suggestions and information are given to city authorities and other responsible agencies.

A brief description of the work of the different projects as of November, 1915, as well as a list of the publications, of the Office of Markets and Rural Organization may be found in Document No. 1, entitled "The Work of the Office of Markets and Rural Organization," copies of which may be obtained upon application.

State Activities in Marketing.

The market investigations of the several States are usually under one of three general types of arrangement, and they will be discussed very briefly under the following heads: —

1. Independent market bureaus, divisions or commissions.
2. Bureaus or divisions under State departments or boards of agriculture.
3. Marketing activities of agricultural colleges and extension services, and investigations of colleges and universities.

Independent Market Bureaus, Divisions or Commissions.

Five States have established by statute divisions specifically charged with carrying out regulatory or investigatory work in the marketing of farm products. These are California, Idaho, Michigan, New York and Texas.

California. — The California law creates the so-called State Commission Market, under the management and control of the State Commission Market Director, appointed by the Governor, and the law specifically commands the director to establish and maintain, in any and all cities and towns where the conditions in his judgment are suitable, commission markets for the receiving, grading, sale and distribution of agricultural, fishery and dairy products. The act creates a State commission market fund into which all fees, charges and costs collected are paid, and also makes an initial appropriation of $25,000 for inaugurating the work. The present State market director is giving special attention to the plans for financing and otherwise aiding growers in the marketing of dried and other fruits, but no attempt has been made to establish and operate State-controlled commission houses.

Idaho. — The farm markets law of Idaho creates among other things the office of director of farm markets, provides for the appointment of the director by the Governor, and limits his term of office to two years. It gives general authority to promote commercial and efficient distribution of farm products, and to maintain a market news service, giving information as to crops, freight rates and commission rates, and acting as a clearing house of information between the producer and the consumer. The present director of markets is actively engaged in conducting a number of specific activities, authorized by law. He not only publishes information, but actively advises producers when and under what conditions to sell or not to sell their crops.

New York. — The marketing work in this State is conducted

by authority of chapter 245 of the laws of New York, entitled "An Act to amend the General Business Law in Relation to the Establishment of a Department of Foods and Markets, etc." This law fixes the term of the commissioner of foods and markets at six years, and his annual salary at $6,000, and provides for his appointment by the Governor. The present commissioner, Mr. Dillon, has given especial attention to the question of auction markets, which are specifically provided for under the law to be conducted by licensed auctioneers, under such a schedule of commissions as the commissioner approves. He also makes certain inspections of the grade and condition of farm products. Recently, in addition to fruit and auction markets, he has taken steps toward the establishment of a milk auction, because of the many complaints of the milk producers in the State concerning conditions in their industry.

Texas. — The Texas marketing law is primarily a warehousing law, and up to the present time, under its administration, cotton has been dealt with more largely than any other product.

Bureaus or Divisions under State Departments and Boards of Agriculture.

As types of this form of marketing activity we may cite the work being done in Alabama, Maine, Massachusetts, South Carolina, Vermont and Virginia.

Marketing Activities of Agricultural Colleges and Extension Services.

Nearly all of our agricultural colleges and extension services are giving some attention to marketing problems. In eighteen States work of a definite character is under way. Massachusetts is among this number.

Marketing Activities of Non-Governmental Agencies.

In addition to State and Federal agencies, certain private enterprises have devoted considerable attention to marketing and rural organization problems, such as the National Grange or Patrons of Husbandry, Farmers Educational or Co-operative Union of America, Farmers' Equity Union, and Ancient Order of Gleaners.

State Co-operation in Marketing Work.

To return to the work of the Office of Markets and Rural Organization, the project, State co-operation in marketing, although not one falling strictly within the classification of marketing and distribution, is the one in which you are most interested, perhaps, at the present time. In its broader aspects the work of the States in the marketing field has had a more recent development than that of the Federal government, though many States and municipalities for years have conducted activities that have an intimate bearing on marketing. The State co-operative and marketing project was made possible by the last Congress, which appropriated $35,000 "to enable the Department of Agriculture to co-operate effectively with the several states in the employment of agents to study methods of marketing and distributing farm products in various states; to incorporate, guide, and assist in co-ordinating market activities undertaken by the various states; and to carry to the people of the states selected for such co-operation, by demonstration or otherwise, the results of the investigations of the Department relative to marketing and distributing farm products"

Now note the exact procedure under which the work is to be undertaken in co-operation with these different State marketing agencies. Congress, in passing the $35,000 appropriation, rendering possible the State co-operative and marketing project, defined the procedure as follows: —

> This work will be carried on in co-operation with certain of those states which appropriate money for marketing purposes through the employment of specialists or agents in marketing, and such other assistants and facilities as may be necessary. These agents will maintain headquarters in the various states concerned, and their salaries and expenses will be borne jointly by the Federal Government and the states. As joint representatives of the two agencies, they will correlate and unify the marketing activities of both, making available the facilities and potentialities of the other.

Previous to the creation of this fund, co-operative work of this nature had been in effect in the States of Louisiana, Oregon, South Carolina, Vermont and Tennessee. At the present time arrangements have been made to carry on marketing work

in co-operation with the States of Arizona, Colorado, Arkansas, Delaware, Georgia, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oregon, South Carolina, Tennessee, Vermont and Virginia. For the work in these States the Department has allotted approximately $25,000. We are also at this time contemplating agreements with the States of Alabama, Mississippi, Washington and Oklahoma.

The purposes of State marketing agencies have been of two general kinds, — demonstrational and investigational. Certain States, as Colorado, carry on both types of work. Our procedure in States carrying marketing information to the farmers by demonstrational methods has been to enter into an agreement with the State university or agricultural college for the employment of a man to undertake the duties of field agent in marketing in that State, and through him and the county agent the information gathered by the Office of Markets and Rural Organization and the college is carried to the people. All activities involving extension work are carried on through the State's relation service, in accordance with the general Memorandum of Understanding of the Secretary of Agriculture and the several States.

In practically all such cases the field agent in marketing, the title under which all our representatives in the States under this project are designated, is under the control of the director of extension, reporting to him and following plans and procedures outlined and controlled by the chief of the Office of Markets and Rural Organization.

The Memoranda of Understanding between the Office of Markets and the States of Colorado and Virginia illustrate the different types of agreements, the former being demonstrational and the latter investigational.

The agreement with the State of Colorado is headed "Extension Work in Agriculture and Home Economics in the State of Colorado, by Co-operation between the Office of Markets and Rural Organization and the State Agricultural College of Colorado. . . . " Quoting exactly from the Memorandum of Understanding with Colorado, the object of the work is "to carry to the farmers in Colorado by demonstration methods useful in-

formation relating to the standardizing, grading, packing, assembling, storing and distributing agricultural products; to assist county agents in perfecting assembling and marketing organizations in the counties; . . . and to assist in the dissemination through county agents and otherwise of market information gathered by the Office of Markets' news service." The exact methods of procedure are next outlined. The organization of the work is shown, and it is agreed that the entire cost of the work shall be borne jointly by the Office of Markets and Rural Organization and the State College of Agriculture. It is further agreed that no change in any of the plans or policies in the conduct of the work shall be made without the mutual consent of both parties to the agreement.

The Memorandum of Understanding with the State of Virginia is of an entirely different type, and covers "Investigational work in problems relating to the marketing of agricultural products in the State of Virginia, to be conducted by co-operation between the Office of Markets and Rural Organization and the Division of Markets of the Department of Agriculture and Immigration of the Commonwealth of Virginia." In Colorado the work is demonstrational; in Virginia, investigational. In the former, co-operative arrangement is made with the State Agricultural College; in the latter, with the Division of Markets of the State Department of Agriculture and Immigration, corresponding to your State Board of Agriculture. The object of the work in the State of Virginia is not to carry to the farmers by demonstrational methods information relating to the distributing of farm products, but "to *acquire* useful information with reference to the various problems arising in connection with the distribution and marketing of farm products in the State of Virginia, particular attention at first to be given to the marketing of apples, poultry products, dairy products and peanuts."

The methods of procedure are definitely outlined, as is the "organization" of the work in the State, as well as the proportion of the expenses to be borne by each party to the agreement.

It is the intention eventually to have *all* questions in marketing, in States where we have established this relation, referred to the field agents in marketing, in order that all marketing activities may be correlated and conducted upon principles

found most desirable by the Office of Markets and Rural Organization. The field agent in marketing is kept in close touch with the activities of our office, so that the investigations made through the numerous projects in the office are available to him. Whenever it is possible we are confining the activities in the several States to particular lines, which, in nearly all cases, are mentioned specifically in the Memorandum of Understanding entered into between the Office of Markets and Rural Organization and the college or university, as referred to before. For example, the field agent in marketing in Kentucky is devoting his time to investigations, principally in fruit, vegetables, poultry, dairy, tobacco and wool products; in Louisiana he is devoting most of his time to live stock and live-stock products; in Virginia an exhaustive survey of the peanut industry is being made; in Vermont a special study is being made of the marketing of veal and of maple products; the field agent in marketing in Minnesota is devoting most of his time to market business practice, in assisting the farmers' organizations in establishing uniform accounting systems and other modern business methods, and so on.

This is but a brief sketch of what is being done in connection with certain phases of this great problem.

It is true, as has been reiterated so often of late, that production has received the major portion of the department's energy up to the present time. However, this situation is changing, and the study of distribution problems is being emphasized. Some conceive of the existence of a single national problem in the distribution and marketing of farm products. No such single problem exists. Each section has its problem, and it may be different from that of almost every other section. Each product within a section likewise presents its own peculiar problems and difficulties. The problem of the cantaloupe grower of the Imperial valley is one thing; the problem of the barley or alfalfa grower of the same valley is a totally different one. The problems of the potato grower of Maine, the strawberry grower of Louisiana, the orange grower of California, the apple producer of Washington and Oregon, and the onion grower of Texas or of Massachusetts have just as many points of dissimilarity as they have of similarity.

A MEMBER. Mr. Chairman, I'd like to ask Mr. Gilbert if he thinks it feasible to sell at auction carloads of vegetable products at the freight yard, as the Harris Fruit Company now sell carload lots of fruit.

Mr. GILBERT. It would be rather difficult for me to say whether it is feasible or not. It is hardly within the province of the Office of Markets to say that one form of sale is more advantageous than another form of sale. I can tell you this, though, regarding the situation in Boston at the present time: the auction sale of apples is bringing much lower prices than the private sale of apples, and no two days' business, either on the auction market or by private sale, is alike. The situation in a market such as Boston changes very largely from day to day, and the desirability of using one form of sale over another form of sale would depend very largely upon the problem of that day, and so, in answer to your question, I would have to know just what the problems were confronting the sale of their product, both by auction and by private sale, on the particular day on which it was offered for sale. The situation has to be followed very closely. It might be that the establishment of another auction in Boston would complicate the problem. It might be that the establishment of another vegetable auction there would be desirable. That can only be found by trying it out.

The CHAIRMAN. Doesn't the variation in grading have more effect on the prices than almost anything else, from day to day?

Mr. GILBERT. The variation of grades does have a considerable effect upon prices which are received, but in my opinion it is impossible to get away from the old law of supply and demand. If you have a quantity of stuff, — no matter how good it is, no matter how desirable it is, — if there's more of it than the buyers want it will lie in the boxes in the warehouses of the people who have it for sale until it rots sometimes, because they won't take it. Just a specific instance of that: this is the season when strawberries are first coming from Florida, and strawberries in January are usually considered quite a luxury, — usually considered beyond the pocketbook of most of us. Well, the other day, because of some unaccountable circumstance in shipping, or otherwise, about six times as many strawberries arrived in Boston as is usually the case; in fact, there were 120 refriger-

ators of Florida strawberries which had arrived on that market, and the produce handlers told me that 20 refrigerators would have been an ample supply. I went down along the market and saw refrigerators piled up there of the most beautiful strawberries Florida ever produced, an excellent quality. The wholesale price had been 40 and 45 cents a day or two previous, and they were having great difficulty in getting rid of those strawberries at 15 and 20 cents a quart on that day. I bought two quarts of them, and I believe that's the first time I've ever eaten strawberries in January that I can remember.

A MEMBER. Mr. Chairman, I would like to ask the gentleman one more question. In the Weather Bureau we have a weather forecaster or forecast agent. Now, I would like to know if, from a study of this data you have secured, there is any possibility of developing a forecast of the demand for these different markets? [Laughter.]

Mr. GILBERT. The answer to that question I think would be that if we attempted any such thing, either in governmental circles or in any State Department of Agriculture, we would probably be just about as unpopular as the weather man.

A MEMBER. Is it possible, though, to arrive at a certain conclusion as to the normal consumption, from which you can eventually expect some prediction?

Mr. GILBERT. That is something upon which the office is conducting an investigation at the present time, and it will probably be some time before they will be able to arrive at any general conclusion. In that connection I wish to say that the office is studying the number of loads of perishable commodities in all of the markets, to determine, if possible, what each market will be able normally to consume at reasonable prices. In connection with the cantaloupe market in the Imperial valley, the office attempted to determine what was the normal consuming capacity of the principal markets of the country, gathering its information from every possible angle and from every one who had any knowledge of the subject at all, and they charted out a tentative list of figures. Then the cantaloupe distributors of the Imperial valley were advised from day to day, and that was posted, and the cantaloupe distributors could gauge themselves so as not to overload any one market. Now, work along

those lines is going to be of a great deal of benefit, but you must remember that the supplies of the various fruits and vegetables come into a market in many different ways, and it's hard to get an exact estimate of how much of any commodity is there and how much has been brought in by farmers' wagons on the way into the market, when they are arriving on the market all the way from 8 o'clock in the evening until 5 o'clock the next morning in the way of local produce, and in carloads by express and by local freight. Then, when you come to go over the records of the various companies — transportation companies — that bring in these products, and endeavor to find out how much of the various commodities have been brought in, it is a problem which is exceedingly difficult to get at, but we hope in time to be able to discover the solution, and to at least make estimates. We hope to be able to arrive at some idea of what the various markets can normally consume, but then there are so many other things that enter into that problem. For instance, cabbage is exceedingly high, as you all know, and cauliflower is coming in splendid quantities and in splendid quality into the Boston market at the present time, and the receivers of cauliflower tell me that they are selling five and six times as much cauliflower as they have ever sold before, because cabbage is so high; that is, the price of cabbage has gone up until it is on a level with cauliflower, if not above it in some cases, so that people now, rather than pay 8 and 10 cents a pound for cabbage, will pay 15 and 20 cents a head for very nice cauliflower, because it is a similar product with a little finer flavor, and they are selling tremendous amounts of cauliflower on the Boston market. The influence that one crop has on another is something that must be taken into consideration in the study of what a market will normally consume.

Following Mr. Gilbert's address, Dr. A. E. Cance of the Massachusetts Agricultural College spoke on "The Functions of a State Bureau of Markets."

FUNCTIONS OF A STATE BUREAU OF MARKETS.

ALEXANDER E. CANCE, DEPARTMENT OF AGRICULTURAL ECONOMICS, MASSACHUSETTS AGRICULTURAL COLLEGE.

The address of Mr. Gilbert to which we have all listened with interest indicates two most significant things: (1) the tremendous scope of a new field of agricultural study, — the marketing of farm products, a field of overwhelming importance, but one scarcely touched by our agricultural teachers and leaders until a very few years ago; (2) the remarkable interest and activity of our Federal government in bringing about a more economical and efficient system of marketing the products of the soil.

The Day of the Economist.

To a student of agricultural economics this movement is a source of much gratification. The marketing problem, large as it is, is but a fractional part of the field of agricultural economics. In America it is a new subject; even to-day men ask what it means. When I came to Amherst eight years ago I was a stranger in Israel teaching strange doctrines. It was the day of the doctrine of two blades of grass, of "consume what you produce and produce what you consume." The tremendous production of farm products which had to be sold at a loss, and the sad awakening of the raise-what-you-consume men when they found other districts offering articles cheaper than they could be raised at home, have forced producers to give attention to quality, price and profit rather than quantity.

On the other hand, the increased cost of living has made the consumer roar and the saviors of the people imagine vain things. The consumer's dollar, which looks like the classic 30 cents to the farmer, has called out everybody — economists, socialists, legislators, country store philosophers, hobby riders

and space writers — to search for the missing 65 cents. Out of the search has come much that is sound and good. For one thing, we are learning something of the problems and the practice of agricultural economics. For another, Congress has added this most important and helpful and deservedly popular division, the Office of Markets, to the Department of Agriculture. A third outcome is this marketing day conducted by the State Board of Agriculture. A fourth is the Massachusetts State Bureau of Markets, which is just in sight.

Marketing Activities of Colleges and Boards of Agriculture.

It must be said that as soon as our agricultural colleges awoke to the fact that the production of crops is useless unless they are well distributed, and that producing bushels is different from producing values, they began to study economics.

Wisconsin and Massachusetts were among the first to add courses dealing with these larger questions; now four-fifths of the agricultural colleges are teaching or investigating economic questions.

Following the work in investigation and instruction on the campus, boards of agriculture and extension divisions of the colleges began to establish marketing departments, and put trained men in the field. But it is all very new. In the fall of 1913 North Carolina, under authorization of the State Board of Agriculture, organized a division of markets under a joint committee, the Federal government, the North Carolina Experiment Station and the State Board of Agriculture co-operating. The same fall the Massachusetts Agricultural College employed an extension professor of organization and marketing — so far as I can discover the first time that a college in the United States ever employed a man for such work.

Marketing men were appointed in the fall of 1914 in other States; in 1915 several State marketing bureaus were put into operation. By the end of 1916, 26 States had established State market bureaus or were employing men to do work in marketing and organization. In 13 States marketing departments have been officially authorized by law. New Jersey and three southern States have placed these bureaus under the commissioner or

the State Board of Agriculture. In three States — Oregon, Minnesota and Kentucky — the bureau is in the direct charge of the agricultural college; in two States — Michigan and North Carolina — the Board of Agriculture and college officially co-operate in carrying on the work. Four States — New York, Idaho, California and Texas — have independent bureaus with wide powers.

In addition to these officially created departments, 13 States employ men to do instructional or administrative work in co-operation and marketing among farmers. Nine of these men are employed by colleges of agriculture and four by commissioners or boards of agriculture.

What the Market Bureaus do.

The duties of these men were not altogether clearly defined at first, since the field is so broad and the problems so many. Now there is coming about a pretty clear definition of functions. Six classes of marketing problems may be recognized.

1. Investigations of marketing methods or costs of marketing. Studies of the distributing system for farm products.

2. Instruction in methods of organization, management and bookkeeping of co-operative societies.

3. A market news, information or exchange service.

4. Administration and enforcement of laws relating to the distribution and sale of farm products, including licensing middlemen, auctioneers, fixing fees and charges and inspection.

5. Determining and establishing grades and standards of products and containers.

6. Issuing publications bearing on the distribution of farm products.

Investigation.

In any State these lines of activity are sufficient to require the energies of several men. It is only a question of what can we afford to eliminate. Practically all of the work of market investigation is conducted by the agricultural colleges and experiment stations, which can employ trained men to give their entire attention to specific problems. In line with this principle the Massachusetts Agricultural College has just issued a

bulletin on the supply and distribution of Connecticut valley onions, and will soon publish the results of a study of the costs of milk distribution in six Massachusetts cities and towns. The investigational work of the Federal Office of Markets has been explained by Mr. Gilbert.

Field Instruction in Organization and Marketing.

Up to the present the organization work in marketing has consisted chiefly in instructing farmers in proper methods of organizing co-operative societies for purchase, sale and production, and in teaching the best methods of conducting the business of the association after organization. None of the market bureaus, except perhaps those independently established, have undertaken the actual organization of farmers. In the practical division of labor the college men and the market bureaus established in agricultural colleges have had the most to do with this organization work. As a general principle, all matters of education, whether at the college or throughout the State, should be placed in charge of the educational institutions.

In Massachusetts instruction in the organization of co-operative societies and in marketing has been carried on by the extension service ever since the extension professorship in agricultural economics was established. Any one who has attended a meeting of farmers who desire to organize a co-operative society understands the necessity for much more instruction along this line. This instructional work in organization, then, is a real function of the agricultural college, and in practice, where two agencies are doing marketing work in one State, this function is being taken over by the agricultural college.

Administrative and Regulative Activities.

The four remaining functions outlined are managed in various ways by the different State bureaus. The independent bureaus have very wide powers, and in some instances have undertaken the actual work of distributing farm products, and have become middlemen in distribution. In the southern States the work of the bureaus has been pretty largely devoted to maintaining exchanges between farmers and consumers for the sale of com-

paratively small quantities of products. Lists of farmers having products to sell are made out weekly or monthly and mailed to prospective buyers. In this way a large number of sales are made.

Some sort of market news and information service for the benefit of farmers or groups of farmers has been inaugurated by a number of the market bureaus, supplementing the news service of the Federal Office of Markets. But no comprehensive plan for giving out market information has been put into operation by any State bureau so far as I am aware.

The administration and enforcement of laws relating to the distribution and sale, and to the distributors, of farm products is entirely an administrative and police function which, I think, should pertain to the State bureaus organized independently or under the boards of agriculture. The determination of grades and standards of farm products and containers is a matter of legal enactment, and appertains to independent market bureaus and others only when these powers are specifically delegated to them by law.

Some Specific Illustrations.

Some of the specific activities of these bureaus are worthy of mention. The department of foods and markets of the State of New York, as most of you know, has promoted auction marketing in New York City, and has been exceedingly active in assisting the farmers to market apples, peaches, eggs, potatoes and other farm products. The department has acted as receiver for the New York Fruit Auction. Moreover, this department, under the energetic leadership of John J. Dillon, has taken an active part in the recent "milk war" in New York City. Mr. Dillon has undertaken energetically an investigation of the abuses which he maintains exist in the poultry and egg exchanges and among the wholesale middlemen of New York city.

The State of Idaho has an independent market bureau very ably and energetically manned. This bureau has done much in the way of giving timely information to farmers as to prices and markets for agricultural products. When the bean associations

of Michigan fixed the price of beans, the result of the meeting was immediately telegraphed by the director of markets in Michigan to the director in Idaho, and from there conveyed at once to the bean growers of that State, with the result that the price of beans in Idaho rose $2 per bushel in one day. This year the Idaho apple crop was very short, and whereas Idaho usually exports many carloads of apples, this year she was obliged to import. The market bureau negotiated with the apple associations of Washington and Oregon, and took general charge of the importation and distribution of apples.

California State Commission Market.

California, whose marketing bureau is called a State commission market, instead of a State market commission, has been very desirous of bringing together the various co-operative organizations of California into a conference which shall result in the exchange of information regarding the markets to which they are shipping their products. The California Fruit Growers' Exchange ships oranges to many parts of the United States, and has a very efficient distributing system, but perhaps 25 to 30 per cent of the oranges in California are not distributed through the exchange. They are handled privately or by independent co-operative societies. Mr. Weinstock has endeavored to bring these organizations together in such a way that they will not compete in the various markets of the United States, and will guard against the oversupply or glutting of any market.

This bureau also established a municipal fish market in San Francisco for the purpose of distributing fish to the citizens more cheaply than through the ordinary channels of trade. For some time the price of fish was exceedingly low. Everybody had all the fish he desired, and everybody was satisfied except the fishmongers. But suddenly, for some unknown reason, the municipal fish market was discontinued. The first and immediate result was a dumping into San Francisco Bay of tons of fish. Since that time fish have been higher, and fewer have been distributed.

In connection with the exchange conducted by the South Carolina bureau of markets the commissioner keeps a card cat-

alogue of wants and offers for sale. When anybody writes to ask where he can obtain a specific product, the commissioner turns to his cards and writes the prospective buyer immediately. On each Tuesday morning a printed bulletin of wants and offers is sent to those whose names are on the mailing list. This bulletin is also published regularly by the leading dailies of the State and by twenty-one weeklies. The commissioner reports that the average transactions of the bureau amount to $30,000 per week in dull seasons, and at least $60,000 per week in rush seasons.

The bureau of markets established in Michigan sends out mimeographed bulletins regularly to a large mailing list in the State, giving advice and information concerning market conditions. The prospects of wheat prices, the situation with regard to peaches, the probable supply and demand for beans, the best method of federating the peach growers' organizations, are some of the topics considered in these bulletins.

Massachusetts needs a Market News Service.

Enough has been said to indicate the importance of a marketing bureau, and to show that there is a field for such a bureau in Massachusetts in addition to the instructional and investigational work that is now being done by the Agricultural College.

1. One of the present needs of farmers in Massachusetts is a comprehensive market news service. Such a news service maintained by the Board of Agriculture might issue regularly, in co-operation with the Federal office —

(1) Weekly or daily quotations of prices of farm products in Massachusetts and competing markets.

(2) Statements of supply showing the condition of the market crop in different market areas of production, the quantities that are shipped from these areas and their destination, the quality of the shipments and the size of the crop. This placed regularly in the hands of Massachusetts farmers who had products to ship would enable them to gauge intelligently the market prospects and bargain more efficiently with middlemen.

(3) The conditions of consumption, the market demand and the possible outlets for the chief crops, not only in this State but in others.

(4) These bulletins might also call attention to market prospects for the chief crops. For example, the potato market was particularly bright and prospects for potato sales particularly good this autumn. A bulletin setting forth the general conditions and the possible supply would have been of advantage to many of our farmers who sold storable potatoes very early.

(5) The bureau might also issue yearly summaries of production, of prices, of shipments, figures of interest to Massachusetts farmers, and, at other times, such market information, new legislation, etc, as is advisable.

Assistance in Marketing.

2. Furthermore, the State bureau of markets might well stand as the farmers' representative in their transactions with consumers or middlemen involving the purchase or sale of farm products or farm supplies or equipment. Frequent misunderstandings arise between the farmer and the distant middleman. It seems to me that the State might well provide a disinterested advocate who would investigate the causes of dispute and, if possible, set the matter right between the contending parties. Very frequently farmers have claims against middlemen, railroads or others that they do not care to push because of the cost, or because they do not well know how to set forth their claims. The "Rural New Yorker," through John J. Dillon, has for a number of years maintained such a department. This department stands ready to investigate the claims of farmers, and has brought about settlements which otherwise would have resulted in very large losses to the farmers.

Frequently when carloads of apparently good produce are shipped to wholesale receivers statements are returned that they arrived in bad condition. A market bureau might well investigate these cases at the instance of the shipper, to see whether the statements are correct. These may be new functions, but it seems to me they are very desirable. If done disinterestedly, this service would bring about justice and a better understanding between producer, distributor and consumer.

Advertising.

3. Another function of the State bureau of markets is the organizing of advertising campaigns to encourage the production of crops which can be grown profitably in Massachusetts, to increase the local demand for such products and to widen their market. This may be done very legitimately and, I think, effectively by such a bureau.

Grades and Standards.

4. The establishment of grades and standards has already been discussed. The State Board of Agriculture is by law authorized to enforce the apple packing and grading law. Other laws of similar nature should be enforced by a bureau of markets. Grades and standards for other products, after thorough investigation and co-operation with the United States Department of Agriculture and the State marketing bureaus of other interested States, should be promulgated. The matter of standardization of farm products is a large problem in itself, and will keep a bureau of markets busy for years.

5. Another function of such a bureau is the initiation and promotion of desirable legislation relating to the marketing of farm products. The State Board of Agriculture, through its committee on legislation, has initiated very much legislation of value to the farmers of the State. The bureau of markets might concentrate on legislation that had to do with the marketing of farm products. More than this, such a bureau might take upon itself the killing of some of the undesirable legislation which appears every year.

6. Such a bureau should co-operate with the Federal Office of Markets, the Massachusetts Agricultural College and with other agencies which are conducting investigations or assisting in any way with the distribution of farm products. It would seem to me very desirable that in Massachusetts the Agricultural College continue the organization and marketing work which it has begun and has been carrying on with the farm bureaus and co-operative societies, and that the market bureau take up the other great and pressing problems which we have outlined.

A Bill to establish a Director of Markets.

In furtherance of these purposes the Board of Agriculture has for three years presented a bill providing for a director of markets under the general supervision of the Board of Agriculture. Practically all who are interested in profitable agriculture in Massachusetts have supported it loyally. In my opinion the bill has been improved each year, and I think the bill presented this year is better than either of its predecessors. I am in favor of it in all points with the exception of the name of the director, who according to this bill is to be called a director of markets and organization.

For the reasons already given you I am sure that the matter of organization is one of instruction, and that this instruction is being very well given through the Extension Service of the Agricultural College. The name of this officer should be the director of markets, rather than the director of markets and organization. With this amendment the bill is an excellent one, and while it carries but a small appropriation, $5,000, there is no doubt that if such an office is established this is but an earnest of the sums of money which this State will in the future probably place at the disposal of such a bureau.

I sincerely hope that every man here present will see to it that his representative and senator votes right on this legislation when it reaches the General Court.

A Member. Mr. Chairman: Professor Cance and Mr. Gilbert both emphasized the profitable production of farm crops, and so forth, and I was wondering how much profit there was to the grower of those strawberries down in Florida that Mr. Gilbert bought for 15 cents a quart in January. [Laughter.]

The Chairman. I guess in a number of instances where perishable products come from a long distance they can't tell whether they will get the freight paid or pay it themselves, but it would seem as though there could be some report so that these growers would know about how much would come in on a certain date from the different sections, and, of course, as these bureaus get widened out and get more money and more agents in the field they can report from the different sources

about how much stock is coming in. That's about the only way to get at it, in my opinion. Is there any other question?

Mr. GILBERT. In reference to grades and standards, I did not mention in my few words the fact that the office of markets or organization in Washington has a project which concerns itself directly with grades and standards. We have considered this one of the most important of our projects, and considerable effort is being put forth along these lines. It seems to me that if there is any phase of co-operation between the Federal States most desired, it is in the promulgation of uniform standards for all parts of the country. Of course, there are certain limitations to that. The products from some districts would not require the same sort of a package that would be used in another section of the country, but, nevertheless, the promulgation of uniform standards throughout the country for most of the products would be of great benefit, and I think there is a point of contact between the States and the Federal government which is very, very important.

The CHAIRMAN. Of course there comes up the difficulty, when you establish a standard, that in a certain section of the country during certain seasons there is none of that product that comes up to the standard. For instance, I heard the other evening a gentleman say that a certain co-operative association which sold apples wasn't in the business this year for the reason that their apples were not up to the standard that the association wished to handle, so that in that region the question of standards wouldn't apply very well the year when there was nothing but the very low standard.

Mr. KENDALL. I would like to ask a question both of Professor Cance and Mr. Gilbert, and I would like to hear from both of them. First, of Professor Cance, whether further organization on the part of the farmers will help to make more effective the work to be done by the proposed bureau of markets provided by the bill introduced at the State Legislature by the Board of Agriculture, and if an organization of what is known as farmers' exchanges in the towns throughout the State would not be of benefit to the farmers, and enable the present Office of Markets Organization to accomplish more it it was dealing with organized bodies of farmers. Second, if it would be

a proper function of this new department of markets to collect and have on file information gathered, perhaps, through the farm bureaus or county agents, as to the approximate bulk of given crops in given localities and the time of maturity of those crops, shipping centers, etc. And of Mr. Gilbert, whether his office is authorized under the present law to collect such information, and if the present work of the Office of Markets and Rural Organization could be more effective, both to itself and to the farmers, if they were organized so as to be treated as units rather than as individuals.

Professor CANCE. It isn't mentioned in the bill, but Mr. Wheeler has spoken about that sort of thing, — as to the method of gathering data, — and I believe it is contemplated to use these farmers' exchanges to gather the data, as far as possible. It is to be said, of course, that, except for the milk associations and the cranberry growers, the farmers' exchanges do not cover a very large part of the products that are handled in Massachusetts. The milk producers through the form of organization that we have presented to them are required to keep an actual statement of the amount of milk that is sold by each individual farmer, so that that particular thing can be known absolutely. There is no question about it. Another thing, I would say that we are just beginning to take up at the Agricultural College, through the county agents, as far as they are willing and able, a little study as to the consumption of certain products here in the cities. The consumption of apples, for example, is one of the things. I don't know how far we will get with it. There is a good deal of work in that connection that must be done, and it costs something, but the farm bureaus are co-operating in that regard. I should say, in answer to all your points, the thing is quite feasible and has been considered.

Mr. GILBERT. With reference to the portion of the question which was asked of me, I wish to say that, in the first place, with reference to organization work, the Office of Markets and Rural Organization has distinct projects connected with it which are for the purpose of fostering and assisting farmers' organizations in all of their activities. In the second place, regarding the publishing of information as to the quantities of given crops, the Office of Markets would be encroaching upon

the functions of the Bureau of Crop Estimates, which is specifically detailed to cover that phase of the government's activities. You have a splendid man here in New England as agent of the Bureau of Crop Estimates, Mr. Sanders, whose headquarters are at Wakefield, and he is doing some admirable work and is getting the confidence of the people, and the reports which he puts out are very good indeed. That phase of the work is being taken care of through the Bureau of Crop Estimates, and it would be an encroachment upon their work for the Office of Markets to attempt to duplicate it. Their work will, doubtless, be enlarged to take care of things as they come along.

While the marketing session was in progress, Mr. E. L. Bradford, General Manager of the Turner Center Dairying Association of Auburn, Maine, was speaking to the Massachusetts Milk Inspectors Association on "My Experience as a Distributor of Milk."

MY EXPERIENCE AS A DISTRIBUTOR OF MILK.

E. L. BRADFORD, AUBURN, MAINE.

My experience as a distributor of milk has been, as a whole, a comparatively tame one. Yet I can testify in parody to the song, "a milkman's life is not an easy one." I have simply gone right on in a blundering way trying to do right as I knew how — and could. A certain deacon when asked whether he considered himself honest, frankly replied, "As honest as the times will permit." Such answer may be of wider application than most of us would like to admit. However, our concern has kept the straight and narrow path fairly well, and in only a very few instances has it collided with the law. In such cases we got only what belonged to us — justice. One case resulted from negligence of employees to stir up a vat of milk before drawing it off. Another case occurred years ago through the folly of an agent in trying a sample of preservative from a salesman who told him in the most confidential way the other concerns were using it. In another case we were haled into court because we did not label cans of buttermilk in a manner similar to that required for skim milk. In this case we were, of course, acquitted of infringing the law.

As for our treatment by inspectors, we consider it has been fair and reasonable except in one or two cases about which perhaps the least said is best. On the whole, we think our relations with health authorities have been very satisfactory, considering the extent of our dealings. I am speaking for ourselves now and not for the officials. We are licensed to sell milk in fifteen towns in Maine, twenty-seven towns in Massachusetts and four towns in Rhode Island. We also ship into numerous other towns in which cases no license is required of us.

One thing which we dislike in common with other dealers is the varying regulations in different towns. I think Mr. Lythgoe

of the Massachusetts Health Department called attention to this evil in an address in this city at the time of the National Dairy Convention. I was told that he said "88 towns in Massachusetts have 900 different regulations." Perhaps I haven't got this right, but the facts are bad enough. It would seem that a set of regulations might be devised that would apply to and be adopted by all the larger cities. Perhaps the New England Milk Producers Association has this thing in view along with other matters of standardization. I am not assuming to make any recommendations; only just helping agitate the question to keep it before those who are competent and whose duty it is to work it out.

A very objectionable milk law, to my mind, is the statute law forbidding the sale as pure milk of milk from which the cream or any part thereof has been removed. This is equally objectionable from the viewpoint of the producer and the consumer. It is well known that milk rich in fat as it comes from the cow is in some degree correspondingly rich in solids not fat. A $4\frac{1}{2}$ per cent milk skimmed to $3\frac{1}{2}$ per cent would be richer in solids than milk of $3\frac{1}{2}$ per cent as it comes from the cow. Yet while it is lawful to sell the poorer $3\frac{1}{2}$ per cent milk it is not lawful to sell the richer. It seems to me this law practically says to the producer, "If you want to continue in your business you must keep cows that will give a large flow of thin, watery milk." Although that is the effect of the law it was not the intention of its makers. Judge Carroll in reference to this statute said in his decision of May 19, 1915, "The statute was passed for a purpose. It was to protect the public health." No doubt that was the main reason for the law, and I think the law makers might well have had in mind, also, to protect the public from being defrauded in the purchase of an important food, the real value of which is not so apparent as in the case of some other foods. Does the law accomplish these commendable purposes? The main questions to be considered are —

First. — Is $3\frac{1}{2}$ per cent milk skimmed down from $4\frac{1}{2}$ per cent any more a menace to public health than $3\frac{1}{2}$ per cent milk as it comes from the cow?

Second. — Is $3\frac{1}{2}$ per cent milk skimmed down from $4\frac{1}{2}$ per cent any more a fraud upon the public than $3\frac{1}{2}$ per cent milk

as it comes from the cow, especially since the former is somewhat richer than the latter in total solids?

It seems to me the answer to both questions is "No." If this feature of the law is without reason, and if its effect is detrimental to breeders of cattle for rich milk, why should it not be repealed? There are laws inconsistent with the plain dictates of common sense. This is one of them. Another such law is the one prohibiting the sale of skim milk in New York City.

The law of which I am complaining, coupled with the practice of producers selling to dealers by the can, regardless of the real value of the milk, results in coarse work commercially. We keep a record of all the milk and cream bought at each of our 20 creameries, and likewise a record of the disposal. This applies to the pounds of milk and cream bought and sold and to the fat therein. Exception is made as to the sales from our Auburn and Portland factories, where we have not as yet attempted to keep such records. But for 18 creameries where such records have been carefully kept and proved twice each month (as of pay day) we find that for eleven months we come out with a loss in weight of milk and cream of two-tenths of 1 per cent, and with a loss in pounds of fat of three-tenths of 1 per cent. This means that for every 100 pounds of milk and cream bought we sold 99.8 pounds; for every 100 pounds of fat paid for we sold 99.7 pounds. Now do not think for a moment that our employees weighed and tested each lot as closely as this, but they weighed and tested each lot as closely as they could. They all understood that was what they were there for; and the average was very satisfactory. Perhaps one producer for one day or for one period got less or more than belonged to him, but there is no reason why each one should not get pretty exact justice in the long run under our system. Compare the system of buying of producers by the can without regard to test of fat. Three and five-tenths to 4 per cent is no extreme variation in the milk of different herds. This means that for every 100 pounds of fat furnished in the richer milk the yield of fat in an equal number of cans of the poorer milk would be 87.5 pounds. This is a big variation in values — what I call coarse business. The variations found by various milk inspectors are

probably not so great as they are in different herds, for the reason that dealers mix the milk of the herds. But from what I know of the conditions I believe that market milk values are about as wide apart as are the 9 and 10 cent prices about which there is so much discussion. And this is necessarily so on account of a feature of the milk law which is absolutely no good looked at from any standpoint. I realize it would take some courage to promote the change in the law which I have proposed. Following the beaten path is a safe and easy way, but is liable to result in conditions not to be desired, like the picturesque but highly inconvenient older Boston.

The cares of the distributor of milk begin with the dairies. Cleanliness and liberal use of ice may be urged upon the producer. It does not cost farmers over $1 a ton for ice, on an average. This is 5 cents per 100 pounds. A farmer can hardly use more than 50 pounds of ice to 100 pounds of milk. Two or 3 cents' worth of ice is sufficient to keep 100 pounds of milk in first-class condition until delivered to the dealer. For several years I have called the producers' attention to this fact at the proper season for storing ice. Nearly all of our patrons do store ice.

The most effective inspection of dairies that I have observed has come clothed with authority from the market in which the milk was to be sold. This inspection is at a standstill now for some reason. I wish that it might be resumed in a reasonable fashion, not too rigorous in its requirements. The next care of the distributor comes in the transportation. This is a matter of no small amount of anxiety where freight train service is used. Such service has not improved any in the last ten years. Freight train service, except in specially favorable cases, is so incompatible with our increasing desire and determination to market a fine quality of milk that I have recently made application for passenger train service in accordance with the order of the Interstate Commerce Commission. Thus far we have had no tariff covering carloads in passenger train service from the Maine Central Railroad, but we are to have it now as soon as equipment can be procured by the railroad company. This will make an increased cost of about $30,000 a year for our company; but that amount distributed over 20,000,000 quarts

will not bear so very heavily, and ought to be compensated for in improved quality of milk. Before I was called upon to prepare this paper I had thought of notifying health officials where our milk is sold that we were going to use the better and more expensive passenger train service; that we were already requiring more frequent deliveries by producers; and in various ways working out and projecting improvements with a determination to bring our milk to a higher standard of excellence.

When the milk arrives in the market the troubles are by no means over. The demand is capricious, resulting too often in a feast or a famine. I have a theory that the situation is aggravated in the following way: when buyers suspect a shortage they order heavily — overstock themselves. By the time an extra supply is brought to hand the customers do not want it, and the distributor has an undue stock on hand. There is no remedy but to use one's best judgment in making shipments. This is merely an apology for the oversupply we sometimes have on hand. With quicker train service the situation should be improved somewhat.

The neglect of customers to wash cans and bottles as soon as emptied is a thing to which we are giving considerable attention. There is law enough for this matter, but a dealer hates to lose business by offending customers. We are working an educational campaign along this line as tactfully as possible.

As for this new-fangled notion of alphabetical milk, — A, B, C. While I do not, as the politicians say, view it with alarm, I am inclined thus far to look askance at it, with a degree of suspicion. I have worked the thing out only in imagination which, of course, is not so reliable as actual experience. It must involve extra expense to keep it separate in the creamery and on the delivery teams, unless you go over the ground an extra trip with special teams. The accounting with salesmen will be a little more involved if grades A and B are carried by the same driver. It is not easy at best to load out a team so there will be milk enough to go around and not be too much to return. I should think this difficulty would be increased by having two grades. If you run short of one kind it would not do to substitute. It would be wicked to label and sell B milk for the price of A milk, and to sell A for B would be discrimina-

tion. Then every producer must have an even chance with every other to sell "A" milk, whether there is demand for it or not. It is not reasonable to suppose that demand and supply of different grades will check up evenly. I seem to see temptation in the plan. I think milk dealers might solemnly and appropriately voice those well-known words, "Lead us not into temptation." Every one knows how badly temptation worked out in the fruit business, and I doubt whether milk dealers are any more immune. If our progenitors had gotten into the milk business ahead of the apple business the downfall of our race might have been ascribed to a different cause.

Afternoon Session.

At the afternoon session the first speaker was Mr. O. M. Taylor of Geneva, New York, who spoke before the Massachusetts Fruit Growers' Association on small fruits. This was followed by the Board's conference on organization and marketing, with Secretary Wheeler and Mr. Edward B. Wilder of Dorchester in the chair. The first speaker was Mr. Marcus L. Urann, President of the United Cape Cod Cranberry Growers' Association, who spoke on "Business Organization as related to Agriculture."

BUSINESS ORGANIZATION AS RELATED TO AGRICULTURE.

MARCUS L. URANN, BOSTON, MASS.

We cannot hope in a single talk within the time allotted to present more than a few points of this important subject. If, however, there occurs to some of us during this hour an idea which may later develop, ripen and bear fruit to the benefit of the industry, or to any branch of society, which draws so much of its life from the country, then we will know this hour has not been wasted.

Organization in commercial lines is quite generally understood and accepted, but its application to agriculture is a comparatively new and untried field. Our physical and natural conditions have contributed to keep it so; even our form of government has resulted in disseminated rather than centralized development.

Our system of marketing and transportation of our various crops, not only in the different parts of the country, but even in the same section, makes the subject more difficult. Then, too, our people come from every known part of the globe. Some sections are peopled by like races, having similar appetites and habits, while other sections are composed of a mixture of people, whose methods of living are widely different. Therefore each particular market must receive special consideration to determine what it wants, when it wants it, its appearance, quality and condition. Add to this that many of our markets are changing and developing, so that he who would organize to supply a given market must not only consider the change in quantity of goods, but, far more difficult still, he must anticipate the changing appetite and needs of a developing population.

These varied conditions mean increased expense to supply all of the various tastes encountered even within a small area, and

requires an efficient service expensive to maintain. Just how far we can regulate and control the development of market taste has yet to be determined, and is one of the great questions for a business organization.

Organization is simply the recognition of certain definite and well-fixed principles, their segregation, proper use and application to the particular industry under advisement. It is the natural way of doing things.

In organizing the United Cape Cod Cranberry Company we desired to secure the administrative purchasing and selling advantages of being large while still retaining personal ambition and ingenuity, to accomplish which the property of the company was divided according to location into given areas, over each of which a superintendent has control, with the same authority that he would have as owner of the property. He keeps a monthly report showing what is done, why it is done and the result. The superintendent himself determines his conduct and measures his success by these reports.

Another obstacle to organization is the business success of the average farmer during the last twenty-five years. True, the feeling is quite general that he is not receiving his fair percentage of the profits from our industrial system. Perhaps, too, he is beginning to realize that legislation which he sought has not proven the panacea expected, for too often laws passed at his behest have contained riders at the request of some influential organization, who saw through him an opportunity to obtain an advantage or secure protection. Nearly always the laws are a compromise. If his law could give the expected relief, it often failed because of administration. It seems a fact, reckoned with by every one except the farmer, that in some way the politicians appear to have charge of the administration of most laws, and they have the uncanny desire to hold their job, to insure which so much of their strength is exhausted that they have no capacity to sympathize with the spirit of the law, or gain the information necessary for its success. The good man (and there are a lot of them in politics) cannot depend upon the support of an unorganized class of farmers.

Capital has combined until its ramifications extend in such a network around the world that it is a unit, and if affected in

any particular place, like the blood of our body, relief rushes from all sections.

Our railroads, street railways, express companies, refrigerator car companies, cold-storage plants are organized with such combination and vision that any industry less organized is at a distinct disadvantage in doing business with them. We think in terms of organization, of large units, lacking which an industry has little respect and no consideration. This is a time of giants. The single tree from the forest will float, but a thousand trees combined make the giant ship to combat storm and gale, defy the ocean's tempest and carry a Nation's trade according to the will of the master.

Inventions are so related to agriculture, and the manufacture and distribution of farm machinery so well organized, as to take tribute from the farmer if desired. This business is obliged now to follow such methods of selling as to materially increase the farmer's cost of doing business.

Labor is organized until it can dictate to the highest bodies which govern us. In the face of all these tremendous movements the farmer still tries, single handed, to combat these organizations, which are determining the course of trade and swaying governments and thrones.

Agriculture has a definite place to fill in the economic development of the world. It is a wheel to the wagon, but whether or not it fulfills its destiny, or, failing, destroys the other great organizations, depends upon the farmers themselves. The farmer needs organization, also, because he has not the capital to distribute his crop, to give necessary credits, or properly develop markets. He lacks not only this financial strength, but also the ability of specialized selling agencies, in harmony with which he is not now fitted to work.

After adopting an organization the next step is to determine how it works, to accomplish which use a simple method of accounting. This will show that certain sections of even the same farm will produce a better quality of some goods than of others; that some sections will produce in greater abundance even the same crop than other sections; that for various reasons, physical or otherwise, some sections can be cultivated at greater economy than other sections; that methods of doing the same work

must be changed in different sections. The expense of production, quality of product, shrinkage in storage and market results known only by accounting determine what crops should be continued and what avoided.

It is sad to learn how lightly accounts are regarded, when often the apparently unimportant detail, lost to memory, determines the success or failure of a whole season.

In commercial lines we can try experiments fast, — our results are soon determined. In agriculture, however, work is by season, often permitting but one experiment a year, and extended over a period where accounts and records are absolutely essential.

The farmer's attitude is not surprising, for he has been born and bred to depend upon himself. His own personal judgment determines his crop, its planting and cultivation, harvesting, packing, as well as when, where and through whom to market.

These conditions not only convince us that organization is needed, but with other facts, now to be mentioned, prove this an opportune time to present in some sections, in some degree, a concrete plan.

Our natural resources are quite, if not entirely, used or exhausted. Our soils have lost their virgin richness. The hundreds of saw and grist mills operated by water power along our streams, and which, because of their number and distribution were no small factor upon which the farmer could depend, have now been starved by exhausted raw material, or crushed in the battle of competition with other great forces. No one is justified in producing what he can buy cheaper than he can raise.

The farmer feels his lack of business training and experience as never before. Observation and the printing press have opened his eyes to what is being done in special lines. The farmer feels his responsibility and opportunity to feed our people, who are becoming yearly more and more helpless to feed themselves. People are crowding into cities with no opportunity to produce. The first generation soon forgets, while following generations never acquire the knowledge to use the soils. A larger percentage of our people are annually becoming workers in factories and distributing agencies, living under conditions which preclude storing a surplus food supply. The squirrel lays by his winter stores, but man individually depends with almost

criminal unconcern upon others for the necessaries of life beyond his immediate wants. True, cold storage, canning and other methods have developed within the last few years, but the farmer is the final bulwark of safety, and only his neglect has permitted these agencies to develop and absorb the profits which rightly belong to him. We can, however, overorganize. There are two ways to destroy the value of the farm to society, — first, overorganize or commercialize it; secondly, let it fall so far behind in the industrial race that those interested in it, or upon whom its future depends, quit in contempt or discouragement. To avoid such a calamity the first requisite is an ideal, a vision of the great opportunity furnished by agriculture to do something worth while, the success in accomplishing which depends upon the quality and amount of brains, skill, cunning and hard work employed. The farmer should himself show a higher respect for his business.

The first great product of the farm is the home, the great source of stamina and moral fiber, the source of that undescribed but definite something influencing a man to shape his life by a principle; here is developed ingenuity and inventive genius, as well as a wilful determination to succeed and the physical strength to sustain.

The farm, however small, should be organized in detail as a solid business unit. Buildings should be so placed in relation to each other and in view of the duty to be performed so that time, labor and investment will be reduced to a minimum.

Build in proportion to the business. Avoid a $1,000 barn for a $100 crop. Watch details. Avoid waste. Seek a balance in the various departments. The barn, shed, outbuildings and house should have such a relation to each other in size and convenience as to perform their functions at proportionate expense.

There are three classes of farmers, — first, the farmer of necessity, who has inherited a farm, and cannot get money enough to leave it. He has not the stamina to let go of the old ideas and undertake new methods, nor to play the long game, either because he does not know it or can not afford it. Necessity compels a crop for which his place is often not adapted and seldom prepared. Thus the industry is injured and his children ill fitted for a place in society.

The second class are farmers of entertainment; they may be retired business or professional men, or men yielding to the desire to become producers, or who, for diversion, start a country place and become the laughing stock of the community.

The third class actually makes a living from the farm. Hard-working, self-denying, training the children for some other business, he keeps his knowledge to himself.

Now of these three classes we should expect nothing from the first, the third is too occupied, but the second one, the center of jest by the rural population, viewed with suspicion by the city men, unclassified by the agricultural school, is really the man upon whom our hope rests, for he has the ideal and the courage to live for it. By business experience he is better fitted to consider the problems, and financially able to put his conclusions into effect. This man just needs to realize his responsibility and the great opportunity outspread before him, and to be regulated and directed.

Agriculture needs, as never before, to be dominated by a comparatively few men; they must be leaders in foresight and energy. But in no industry is it so necessary for success that the organization is understood by all, entered into by all and the profits shared by all.

We are growing too many crops without organizing the community itself, including standardizing the crop and product. The attempt has been made to immediately put on agriculture an organization, equipment and efficiency which commercial lines, though lending themselves more readily to organization, have required years to accomplish.

The farmers have reached no extremity; they are not in a fit of the blues, nor are they in the last ditch of despair. The fairly intelligent man has succeeded and will continue to succeed without an organization, but every man will succeed better if organized, and agriculture as a whole can occupy its true position and fulfill its service to society only by organizing.

Select your neighborhoods in which to start; it will be many years before any agricultural organization, however desirable, will be universally adopted. In determining the location remember that necessity alone must be the force to draw these people together. This is not abandoning the higher ideal, but

recognizing the necessary tools by which alone that ideal can be accomplished. Let this community determine what crops it will raise, to decide which it is necessary to know the needs of the proposed market, means of transportation, the competition likely to be encountered and the nature of the soil to be worked.

Frequent crop reports from competitive sections will help the producer to determine the time of developing his crop to the best advantage to both himself and the consumer. The word "competition" is used advisedly, because that must be reckoned with for some time yet. As a matter of fact, there is no place for competition in a properly organized industry, and especially in agriculture.

There are so many people, and they will eat so many potatoes, so much wheat, corn and other food products. Agriculture, when organized, will know what sections can best produce a particular crop, and, with proper advice as to the area planted, there should be no surplus, no waste, no duplication, and our producers would avoid attempting something which more complete or advanced information would have shown them could result only in failure.

The next step in the organization is neighborhood or community equipment. It is seldom in this section of the country at least that any one farm is conducted on a scale permitting an economical equipment, although our production cost can be greatly reduced by using the machinery which modern invention provides.

With your community standardized as to crop, you could then have a community department of labor, just as the city has its fire apparatus, sewer department, etc. The expense of this universal equipment would be comparatively small to the individual, and the work conducted by a special crew trained and experienced for a particular service could be accomplished more effectively and at less cost than in any other manner. Frequently it costs as much to tone up the machine before using, and pack away after using, as it does to do the work. Under this plan this item would cost no more for many farms than for one. Also it frequently requires some time for a crew to readjust itself to a new job. All of this expense would be saved.

There should be a community department of construction and

repair; its workshop should be centrally located and specially fitted and stocked for general repair work of tools and equipment in stormy weather, and in pleasant weather it should attend to the repair and construction work of the community, beyond the farmer himself in ability or equipment.

The matter of spraying for crops as well as weeds will be much more effective if conducted by a crew especially trained for that service, gaining economy in equipment, materials and labor. This plan will tend to a good equipment for a few crops instead of a poor equipment for many.

There should be community storage. It is folly to expect each producer will, can or should provide suitable storage for his crops; the cost is unreasonable, prohibitive and wholly unnecessary. It can be easily determined over what period a crop is likely to be marketed, and central storage facilities provided at comparatively low cost to the individual. Every man is vitally interested in this matter, for his product, under the present system, must come in direct competition with similar goods stored, packed and transported under all kinds of favorable and unfavorable conditions.

Community storage will likewise change what is now a loss into a profit. On every place, however large or small, there is always a surplus of fruit or vegetables, which at present are being wasted because not in sufficient quantity to market. With central storage these small lots will, together, be an amount worth shipping.

At this central house should be community packing. To properly pack a commodity of any kind is a fine art, and to pack for different markets requires special knowledge of the conditions at destination, as well as the distance and means of transportation.

This central packing house will also help to remove a thorn from the flesh of the producer universally referred to as "the middleman's profit."

Without defending any one I wish to say that much of the expense between the producer and consumer is due not to the abnormal profits or dishonesty of any one handling the goods, but to the system itself, much of which can be saved by the method advised, and the chance of dishonesty greatly reduced.

Having the storage houses the producer will keep control of the goods, so that there will be no reported sales on a rising market or delayed sales on a falling market. No plan has yet been devised to successfully avoid the middleman, and it will be far wiser to work with him. Few commission houses have facilities for handling and keeping the goods under favorable conditions. The producer's storage facilities should be used by the brokers, saving rent, repacking and clerical work, as well as quality loss. They would have a larger stock from which to select and less competition among themselves, at least, the competition would not center around the goods being sold, but would be based on service rendered. It will save self-competition. Very frequently a shipper will send goods to several brokers in the same market, and thus they are bidding against each other on his goods. Fill the broker's order from the storage house nearest the purchaser.

A purchasing department should be located at this central packing house. A trained buyer will save his expenses several times over, even for a small group of farmers. Buying in bulk is a small item compared to finding stock articles to replace specialties, or to finding a ready-made tool for a particular service.

The next step is joint shipping, which, properly developed, will save freight, breakage, packing, loss in transit and avoid a surplus in any market. There are distinct advantages in quantity shipping. Many producers desire to distribute their crop during the entire season, or have less than a carload, or after loading have a remainder, in all of which instances, by uniting with other producers, as can effectively be done only with a central packing house, it is possible to match lots so as to load a car of the same grade and quality of product.

At present, and probably for some time in the future, shipments will be made regardless of like goods sent to the same market from other places. The individual shipper cannot afford the expense, nor has he the facilities to watch shipments, but the community department can keep closely in touch with the various markets within his reach, as well as shipping points, so as to know when, where and what class of goods should be shipped, as well as determining the time required to reach

consumption. This will materially affect the expense in packing.

Another great advantage is the use of by-products. No producer but that at times has a perfectly good product and always a second quality which, for various reasons, cannot be marketed to advantage. It is a very small community that cannot support a preserving plant, permitting spare time or unused land to be utilized with distinct advantage.

So far we have considered only the cold-blooded business aspect of the situation. Necessity makes a man work just to supply his need. Beyond this it must be higher motives. Few work for money. It may not seem so, and possibly the man himself may not analyze his motives, but generally the pleasure of doing things, the zest of the game, is the force driving him to invention, sacrifice and work, and if he has no room to employ this energy, resting in some degree in the breast of every human being, either his spirit is broken or he seeks a new field.

What a wonderful opportunity organized agriculture presents to train and direct the push and energy of youth. If agriculture will keep at home some of the jobs which can be done in the country, but which as now organized are located in the city, these back-to-the-farm, rural-life, crowded-city and depleted-race questions will be solved. In accomplishing this do not forget that a social department is a vital thing to a country business organization. Man is a social being craving the society of men, and he prefers those of his own experience and ideals; he wants entertainment, but unknowingly will choose that best fitting into his life, and his amusement will naturally be from topics which his training and experience enable him the most easily to comprehend.

This branch of the organization should include schools, both trade and business, preparing him for his work instead of the university.

This is the proper department for sanitation, nursing and clinics dealing especially with children's diseases. There should be physical training with gymnasiums, shower baths, bowling and other games, as well as military drill.

The proper agency to successfully undertake this part of the

organization is the church, weak now because its time is spent in prayer and praise, without criticising which it may be suggested that faith without works is void, and the demand now is for community service and public welfare. You should every one support the church, preferably from the highest religious motives, but, if necessary, because of business necessity. Its history, standing, motives and foundation principles, universally acknowledged, make it the only agency to successfully accomplish these social benefits.

The business organization, departments of labor, storage, packing, supplies, etc., naturally tend to centralize the country neighborhoods, giving the church an opportunity never before enjoyed.

After organizing the individual community there should then be established warehouses in the large markets, the most important one of which should be the head of the institution, in instant contact with every branch house, from which it could direct shipments of surplus stock to the nearest market having a demand. The local houses will, of course, first satisfy local need, the surplus then being sent to the point of demand. I venture to say that farm products have been sent from the vicinity of Springfield to Boston, with consequent cost of storage, packing, transportation and commission for selling, and returned within a short distance of the man who raised it.

The entire organization advised cannot be immediately adopted, and its success does not depend on universal acceptance either in plan or area. Each community, being a single unit in itself, may adopt as much or as little of the plan as desired. It can likewise work in harmony and to advantage with other communities similar or less organized, and as time passes, with other sections seeing the advantages obtained by the organized communities and feeling the pressure of their competition, the system will spread, and as it extends it will be developed and more completely adopted until finally agriculture will take its place as one of the large organized units in our modern industrial system.

Following Mr. Urann's talk, E. L. Brigham, Commissioner of Agriculture for Vermont, spoke on "Co-operative Dairying."

CO-OPERATIVE DAIRYING.

E. L. BRIGHAM, COMMISSIONER OF AGRICULTURE, ST. ALBANS, VERMONT.

The dairy industry is, generally speaking, of fundamental importance in a system of farm management suited to New England conditions. The dairy cow can turn the grasses growing upon our rough, uncultivable pastures into a marketable product; she aids in upbuilding soil fertility by returning to the soil in manure a large proportion of the plant food we feed her; and she furnishes to farmers and their men during the long winter season employment yielding a steady income. When we consider, also, that the farms of New England are but a few hours' distance from populous, consuming centers which make the best markets in the world, there is every reason why our dairy industry should steadily develop and prosper.

The final test by which any business stands or falls, however, is the test of profit. If the business yields a return sufficiently large to pay all costs, including interest on money invested, depreciation, raw materials, labor, etc., together with a profit, it is called a satisfactory business; men are attracted to it, the spirit of success pervades it, and those who are engaged in it are proud of their calling. On the other hand, men are driven from the non-profitable business, and everything connected with it has an atmosphere of discouragement and discontent.

There seems to be a feeling among dairymen at the present time that their industry is not a profitable one, as judged by the standards I have indicated. Granting that this be true, what are we, who are interested in this business, going to do about it?

Nowadays, when a business is in trouble, a man called an efficiency expert is called in to study the business with a view to instituting reforms which will lead to a decrease in the cost of production. Have we done this in dairying? For a quarter of a century or more agricultural experiment stations have

been maintained in the several States for the purpose of making scientific investigations of agricultural problems. These stations in our northern States have found out and told us much about better methods of dairying. We know how to breed, feed and care for dairy cows better than we ever did before. We have adopted the silo pretty generally, and the growing of clovers, to cut down the cost of the ration. Furthermore, in order that records of production and feed costs might be kept of each cow, and expert advice be had about feeding, we have formed co-operative cow-testing associations. In 1914 we had in Vermont 25 of these associations which completed the year, and which made it possible to obtain the records of about 13,000 cows. These records ought to give us an inkling of the profitableness of dairying. The cows under test averaged to produce 5,087 pounds of milk and 230 pounds butterfat, and the feed cost was $45.76. But there are sources of income other than milk or butterfat, and other expenses besides feed. I asked two representative dairymen to go over the figures with me and make an estimate of the other items which go upon the debit and credit side of an account with a dairy cow. We agreed upon the following as conservative: —

Dr.		Cr.	
Feed,	$45 76	5,087 pounds of milk at 1.48 cents,	$75 28
Labor,	24 30	Manure,	15 00
Interest,	3 60	Calf,	2 00
Taxes and interest,	88		
Depreciation,	8 00		
Barn rent,	5 00		$92 28
Bedding,	1 50	Loss,	5 84
Keep of bull,	2 00		
Incidentals,	1 00		
Cost of keeping records,	1 00		
Hauling milk,	5 08		
	$98 12		$98 12

Now we must bear in mind that these cows were fed under the directions of cow testers who have had training in scientific feeding. In many of the older associations the poor cows have been weeded out, so that we may assume, I believe, that

these figures are fairly representative of what good Vermont dairymen are doing. I believe the figures for income show the case better than it is, because I have applied the average price for the year, although, as you know, the largest milk flow is in the spring months, when the prices are well below the average given.

Figures taken by Dr. Lindsay, director of your Massachusetts station, show a higher cost of producing milk in this State, and a larger loss. Dr. Warren of Cornell, in an address before the New York Dairymen's Association, as reported by "Hoard's Dairyman," stated that, charging labor at 20 cents per hour, it cost on the average $2.57 per hundred to produce milk in Delaware county, while the price received was $1.65 per hundred.

Some of you will say that these figures are wrong, because you know of many dairymen who are making money, paying for farms, accumulating savings bank accounts, etc. I answer that this does not prove my reasoning false. The labor of caring for dairy cows usually comes before and after what is a normal day's work for every other class of people; therefore the labor cost is cut down. A farmer may raise hay and grain at lower prices than the market price for which he could sell them; he may possess some capital, so that his interest charge does not have to be paid out of pocket. If these items are disregarded one can figure money in dairying. But such items are not disregarded in figuring costs by the handlers of milk or by any other business concerns in the country. If a farmer puts in sixteen hours a day he should have pay for his overtime. He is just as much entitled to interest on capital invested as is the milk contractor, the manufacturer or any other class of business man, and he is entitled to receive the market price for raw materials which he uses in his business.

When farmers begin to figure and reason in this way they see the necessity of not only lowering the cost of production, but also the necessity of better prices for dairy products, which means better marketing. We have seen within the year the feeling of indignation and wrong felt by dairymen over the prices they are receiving break out in a series of milk strikes in several places in the eastern part of the United States. These

strikes have undoubtedly served a good purpose; the producer's side of the milk question has been brought before the general public, the dealers have been taught a wholesome respect for the producers, and a temporary increase in price has been received.

It is the opinion of many people, however, even of some of the strike leaders themselves, that the question of better marketing of dairy products will not be permanently settled by strikes, but by co-operative action based upon the fundamental principles of better marketing.

The problem of marketing dairy products is, after all, a plain business proposition. On the one hand, we have the consumer demanding dairy products in the form of milk, cream, butter, cheese and ice cream. This makes the market. On the other hand, is the dairyman, with his supply of milk to dispose of, in such a way that he will get the highest possible price for it.

Milk and cream are comparatively bulky products of a perishable nature, which makes it necessary and economical for a city to draw its supply of them from a near-by territory. The fact that milk is used for infant feeding, and is a good carrier of disease germs makes it subject to stringent regulations by city boards of health.

Butter and cheese are less bulky, and of a less perishable nature, so that they may be transported long distances in good condition at small cost. Therefore we find our great consuming centers of New England and New York drawing their milk supply from territory as near the city as possible, going back a little further for cream, and getting butter and cheese at greater distances, even as far away as New Zealand, which is halfway around the world. In the case of all these products we find that the consumer pays a somewhat wide range in prices as the quality varies from poor to excellent. We must bear in mind, also, that the price of butter and cheese must necessarily bear a certain relation to the price of milk, because if the price of milk is much higher than its value for butter or cheese making, additional supplies of milk usually made into these products will be attracted from the territory farther back from the city. In Vermont, in 1914, we made 20,000,000 pounds of butter. If

the price of milk should rise much above the value of the butter which could be made from this milk, plus the value of the skim, much of what is now made into butter would be shipped to the city.

We must take into consideration that certain things must be done to move dairy products from the farmer's door to the consumer's table, and that these things cost money. Milk and cream must be delivered by team or auto truck to a central plant, where they are processed so that they will stand shipment without spoiling, and so that they will meet the requirements laid down by city boards of health. If butter and cheese are made, these products must be manufactured.

After they are processed or manufactured at the plant, dairy products must be placed on the train, transported to market, and there handled by various middlemen to the consumer's door. In many parts of New England milk is loaded on the train directly, and the processing is done in the city. Since the consumer will increase or decrease the amount of dairy products he consumes according to the quality and the price he has to pay, I believe it is important for every dairyman to get the view that he is interested, from the standpoint of his own pocketbook, in making the cost of getting his product from his own door to the consumer's door just as low as possible.

The system of marketing dairy products which obtains at present requires of the producer the least possible expenditure of thought and effort; in fact, the dairyman is simply and solely a producer. The milk contractor is expected to furnish cans, in most instances to collect the milk from the farmer's door, transport it to the railroad station or the plant, arrange for its transportation to the city, process it and distribute it to the consumer.

The contractor is expected to take any and all milk offered him, whether the quality is good, bad or indifferent, and regardless of whether the supply is equal to the demand, or the demand equal to the supply. There has grown up in many of our States, and there is gradually but surely growing up in others, an almost absolute dependence upon the milk contractor to perform all the operations connected with the marketing of milk from the time it leaves the farm until it reaches the con-

sumer. Conditions which have obtained under the leased car system of transportation, and the old rate system, made it more economical for the contractors to divide territory rather than compete with one another in the same territory. Therefore, except in some of the larger dairy centers of New England, dairymen have but one contractor doing business in a single city to whom to sell their product.

I have nothing to say against the milk contractors. There are all kinds of men in the business, ranging from good to bad, just the same as there are in farming. I do say, however, that it is not sound economics or sound business for a great industry like dairying to be absolutely dependent upon one set of middlemen to move dairy products from the farm to the market, with the ability to fix the price, as is now the case. The time has come for the dairymen of New England to formulate a declaration of independence, and to take such steps as will make that declaration mean something.

What are we going to do? The day has gone by when the product of the individual dairyman, unless he be doing a very large business, can make an impression in the city market. This is a time of big business in agriculture, just the same as in other lines. The small farmer may be the most efficient producer, but he will lose out in marketing his product unless he combines his product with his neighbors, so that a marketable volume of a standard product may be assembled and offered for sale. Co-operation among farmers, difficult as it is to bring about in New England, is a necessary step before we can improve conditions.

The necessity for co-operation seems now to be pretty generally conceded. Where shall co-operation begin, what shall be the work of the organization, and how shall one community link itself to other communities are fundamental questions pressing for wise solutions at this time. Co-operation, in my opinion, should begin in the local community, among dairymen who have a similar problem, — viz., to obtain the highest possible price for dairy products. The program should include not only the collective bargaining through a board of directors for the highest possible price, but also the production of fine-quality products on the farms of its members, and the hauling

of these products to the railroad station, or, wherever the number of cows is sufficient, to a central plant owned and operated by the organization, where the milk may be processed so that it is marketable in any city, and where in times of surplus it may be manufactured into butter or cheese.

When such steps are taken the dairy products of the community may be offered for sale to the highest bidder, and bids may be solicited from dealers in all cities within shipping distance. In this way the highest market price which the product will command may be received without the periodical friction which is bound to arise if the organization tries to force one dealer to pay the price which it thinks should be paid. In short, I would have the dairymen, through their co-operative organization, assume the responsibility of that portion of the process of distribution which the contractor now performs in the country.

The Richmond Farmers Co-operative Association, Inc., of Richmond, Vermont, has just perfected an organization which may be used as an illustration. The steps taken in the formation of this organization were as follows: —

1. A survey of the community.
2. The organization of a co-operative corporation.
3. The sale of stock.
4. The building of a plant of sufficient capacity to take care of the milk of the stockholders.
5. The employment of skilled help to receive and process the milk.
6. The offering of the processed product for sale to the highest bidder.

A survey was taken of 228 farms. It showed that these farmers owned 4,200 milch cows; that 85 per cent. of them sold cream, 10 per cent. of them sold milk, and 5 per cent. made butter at home. It also showed that these farmers obtained some income from the sale of hay, apples and live stock; that 95 per cent. of the number had milk houses and put up ice, 50 per cent. were interested in cow-testing associations, 85 per cent. owned their farms, 80 per cent. were American born, 48 per cent. owned automobiles, and 45 per cent. carried checking accounts in the bank.

Rear view of plant of Richmond, Vermont, Creamery Association.

Stock to the amount of $10,000 was sold to 30 farmers at a par value of $25 per share, 1 share being issued for each five cows.

The creamery company was incorporated under the co-operative law of Vermont, which enables one person to hold not more than 10 per cent. of the capital stock, and limits dividends to 6 per cent.

Plans for a plant were agreed upon after consultations with representatives of the Federal and State departments of agriculture. Representatives of these departments were also consulted concerning all the plans of organization, management, etc.

The plant was completed and opened for business about the middle of November, 1916.

Let us contrast the position of this community now with that which obtained before this plant was built. These farmers were selling their milk individually to the Borden Condensed Milk Company at a price fixed by that company. If these farmers had formed an organization, and sent a committee to Boston or New York to try to induce another buyer to come into the territory, the buyer would have reasoned something like this: "The territory at Richmond is occupied by one of the strongest concerns in the United States. If I go up there to buy milk I must erect a plant at an expense of at least $10,000, and I must enter into a fight with this strong concern now occupying that territory. Perhaps, after a large expenditure, I will be able to get only a small amount of milk. I see nothing in the proposition for me." On the other hand, equipped as they are with a milk plant, which is supposed to carry with it the product of the incorporators, an entirely different proposition is laid before the dealer. The farmers are able to say to the dealer, "After making a survey of the territory about Richmond we have formed a farmers' co-operative organization to build a milk plant which will handle the product of so many cows. We expect to have so much milk each month in the year. The plant belongs to us, and will be operated by our own manager. We do not ask you to invest a cent. We do not ask you to enter into a fight with the concern now occupying the territory, as we are going to do that

ourselves. All we ask you to do is to make us an offer for our product processed and standardized ready for market. If you want to bid on our milk or cream, or if you want a supply of fancy butter or cheese, give us a bid accordingly. We are ready to do business with the man or the concern which will give us the highest price for the fine quality of product which we intend to produce." The dealer will say to himself, "I will not have to make an investment in a plant. I will not have to enter into a costly and unpleasant contest for the territory. I am simply asked to bid on the finished product. I can afford to pay something for that," and he will. Forty different buyers from several different cities have made offers for the output of this plant. Sales are made to the highest bidders wherever they may be located, so that the highest prices are received. A new interest in dairying has taken hold of the community, and an addition is now being built to the creamery so that the anticipated business of next summer may be taken care of. The complete plant with contemplated additions will cost $18,000, a sum which would have startled the farmers a year ago.

If this plant is successful — and its success will depend simply upon good business management and the continued support of its patrons — the good will of the business will belong to the farmers of the Richmond community. It is said that the great Borden Company, which has for some years handled the product of that community, has issued, and claims the right to earn dividends upon, $5,000,000 worth of stock representing its good will and its label. That good will and label have not been worth one penny to the farmers of Richmond. If the Borden Company should conclude to move elsewhere to-morrow, it could do so without consulting a single one of its patrons. But the good will of the farmers' plant belongs to the farmers of Richmond, and will add value to their product and to every acre of their land. If these dairymen produce a superior quality of milk which is more valuable in the market, purchasers will offer higher prices in order to secure or retain the supply. If we could have in New England a number of plants like this one, which could furnish a constant supply of fine-quality milk, I am of the opinion that instead of being dis-

tributed by a few large dealers, the milk of our cities would be distributed by a number of small dealers who would make a specialty of handling milk produced in a certain community, the quality and cleanliness of which they would advertise.

Now as to the relation of communities. When we have a number of such plants it will be feasible to form a federation of plants having similar conditions of production and marketing, in order to hire expert service along those lines which would not be possible for a single plant. In time it might be possible for such a federation to go into the business of distributing milk in the city, but such an enterprise should not be attempted until there first is laid the foundation of success in the fundamental lines of production and preparation for market. Permanent improvement of conditions, in my opinion, will come by evolution and not by revolution. I believe it to be the duty of our agricultural agencies to ascertain by careful study the steps necessary to be taken in this gradual process of evolution which will lead to better marketing conditions, and, having decided upon what steps are necessary, not to fail to advocate them because the path seems hard and the goal slow of attainment. The world of business proceeds in accordance with certain economic laws. Great corporations have succeeded because, through a form of co-operation, small units, each having the same end in view, have united to accomplish these ends. I know of no great corporation which has succeeded without first producing a standard product and then taking the necessary steps to place that product in the hands of consumers in the best possible form and at the least possible cost. I believe that the dairy problem of New England will be solved only by co-operation among dairymen to attain the same end.

Following Mr. Brigham's talk, Mr. E. L. Bradford, manager of the Turner Center Dairying Association, Auburn, Maine, spoke on "Marketing Milk and Cream."

MARKETING MILK AND CREAM.

E. L. BRADFORD, GENERAL MANAGER, TURNER CENTER DAIRYING ASSOCIATION, AUBURN, MAINE.

A prime consideration in any market question is preparation of the goods for market. We have all been shown graphically in a leaflet issued by the Massachusetts Dairy Bureau the comparative value of milk with other common articles of food. I was asked by a producer only a few days ago why it is that milk with its high food value and comparatively low cost is not in greater favor and more generally consumed? I think perhaps it is in part because it has not always gone into society as any one else would who sought to be a favorite, — namely, in spick and span, clean, fresh condition. The manner of producing and handling milk at the dairy governs, to a large extent, its final desirability and worth. Cleanliness and liberal use of ice are indispensable. But I for one have thrummed this tune for many years, and it is indeed refreshing to note that the Producers' Association has caught up the refrain, "Better prices for better milk." Let works accompany the words, that they be not "as sounding brass or a tinkling cymbal." Our concern will meet the producers 100 per cent of the way in their endeavors for better prices for better milk. Better milk would bridge over a sea of troubles in the dealer's life. We would gladly pay to the producer every penny saved or gained through better milk.

I do not belong to the Producers' Association. I doubt whether I am eligible. But "Barkis is willin'." The wicked socialist believes in co-operation of all interests, not in co-operation of one interest to oppose another. The socialist calls this latter thing "war," — an irrational, stupid thing. But do not listen to the socialist lest you too have an iridescent dream, — selling milk at auction and raising in New England all the

milk, cream, butter and cheese consumed in New England, — plus the nightmare of selling milk by the can without regard to test.

I feel consistent in saying that in the present condition of society and commerce I know of no better way of marketing milk than the one pursued by the association to which I belong, subject at all times to such improvements in detail as may be suggested. If I knew of a better way I should be after it. It will, then, be proper for me to set forth our methods of marketing milk for the producers.

In imitation of the great Cæsar, I will divide the duties of our concern into three parts, and in true orthodoxical and paradoxical fashion the last shall be first.

First. — Obtaining a fair market price for the milk.

Second. — Financing and conducting the operations from producers to consumers.

Third. — Distributing to producers their fair share of the proceeds.

Making the selling price is perhaps the highest responsibility the milk dealer assumes. One casts about to see what others are selling milk for, — what the market price seems to be. This is not the easiest thing to be determined. The situation is pretty well known and needs no comments from me. Then you take into account the present and prospective supply available; also, if you are a large dealer, you think about the substitutes which are in competition with your milk. The moral effect on the consuming public of insistent demands from producers for increased returns is a very important bracer for your price maker. When the matters are all gone over you have got to make your decision. Our association manufactures butter and casein from its surplus cream and skim. For 1916 the pounds of butter made were a little short of a million, while the pounds of casein were a little short of half a million. This, of course, is the least profitable part of the business; and for this reason we pay a smaller price to producers or small dealers who turn over to us only their surplus, and have no milk for us when we need it most. The trade we cherish is for cream, milk and skim milk. In making a price list I like to have the prices of these articles entirely consistent throughout, — a composite

price, so to speak, of the fat and skim. It is fair, and will go to place the price of fat in cream and milk somewhat above its value for butter making. Then the price of skim will be made such as to attain the desired rate for milk of the test which you are selling, or rather, which you are trying to bring out by blending the various grades which come from your producers. In another paper to-day I have vented my spleen over the useless law which compels us to go about blending or standardizing in the awkward, unscientific way we are obviously obliged to do. When the prices have been established per pound of fat and per hundredweight of combined skim and fat, any one can make out our price list for any desired per cents of cream, milk and skim or buttermilk so that all grades will be of consistent prices. Any one can have our price list by applying for it. Before leaving this important part of my subject I want to call attention to certain things that must be taken seriously as substitutes for fresh cream, milk and skim milk. When cream is short at certain seasons and in the hot spells of summer, the ice-cream maker gets on nicely with "Homo," — a product of sweet butter (unsalted) and skim milk, put together by a homogenizing machine. If skim milk is short, one-half skim may be used and the rest made up with skim powder and water; or, indeed, the product may be made wholly from sweet butter, skim milk powder and water. In fact, this product is so smooth and satisfactory that some ice-cream men prefer it to use all the time, even when straight cream is plenty. Fresh milk is in competition with condensed milk. Fresh skim milk has for a competitor condensed skim milk and skim milk powder. Some bakers prefer the powder on even prices. With these conditions in view the New England producer may well be careful not to go too far in his demands.

The second division of the milkman's duty — financing and conducting operations from the producer to the consumer, — affords plenty of watchful working and exercise for prudence and judgment.

As evidence that this service is performed in good faith at minimum cost, the distributor should not hesitate to publish the cost and selling prices and the classified operating and

other expenses. This applies, of course, to cases where the dealer handles milk of producers, paying them "what he is able to," or, as some people inconsiderately say, "what he sees fit to pay." Contracting for milk six months in advance is and always has been a very bad practice. No responsible concern would care to do so unless at a low price. The milk market is and properly should be open to all producers of good milk, and there is little more reason in contracting for six months in advance than in buying the crops of wheat, cotton or potatoes before they are planted. If the dealer publishes his operations as above suggested he will be open to criticism on three points, — first and second, the selling and buying prices may be criticised by opposing interests; and third, the costs of operation may be criticised by both these interests. If these three matters are kept within reasonable limits, why is not such a business commercially sound, — worthy of the support of buyers and sellers? From some things we read or hear said one might think, and probably many do think, that the milk dealer's business is to take 10 cents a quart from the consumer, pay the railroad a fraction of a cent, return to the producers 4 cents or so, and pocket about one-half of the proceeds. I would not take any notice of this stuff except that it too often comes in pretty strong solutions from people who ought to know better. No doubt there is poor management. We know there is, and we are constantly trying to improve it. Once in a while we get a suggestion made in good faith and calculated to be helpful. Such suggestions are gratefully received whether of any value or not. But the greater part of the criticism aimed at milk dealers is untruthful bluster.

Our association retails comparatively little milk. Our bottle milk is sold chiefly to retailers.

We have no smart ways of bribing the buyer or the chef or the janitor, or doing any such things. The price we sell our goods for we get, — generally cash when the sale is made in case of all the smaller deals. Employees are taught from the beginning that the first principle of good business is integrity, and that is what will be expected of them in all dealings with our customers. We have no use for cunning, tricky methods.

For the advancement and security of our business we make

a moderate reserve fund, just as savings banks are required to do by law. I want to briefly allude to the plan of farmers owning plants with a view to contracting with the highest bidder. That may be worked out successfully in some cases, but my belief is that it will not be generally successful. That is too long a story to go into here.

The New England Milk Producers Association seems to take a firm stand upon standardization. I like that wherever applied. Standardization of *method* of price making (not of price) to producers would be very helpful, and would show all sections of New England where they "were at." We would like to join in such a plan provided our method was adopted.

Our plan of price making to the farmers is the last and easiest of our duties. Why not? It is just a matter of bookkeeping. We pay the operating and other expenses first, and pay the farmer what is left. We have a file of annual reports running back more than thirty years which support the statement. The only criticism or objection I have heard to our expenditures is on the dividend we have paid to employees for the last few years. Some farmers thought it should have gone to themselves rather than the employees. My opinion and explanation of the matter has generally been satisfactory to such producers. For three years we have made dividends to the producers, in 1912, 1913 and 1916. The patrons' dividend for 1916 has not been paid yet, but it will be 5 to 10 per cent (we hope the latter) of what they were paid in June, July and August. In those months we bought large amounts of butter and eggs from outside sources; also made and sold large quantities of homogenized product. This was not speculation, it was stuff for which we had a sure market. All the profit from these sources went into the general business, and the farmers profited by it, or will do so as soon as we make the dividend to them in a few days.

In making prices to producers we consider the market requirements. If a large amount of milk is likely to be called for, as in the fall, — particularly in November and December, — we make the price "per hundredweight" higher to encourage as many as possible to bring along milk instead of cream. When milk is in oversupply, as in the spring and early summer, so

that we have to make skim into casein, — a less profitable use of it, — we cut down the price per hundredweight, and then the more distant patrons will send in only cream and feed the skim, which is not worth much more than the cost of hauling to the factory.

Another thing we do which may or may not be right. In the flush season, when milk seems to be made more cheaply, we intend to hold back a small margin to help out the price when the supply is scant. The object is to encourage a more even production, avoiding the unprofitable surplus and having the milk when customers greatly need it. Having a goodly supply in the short season really helps the man who produces mainly in the flush season, for you can only expect to have such customers in the flush season as you can carry through the short season. For this reason we are obliged more and more to protect our steady patrons against the practices of some who will leave us when we need them and want us to take them on when we do not need them, — when they are a positive setback to the business. There are customers of a similar sort who will apply when milk is short and drop us when the supply is plentiful. We are now keeping a card file on those sellers and buyers who would use us only as a convenience. Our plan is, on the one hand, to pay butterfat price only, — no per hundredweight, and, on the other hand, to sell at retail price, if we have the goods to spare. We never indulge in the reprehensible practice of taking goods away from a regular customer to sell at a premium to some one else.

Following Mr. Bradford's talk, R. D. Cooper of Little Falls, New York, spoke on "The New York Dairymen's League."

THE NEW YORK DAIRYMEN'S LEAGUE.

R. D. COOPER, LITTLE FALLS, NEW YORK..

The Dairymen's League knows no State lines. The Dairymen's League was incorporated under the laws of New Jersey, and at the present time takes in the western part of Connecticut, the western counties of Massachusetts, the western side of Vermont, the dairy section of New York State, the northern tier of counties in Pennsylvania, — northeastern Pennsylvania, — and the northern part of New Jersey. The Dairymen's League is not confined to New York State. Possibly the idea that it was may have come about from the fact that the Dairymen's League was originally organized because it had in mind at that time the New York market, but, of course, the New York City's milk market, for that is the territory from which it draws its supply, covers New York State and many adjoining States.

The Dairymen's League was incorporated under the laws of New Jersey for $100,000, and was started in a small way down close to the New York and the New Jersey line. It was organized about nine years ago, and its growth until last year had not been rapid, but thrifty. However, about three years ago the League believed that it should attempt to secure better prices, and a committee of five of the directors went to New York to confer with the dealers there and ask them for a better price for the milk. They first went to the Borden Company, who refused to have anything to do with them. They then went to some of the smaller companies and smaller dealers and asked to talk the matter over, and the latter at once asked the committee what Borden's had done. When the smaller dealers were told that Borden's had done nothing, they said, "Well, if Borden can't do anything with you we can't either." So our committee went back home and announced to its members that

they had been unable to sell the milk. That was a very severe blow to the League. For a couple of years after that the Dairymen's League did not seem to be in favor with the farmers, because they felt that they had, as many times before, joined an organization, paid in some small amount of money, and it had failed, and that was all there was to it.

About two years ago, or possibly a little bit longer, a New York executive committee was appointed, of which I happened to be a member, and we got Professor Tuck of Cornell University to look over the situation in Central New York and see if he could find out exactly what might be done. The other members of the executive committee were of the opinion that the co-operative plan idea should be fostered by the League, and upon the recommendations of many men, and particularly of Cornell University, the League adopted as its policy one of fostering and trying to urge its members to build co-operative plants. We have in Central New York many very successful co-operative plants.

As I have stated, the Dairymen's League was incorporated under the laws of New Jersey, and it spreads now to five or six States. The following are the purposes of the League: —

The purposes of this company shall be to oppose and prevent monopoly in the production or sale of milk, and to encourage competition therein, and to protect its stockholders and the consumers of milk against monopoly or any unlawful combination of any kind or nature whereby the producers or consumers of milk are injuriously affected; to promote legislation and board of health ordinances beneficially affecting the interests of its stockholders who are producers of milk for the metropolitan district and other markets; to act as their agents in marketing their products; and to carry on all such business as its articles of incorporation authorize.

Should the directors be unable at any time to negotiate equitable conditions of sale of the milk from the local branches of the League at a price proportionate with the cost of production of pure unadulterated milk produced under conditions to properly safeguard the public health, each member shall be so notified, and in such an emergency it shall be optional with each local branch of the League whether its members manufacture their milk at home or at a place provided and operated by the local branch.

Should the conditions of any local branch be such that the milk cannot be manufactured profitably by the board of managers, they may authorize the sale of such milk, making due allowance for such local conditions.

The Dairymen's League is a stock corporation. The stock is issued at the rate of $2.50 a share, and the producer subscribes for stock at the rate of $2.50 a cow.

We have made in the constitution of the Dairymen's League a provision for local branches. The article of our By-Laws which gives it is as follows: —

> Local branches of the Dairymen's League may be organized at any point where there is a condensary, creamery, or shipping station, and may meet at will for the purpose of assisting the directors and facilitating the business of the corporation, and may levy such local dues for local purposes as each branch may decide.
>
> It shall be the duty of the secretary of the local branch to report the proceedings of these meetings, furnish a list of the members, and such other information as may be required by the secretary of the League.

Thus you will see that the local branches are merely a sort of convenience for the operation and performance of the business of the League, and each individual who becomes a member of the Dairymen's League is a member of the central organization. It is exactly the same as any large corporation would be, only it is stated here that the branches are formed, not necessarily where there is a certain cheese factory or condensary, but where the geographical conditions are such that it is the natural gathering place for a certain number of members.

Co-operative Plants.

Apparently the farmers were not receiving money enough, or, at least, were very backward in subscribing money and organizing their co-operative plants. By the term "co-operative plants" here we mean, particularly, milking stations. On the first of June, 1916, on account of the rapid increase in the price of labor and other conditions affecting the farmer, a special meeting of the directors was called in Albany, and the fact was there brought forth that it was necessary for the League to do something if it was ever going to amount to anything. Apparently the opportune moment had come. One of the directors severely scored the executive committee and its officers for not having been more active, and, possibly, not having had the courage to take up the proposition of what they called a "strike."

As I have stated, the board of directors had already mapped out and had approved of the plan of the co-operative plants, but it was working too slowly. The executive committee defended itself and made this statement, that if it was the desire of the board of directors that they make a stand for a better price for milk, the executive committee was there to fight just as hard for that plan as it was for its own plan. Therefore the resolution was offered and passed, which took a very short time, that the executive committee should work out a plan, and put it into operation, whereby the members of the League could secure a better price for milk on the 1st of October. It took just about as long to pass that resolution as it has for me to tell you about it, and it was some big job for the executive committee, or, at least, it appeared so to me.

We formulated this plan. We did have in Central New York a number of the co-operative plants, and one which I am particularly interested in is operated entirely by the farmers, that is, they pay their own operating expenses and their milk is sold f. o. b. the cars, while most of the other plants are rented out to the milk dealers, where they pay so much a month or so much a year for the rent of the plant, and contract for the milk for a certain period, in some cases six months, but generally for a year. I believe that our method in proceeding to get the better price is not correctly called a "strike," because, as I would interpret it, if we had a "strike" it would mean that we were to hold back all of the milk. That would be a physical impossibility, particularly in New York City, where there are normally consumed about 2,500,000 quarts of milk a day. However, we did arrange to have an outlet for the milk, which we could secure and control through our co-operative plants. The plan was that we were to put into New York all of the milk which we could get hold of at our price, and hold back all of the milk possible that was going into New York through the large dealers or any of the dealers so classified. We were, of course, doubtful as to our strength, and so we consulted and spent about twenty-four hours with Secretary Kittle of the Chicago Milk Producers Association. That association won its strike last year, and it was through the small dealers that they were enabled to win. Therefore you may see that we very closely

followed the method that was used out there. They had been successful there, although their conditions were different from ours and our territory was much larger.

I believe that shortly after the 1st of October, about the 5th or 6th, the supply of milk to New York City was cut down to nearly 30 per cent, but I'm not going into the details of all that went on in that milk strike. I was in New York at the time, and it certainly was hard work. It was about a twenty-four hour a day job, and I would like to state now that the job of the President of the Dairymen's League is not an eight-hour a day job — it's still a farmer's job of twelve, fourteen or sixteen hours a day. However, we were, as we feel, successful in our milk strike, although we were working against heavy odds. Where was our strength? Our strength was in the farmers back in the country and out in the hills that stood by us. It was the farmers' victory, it was the men who were producing milk around in the country for labor at possibly 8 or 9 cents an hour. Those were the men who won that milk strike.

I want to tell you that it was a very acute time in New York, after that strike had been going on for some two weeks, to know just how much longer those fellows in the country would hold out and could hold out. Nevertheless, we were successful.

Since that time, however, many things have confronted the League. We were, up to the 1st of October, in a dormant, a semi-dormant condition, and I would state that in the middle of the summer, along in August, we had about 13,000 members, whereas to-day we have, I believe, over 31,000 members; we represent over 400,000 cows, and we have over 560 branches. Now, if you can imagine a body of farmers working together, and at a time which seemed opportune combining all their efforts and energies towards winning what belonged to them, and then, after having sold millions of dollars worth of milk find an organization a corporation of this size, doing business without any office force, without any equipment or any system in its office, you will see that the League had a large proposition. And the first thing after our winning the strike we felt that it was necessary to go ahead and round out and perfect as much as possible our organization, which has been growing rapidly ever since that time.

We have now before us several propositions, and, of course, the marketing of milk for the 1st of April will be here before we know it. The League has before it a great opportunity, as by our charter we are allowed to do most anything. We can do collective buying; that means that we can purchase for all of our members their feed, their harvesting implements and anything that may be of use and which the farmer wants. I believe that it is for us to establish sooner or later our own banking facilities. There is spent in New York City, I believe, an amount estimated at nearly $80,000,000 for milk annually. Now, our organization has grown so that we now cover the Buffalo market, we are covering the Rochester market, we are creeping over on to your Boston market, and I believe that is a thing that the League should take up as soon as possible, and co-operate with the New England Milk Producers Association.

Following Mr. Cooper's talk, E. E. Conant, manager of the Maine Fruit Growers' Exchange, spoke on the "Oxford Bears' Fruit Growers' Association."

THE OXFORD BEARS FRUIT GROWERS' ASSOCIATION.

E. E. CONANT, MANAGER, MAINE FRUIT GROWERS' EXCHANGE AND OXFORD BEARS FRUIT GROWERS' ASSOCIATION.

I think perhaps the best way to begin my talk is to tell you something of the conditions among farmers in Maine. They are about the same as in any other section of the country. While the agricultural prosperity, as measured in terms of production, is equal to that of any part of the country, little effort has ever been given to placing the products of the soil on the market in any businesslike manner. Generally speaking, the farmer disposes of his crops in the same hit-or-miss fashion as is common the country over.

Several years ago conditions among the apple growers in our locality were especially bad. Nearly all of the crop was disposed of to local buyers who made their own price. This price the grower had to accept or let his apples rot in the cellar. Under this method the farmers were bidding against one another, always working to their disadvantage, and playing into the hands of the buyers. When a lot of apples consisted of several varieties, the price was usually fixed at the figure offered for the least desirable kind. The grower would sell to the buyer who would pack the largest number of barrels from the lot, throwing out as undesirable the smallest number. This, of course, resulted in a very low standard of packing. The few farmers who consigned their apples to the commission houses in the cities were no better off. Ignorance of commercial practices and market conditions resulted in the returns being no better than for apples sold to the local buyers. Cases are on record where the transaction resulted in a complete loss. The returns received for apples disposed of under this system — or, better, lack of system — were so meager that it is little wonder that the trees received only casual attention. There was little in-

centive for a man to prune, spray, cultivate and generally improve his orchard when he could receive little more than the cost of production no matter how good his fruit.

It is not my purpose to enlarge upon conditions. Most of you are familiar with the case of the farmer as an independent unit, without knowledge of conditions, trying to sell his crop. I shall, rather, try to show you what one small body of men have been able to do through organization. The first step in advance came with the appearance in our State of representatives of English receivers of apples. These men were desirous of getting Maine apples on the foreign market, and competed with the local buyers for the crop. One house in particular sent its representative into our section year after year, encouraging the farmers to export their apples, and pointing out the possibilities of the foreign market. It was customary for these English houses, through their agents, to advance to farmers a certain amount per barrel, usually as much or a little more than the local buyers were offering. The apples were then shipped in the farmer's name, to be sold on commission by the receivers across the water. After making the sale, account sales were made up and returned to the growers together with remittance for whatever the apples net over and above the advance. The individual farmer in exporting his apples was at a disadvantage, and often fared as poorly as his neighbor who sold to the local buyer or consigned to some domestic commission house. In passing I may say that the apples put up for export were packed rather poorly, and were not a good advertisement for Maine apples.

At the same time, well-graded and packed fruit when exported gave the farmer very satisfactory returns. The main thing for which we have to thank our English friends is that they opened our eyes to the possibilities of a market across the water. Owing to the fact that only large growers were able to make up car lots, the smallest unit economical to ship, it became customary for several of the smaller ones to get together making up a shipment. While there was no attempt at organization, this was a step toward co-operation.

In the spring of 1911 a young man from our town took advantage of the opportunity to attend a short course in fruit

growing given at the State college at Orono. There he learned, among other things, of the successful operation of the well-known co-operative associations in the west. He came back with wonderful stories of how these organizations were overcoming the obstacles of distance and unfamiliarity with market conditions, and were handling crops so as to return the grower a profit sufficient to encourage the growing of better fruit. The young man began by interesting his brothers in a scheme for better marketing. On numerous occasions there were lively discussions, and it was finally decided to form a co-operative society with seven brothers as charter members. This was in the summer of 1911, and marks the beginning of the Oxford Bears Fruit Growers' Association. Much valuable assistance was given us by the State Department of Horticulture through Mr. S. K. Gardner, the State Horticulturist, and Mr. G. A. Yeaton, assistant. From the success attained by the organization it is apparent that from the start the founders were on the right track. The chief essentials for success in co-operation were present, and I wish that you would mark these few necessary things.

First. — As shown by existing conditions, the association was born of necessity.

Second. — There was a sufficient supply of fruit being grown in the neighborhood to assure us of enough business.

Third. — It was possible for us to hire as manager one having some knowledge of marketing.

Fourth. — Most important of all, I consider, we had as members men possessing the true co-operative spirit, a progressive outlook, and a willingness to stand back of the organization through thick and thin.

We incorporated our association under the laws of our State, with a capital stock of $1,000, this being divided into 200 shares at $5 each. Each grower subscribes to 2 shares of stock upon being elected to membership. This entitles him to vote at all meetings of the association. Only matters pertaining to the general policy of the association are voted on in the regular meetings of stockholders. Most of the business is transacted by the board of directors, in whom we place considerable responsibility. These directors are five in number and are chosen

annually. Only two new ones may be elected at any one time. This board elects the officers of the association and hires all of the employees, fixing their compensation. One of the most important things that the directors do is to determine how the fruit shall be packed, and they have full power to reject any lot not considered up to the standard. Since so much depends upon the board of directors, we are very careful in choosing them. As these men practically give their services, receiving only $1 for attendance at each meeting, they must be men unselfish, broad minded and alive to the interests of all the members. We have always been able to secure the services of men of this sort.

After organization the first thing to do was to define exactly the place and purpose of the association. As set forth in our by-laws, our object is threefold.

1. To secure to the fruit growers of Oxford County and vicinity all possible advantages in marketing their fruit.
2. To build up a standard of excellence.
3. To create a demand for the same.

Our aims are not confined to these few things, however. Broadly speaking, the purpose is so to co-operate in our business that we may not only render valuable service to our members in every way, but that we may also, by setting an example, help in establishing a better community spirit.

We early recognized the necessity of establishing a name for ourselves. We began by selecting a name for our organization which should be distinctive and at the same time representative of our section of the country. After choosing the name Oxford Bears Fruit Growers' Association, we immediately set about to design a trademark by which our brand should be known on the market. This trademark appears on the label in every barrel and on every box of apples packed by the association. It stands for *quality first*, the phrase we have taken for our motto. We have never had a special appropriation for advertising. We believe that honestly packed fruit placed on the market under a brand name will advertise itself. Our experience has borne out the truth of this statement. The label and what it stands for have been enough. One thing that has enabled us to establish a name for ourselves is the making up

of car lots of seasonable varieties. By this, I mean that at a certain time, when a variety is in prime condition, we are able, by drawing on the various members, to make up a car lot, thus securing the minimum freight rate. The individual grower, in order to make up a shipment of desirable size, has to hold some varieties until they are somewhat past season. Association apples can be shipped in proper season to meet market demands. The fact that our association apples are on the market year after year keeps the buyers on the watch for them, and they know what to expect. An individual's apples may be ever so good, but if the brand is unknown the price will be less than that realized by those with a reputation. To illustrate this point I will say that this year we started in early to export our apples. From the middle of October until the Christmas holidays nearly every boat docking in Liverpool had in its cargo one or two cars of Oxford Bear apples. The buyers were expecting them, and were willing to pay a premium of two shillings per barrel or more for them. Almost invariably we received a cable after each sale, "Sold Oxford Bear apples absolutely top of market." It is with no small effort that we have built up and maintained our reputation. Insistence has ever been made that all fruit put out under our name should be honestly graded and packed strictly according to law. Our manager is ever on the alert, and the packers are carefully watched to see that their work is done as well as possible. Of course, it is impracticable to inspect each barrel of apples put up, and the packers, being human, sometimes err. However, I will say that we have so far succeeded in maintaining our standard that we have seldom received a complaint and never have had a shipment turned down. Frequently our apples are sold at auction or private sale without showing a sample, solely on the reputation of the Oxford Bear brand. When cars for export are shipped we cable a variety list to our English receivers, and frequently the apples are sold before landed at a premium of two to three shillings over the top prices realized at auction for the same varieties on the same sale.

One of the chief things our manager does is to make a careful study of the market. All information as to crop conditions throughout the country is obtained early in the season. This is

supplemented about harvest time by reports of crop movement and prices on various markets, together with cold-storage reports and all other information available. We receive the market report issued daily by the United States Office of Markets and also the Canadian Telegraphic Report. These we find of great value. With all of this information at hand we are able to form a good idea of crop conditions, and know something what to expect for prices.

Since it has always been customary for our people to export a large percentage of the crop, we have been particularly interested in every bit of information obtainable as to conditions in England. Most everything we knew prior to 1913 came to us through the representative of our English receivers. In the fall of 1913, however, it was decided that it would be worth a great deal if our manager could see for himself just how apples were handled on the foreign market. Accordingly, plans were made for the trip. As I was at that time manager of the association, it was my pleasure to make the trip. About 600 barrels of Oxford Bear apples were on the same steamer with me. Before leaving home I had seen these apples harvested, packed and loaded into the cars, so I knew just what they were like. I was now to follow them through the whole process of marketing. I was met in Liverpool by the representative of our English house who had so often visited me at home, and whose guest I was during my stay in England. Under the guidance of this man I was shown the ins and outs of the Liverpool, Manchester and London markets. On the docks in Liverpool I met the same apples I had seen so carefully packed. They were being inspected by the buyers there on the docks, and I had a chance to note in just what shape they arrived. Some few of them I noted were slack on account of faulty coopering. This put me on my guard, and since then more care than ever has been given to coopering, the result being a very small percentage of slacks. For several hours at a time on two or three occasions I sat in the auction room where apples were selling. I also had a chance to meet many of the fruit brokers and large buyers, as well as a number of retailers. From personal observation and conversations with these men I was able to gain more of an insight as to market demands, preferences, and so forth, than I

could have learned in several years' reading up on the subject. Most important of all, I learned that the English buyers are able to distinguish between an ordinary apple and a well-graded and packed article, and that they show this by their willingness to pay more for the latter sort. We have not, however, been interested solely in the export market. For several years our manager has made a trip to Aroostook County in our own State, and has succeeded in building up a nice little business there. A number of cars were placed there this fall.

I will now attempt to tell you a little of the actual operation of our association. Early in the fall, at the time crop reports are coming in from various sections of the country, the manager puts in several days visiting the orchards of the members. He notes about how large a crop and what varieties and quality each will harvest. By a careful estimate he is able to tell somewhere near what the crop will be, — how many hundred barrels of Baldwins, Greenings or other varieties he may count on, and how they will run as to grade. At this time, also, he gets a better idea of price by talking with the growers.

As the apples are harvested, crews are organized to do the packing. These men are hired for the season and paid so much per day and board. The association pays the packers, charging their time to the growers at cost, and they are boarded at the expense of the men whose apples are being handled. A crew usually consists of three men, one of whom is foreman. Each crew is provided with sorting tray, barrel press, baskets, stencils and other things necessary for packing. In addition to the regular stenciling, consisting of variety, grade and association name, each crew has a number of its own to go on the barrels. This is for the purpose of identification in case any fault is found with the barrel. After stenciling what is to be the face end of the barrel it is turned over, and before the pulp-head is put in, one of our barrel labels is placed in face down.

Our system of loading cars for shipment is as follows: we do not pool our varieties and grades for the season, but rather on each sale. By this I mean that every grower receives the same price for No. 1 Baldwin, No. 2 Greenings, or whatever the grade may be. Of course it happens under this arrangement that one man may receive a different price for apples of a certain grade

than his neighbor whose apples go to another sale. To counteract whatever difference there may be, we try to be as fair as possible, dividing up the shipments, and plan never to have all one man's apples on a single sale, but to split them up. Perhaps I can best illustrate this point by showing how it has worked out this present season. Early in the year, before any one could tell what turn the foreign market would take, we sold several cars at very good prices f. o. b. shipping point. As it happened, apples exported began to bring unprecedented prices and we wished that we had shipped everything we had. However, the orders taken early had to be filled, so to average things we loaded a certain part of each member's apples in export cars, and a certain part in those cars sold for a cash price. We use a card in keeping a record of shipments. For every car shipped one of these cards is made out. These are copies of actual records in our office. We find them very convenient in keeping our accounts correctly. A proper and well-ordered system of accounting is very essential to the success of any business, and is particularly desirable in the case of a co-operative society, where the records are open to inspection by the members at any time.

After the apples are hauled to the cars for shipment the individual member has nothing more to do with them. The association looks after the whole business of marketing. It attends to the billing, invoicing, tracing of cars, and, in short, everything pertaining to shipping. It also, in the case of export stuff, sees that space is obtained on the best steamers to the most likely markets. The association also collects all moneys from the sales, paying the grower for apples delivered by him. We have always found it well to keep our members supplied with money during the season, paying them on account from time to time. We are able to do this because of the prompt manner in which money comes in from our sales. Immediately upon consummating a sale, the foreign agents make up our account and cable the amount due us to our credit at the bank.

It has never been our policy to increase our membership merely for the sake of having our amount of business look big. We have thought it best to limit our growth, keeping it healthy and within manageable limits. At the present time we have

30 members. Since organization we have returned to our members nearly $100,000. This present season we shall handle nearly 8,000 barrels, and return the members $30,000. One thing we think remarkable. In doing this large amount of business we have never lost account of a single barrel or box, and *what is still more remarkable,* we have never lost a cent in bad bills.

While the most important achievements have been in the marketing of our crops, we have also been able to save our members considerable by purchasing supplies co-operatively. We buy fertilizer, lime, spray materials, barrels, head liners, pulp-heads and other materials in large quantities, thus taking advantage of discounts. Last spring, by immediately accepting an offer, we saved $60 on a ton of lead arsenate.

At Hebron Station, our shipping point, we have built a storehouse one story high with about 2,800 square feet of floor space. This building we have found very useful both in shipping season and for the purpose of storing supplies we have bought. This season, when the car shortage was troubling, our members were able to keep right on hauling their apples and putting them into the building. Then, when a car or two was sent in, it was an easy matter to hustle the apples out of the building and into them.

One of the activities of our association is its winter meetings. These were formerly held at the homes of some of the members, but now at the storehouse. The meetings take the form of a general discussion of any matters of interest in the growing or marketing of fruit. They are held monthly and serve to keep up the interest through the winter. All of the Bears turn out for all day. The wives of our members provide a lunch, and a general good time is enjoyed by all. Our biggest get-together is the annual field meeting. This event is held in the summer time in the orchard of one of our members. It is widely advertised and every one is invited. We have had an attendance of as many as 500 at one of these meetings. We have been very fortunate in obtaining speakers, and have had some programs of exceptional interest.

I have now told you at some length of the main activities of

our association. There are a good many interesting stories connected with its life that I would enjoy telling you if time would allow. It is sometimes said that success is made up of failures. In our six seasons of activity, all has not been easy sailing. Mistakes have been made, but they have not been serious mistakes, or, at least, we have discovered them in time to correct them.

In closing I will say that I attribute what success we have had to four things.

First. — We have had leadership, not of a few, but of many, as manifested in the true spirit of co-operation.

Second. — We have always employed a good system of accounting.

Third. — The board of directors and the manager have always been businesslike in their methods.

Fourth. — All-important, square dealing has formed the cornerstone of all our business.

Mr. ROGERS. I would like to ask the gentleman what is the cost for packing a barrel of apples and getting them into the foreign markets this year.

Mr. CONANT. Why, according to what the barrel sells for when it gets there, — something from $2.95 to $3 a box. You see it is sold on 5 per cent, and the higher it sells the more it costs to get it there and get the money back with the expense of selling. You'll see on this card that some of our apples net up to $7.69; now, they must sell for over $10.

A MEMBER. Does that include the packing and getting them ready for the market?

Mr. CONANT. No, after loading on the cars. These nets are all back to loaded stations.

A MEMBER. How much does your packing cost?

Mr. CONANT. The labor of packing, as I went over the books, was from 10 to 13 cents a barrel to a member, according to the way his apples grew; the poorer the apple the more it cost to pack them.

A MEMBER. Are they packed in the central packing house?

Mr. CONANT. No, we have to go around to the farmer to

pack them, for the reason that when you haul apples over stony roads without the head on the barrel it bruises them up too much.

A MEMBER. What is the cost of labor if the farmer doesn't help?

Mr. CONANT. Many times he's not there at all. The apples are taken from the barrels as they are picked, and sometimes when he's around he may take hold, but you understand a grower is not allowed to pack his own apples. These packers do them. No man has anything to do about sorting his own apples in any way, shape or manner.

A MEMBER. What does it cost to send apples from here into Canadian lines?

Mr. CONANT. I can't tell you on that part of it because we sold f. o. b., and I think that it would depend on what part of Canada they were sent to. Montreal I think is about 40 cents a barrel.

SUMMER FIELD MEETING

OF THE

STATE BOARD OF AGRICULTURE

AT

GREAT BARRINGTON.

JUNE 14, 1916.

SUMMER FIELD MEETING.

The Annual Summer Field Meeting of the Board was held at the Crissey Farm, Great Barrington, on June 14, 1916, at the invitation of the Housatonic Agricultural Society. The newly organized Berkshire County Farm Bureau also participated in the program. At the morning session Mr. C. L. Gold of West Cornwall, Connecticut, President of the Connecticut Sheep Breeders' Association, spoke on "Sheep Raising," and Mr. H. A. Emerson of the New York Department of Foods and Markets spoke on "The Functions of a State Department of Markets." Dinner was served by the local grange, and after dinner Mr. L. L. Richardson of Leominster, delegate to the Board from the Massachusetts Federation of Farm Bureaus, spoke on "Raising Farm Horses," and Mr. Henry G. Bell of the National Soil Fertility League spoke on "Soil Improvement." There was also a demonstration of farm tractors and an exhibition of draft horses and dairy cattle. The attendance was good and a large amount of interest was manifested throughout the day.

ESSAYS.

(Especially prepared for the Sixty-fourth Annual Report.)

FOOD PLANTS TO ATTRACT BIRDS AND PROTECT FRUIT.

EDWARD HOWE FORBUSH, WESTBOROUGH, MASSACHUSETTS.

Introduction.

The Arnold Arboretum at Boston has become noted as a resort for birds. Probably the number and variety found there are not exceeded in any upland locality in New England. Any observing person frequenting the Arboretum can see for himself that birds are attracted there by the diversity of plants, which support a great variety of insects and produce quantities of fruit and seeds, thus affording birds an unusual abundance and variety of animal and vegetable food.

It would be well for the farmer and the orchardist to make their home grounds especially attractive to useful birds. And all who live in the country or in the suburbs, and even some who reside in cities, may, if they will, utilize plants to attract birds. Landscape architects and gardeners who lay out the grounds of large estates often plant quantities of shrubs and trees without considering what are inviting to birds. While there are many flowering plants that birds like, there are many also that bear highly colored and ornamental fruit on which birds feed. Nearly all of these plants can be utilized in beautifying country estates. There should be fruit-bearing shrubbery and vines and dense hedges or tangles of ornamental fruiting plants. The coniferous trees may be best used in small patches or rows as windbreaks, for large groves of such trees are likely to shelter hawks, crows, squirrels and other enemies of birds.

The up-to-date fruit grower should never plant an orchard or attempt to cultivate small fruit without first providing rows of early wild fruit to attract the birds from his cultivated varieties. Otherwise, unless there is a quantity of wild fruit growing in the neighborhood, birds are likely to reduce his profits.

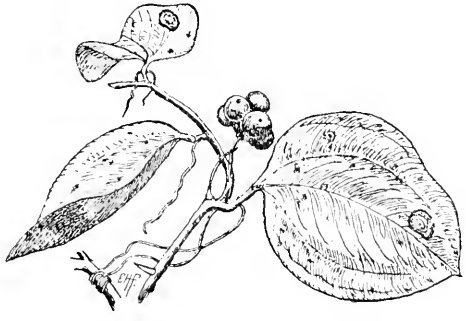
Plants Attractive to Fruit-eating Birds.

Farmers know that birds are fond of the earliest cherries and strawberries, and that some will feed on raspberries and blackberries unless there is other more attractive food near. Therefore, if fruit is wanted only for home use it is well to plant enough for the family and the birds. If cultivated small fruits are planted in quantity, all the fruit-eating birds of the neighborhood will be there when the fruit is ripening. But there are other fruits even more attractive to birds. First among these for early summer are the wild strawberry (*Fragaria americana*), the June berry or service berry (*Amelanchier canadensis*), the red-berried elder (*Sambucus racemosa*) and the white mulberry (*Morus alba*). The wild strawberry fruits as early as the cultivated varieties, and it lasts longer. The June berry is earlier than the earliest cherries, and is supposed to hang later, but in my experience the birds get all the June berries before July 4, and if gray squirrels are very numerous they are likely to take the fruit even before it becomes ripe enough for the birds. This is a fine fruit to cultivate could the birds be kept away from it. The red-berried elder fruits early in June, and like the common elder (*Sambucus canadensis*), which fruits in Massachusetts in August and September, is one of the chief attractions for summer birds. All the mulberry trees are extremely inviting to birds. The native red mulberry (*Morus rubra*) is useful but does not fruit quite so early in June as the introduced white mulberry (*Morus alba*). The Russian mulberry has been widely recommended, attracts birds remarkably, and in some cases has been established in Massachusetts, but it appears not to be hardy on the higher lands of the State, and seems to require special treatment to establish it here. The Downing (or the New American, which appears to be identical) is a cultivated variety with a fruit

Tupelo or sour gum.

that is much more palatable than the common kinds, and has been successfully grown here. The dwarf white mulberry also seems hardy and gives a crop of fruit a few years after planting.

The mulberries make fine shade and ornamental trees, but should not be planted where they will overhang walks or buildings, as the decaying juicy fruit, if not all eaten by birds, drops to the ground in summer, where it is crushed by the feet of passers-by and disfigures walks or stains clothing. Wild blackberries, raspberries, blueberries and huckleberries all are eaten by birds in summer and all attract them. All wild cherries tempt the birds in July, August or September. There is a prejudice against these trees because they harbor tent caterpillars, which, however, may be killed by early spraying, but if wild cherries are not present many birds will be likely in August and September to go where they can be found or to attack cultivated fruit. Any crusade for the extermination of wild cherry trees will fail, as they may be found not only in yards, fields, pastures and along the roadsides, but almost everywhere in the woods.



Smilax, greenbrier, bull brier.

In September or October practically all the later wild fruits ripen, and, as many of them remain on the stems all winter, and some until spring, it is only necessary to have them in sufficient variety to provide winter food for fruit-eating birds. A few of these fruits, however, are particularly important as well as ornamental. Some are not eaten much by birds while the softer and more desirable fruits are at their best but later they remain intact during the inclement months, when frost and storms have destroyed or covered other fruit, and then they offer nutriment to the birds in time of need. Such are the American and European mountain ash, the various sumacs, the junipers and the black alder (*Ilex verticillata*). The fruit of the mountain ash is very rich and ornamental in color,

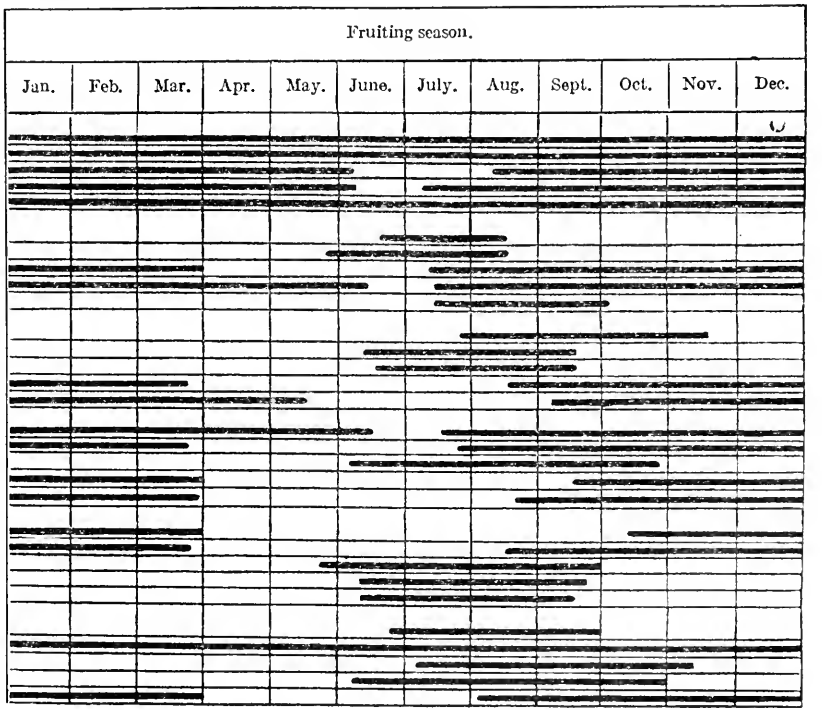
and rarely is disturbed by birds until the dead of winter, when they seek it eagerly. The foliage of the sumacs is brilliant in autumn, while the fruit, as well as that of the black alder, is handsome and remains on the stem for the winter birds. The catkins of the birches and of the common alder are sought for their seeds by winter birds. It is essential to provide berries and seeds on shrubs and trees well above the snow for winter food.

All trees that are attacked by many insects are favorites with birds. Many hundreds of species of insects infest the apple, oak, poplar, willow, birch and alder. Hence these trees are desirable. The coniferous trees are not subject to the attacks of such a variety of insects, nevertheless certain species sometimes become numerous upon them. The white pine is a favorite with titmice and kinglets in winter, as they often find the eggs of aphides on these trees in enormous numbers. The seeds of coniferous trees are eaten by a few species of birds. Elms ripen their seeds early, thus providing food for birds in early summer, while the spanworms that infest elms and apple trees are sought by nearly all birds.

Mr. W. L. McAtee of the Biological Survey, who has made a special study of fruits attractive to birds, has published in Farmers' Bulletin 621, entitled "How to attract Birds in Northeastern United States," the following table, showing the seasons in which different fruits are available for birds: —

TABLE 1. — *Seasons of Fruits attractive to Birds.*

COMMON NAME.	Scientific Name.	Native or introduced.
Juniper,	*Juniperus communis,*	Native
Red cedar,	*Juniperus virginiana,*	Native
Greenbrier,	*Smilax rotundifolia,*	Native
Bayberry,	*Myrica carolinensis,*	Native
Hackberry,	*Celtis occidentalis,*	Native
Red mulberry,	*Morus rubra,*	Native
White mulberry,	*Morus alba,*	Introduced
Pokeweed,	*Phytolacca decandra,*	Native
Barberry,	*Berberis vulgaris,*	Introduced
Sassafras,	*Sassafras variifolium,*	Native
Spice bush,	*Benzoin aestivale,*	Native
Wild gooseberry,	*Ribes cynosbati,*	Native
Red currant,	*Ribes vulgare,*	Introduced
Asiatic currant,[1]	*Ribes fasciculatum,*	Introduced
Flowering crab apple,	*Pyrus floribunda,*	Introduced
Chokeberry,	*Pyrus melanocarpa,*	Native
Mountain ash,	*Pyrus americana,*	Native
June berry,	*Amelanchier canadensis,*	Native
Asiatic service-tree,[2]	*Amelanchier asiatica,*	Introduced
Cockspur thorn,	*Crataegus crus-galli,*	Native
Washington thorn,	*Crataegus phaenopyrum,*	Introduced
English thorn,	*Crataegus oxyacantha,*	Introduced
Wild strawberry,	*Fragaria americana,*	Native
Wild blackberry,	*Rubus allegheniensis,*	Native
Wild blackberry,	*Rubus triflorus,*	Native
Wild blackberry,	*Rubus canadensis,*	Native
Pasture rose,[1]	*Rosa humilis,*	Native
Wild black cherry,	*Prunus serotina,*	Native
Wild red cherry,	*Prunus pennsylvanica,*	Native
Beach plum,[1]	*Prunus maritima,*	Native

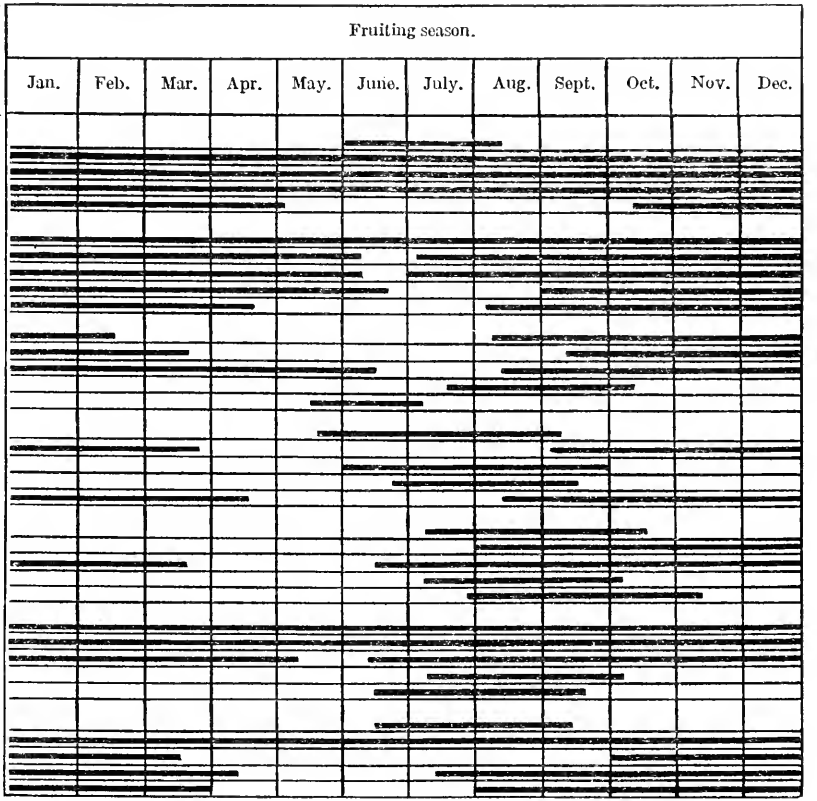


[1] Fruit becoming dry at end of season.

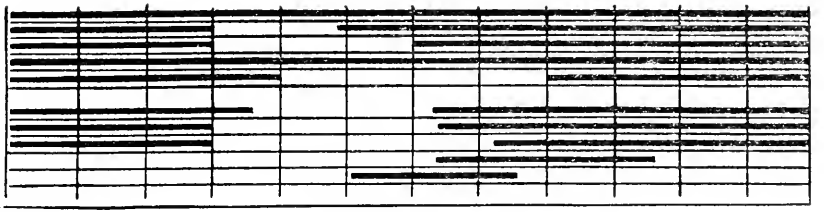
[2] Apparently procurable only from foreign dealers.

TABLE 1. — *Seasons of Fruits attractive to Birds* — Concluded.

Common Name.	Scientific Name.	Native or introduced.
Sand cherry,	*Prunus pumila,*	Native
Crowberry,	*Empetrum nigrum,*	Native
Smooth sumac,	*Rhus glabra,*	Native
Fragrant sumac,	*Rhus aromatica,*	Native
Holly,[1]	*Ilex opaca,*	Native
Inkberry,[1]	*Ilex glabra,*	Native
Black alder,[1]	*Ilex verticillata,*	Native
Mountain holly,[1]	*Nemopanthus mucronata,*	Native
Bittersweet,	*Celastrus scandens,*	Native
Buckthorn,	*Rhamnus cathartica,*	Introduced
Virginia creeper,	*Psedera quinquefolia,*	Native
Japanese creeper,[2]	*Ampelopsis tricuspidata,*	Introduced
Summer grade,[2]	*Vitis aestivalis,*	Native
Frost grape,	*Vitis vulpina,*	Native
Leatherwood,	*Dirca palustris,*	Native
Wild pepper,	*Daphne mezereum,*	Introduced
Oleaster,[2]	*Elaeagnus angustifolia,*	Introduced
Buffalo berry,	*Shepherdia canadensis,*	Native
Wild sarsaparilla,	*Aralia nudicaulis,*	Native
Asiatic sarsaparilla,[2]	*Acanthopanax sessiliflorum,*	Introduced
Bunchberry,	*Cornus canadenis,*	Native
Flowering dogwood,	*Cornus florida,*	Native
Red osier,[2]	*Cornus stolonifera,*	Native
Alternate-leaved dogwood,	*Cornus alternifolia,*	Native
Sour gum,	*Nyssa sylvatica,*	Native
Wintergreen,	*Gaultheria procumbens,*	Native
Bearberry,	*Arctostaphylos uva-ursi,*	Native
Creeping snowberry,	*Chiogenes hispidulus,*	Native
Black huckleberry,	*Gaylussacia baccata,*	Native
Early sweet blueberry,	*Vaccinium pennsylvanicum,*	Native
Swamp blueberry,	*Vaccinium corymbosum,*	Native
Cranberry,	*Vaccinium macrocarpon,*	Native
Persimmon,[1]	*Diospyros virginiana,*	Native
Privet,	*Ligustrum vulgare,*	Introduced
Purple berry,	*Callicarpa purpurea,*	Introduced



Partridge berry, . .	*Mitchella repens*, . .	Native
Fly honeysuckle,[2] . .	*Lonicera caerulea*, . .	Native
Tartarian honeysuckle,[2] .	*Lonicera tatarica*, . .	Introduced
Snowberry, . . .	*Symphoricarpos racemosus*,	Native
Coralberry, . . .	*Symphoricarpos vulgaris*, .	Native
High-bush cranberry, .	*Viburnum opulus*, . .	Native
Arrowwood, . . .	*Viburnum acerifolium*, .	Native
Sheepberry, . . .	*Viburnum lentago*, . .	Native
Common elder, . .	*Sambucus canadensis*, .	Native
Red-berried elder, . .	*Sambucus racemosa*, .	Native



[1] Sexes tending to be on separate plants; both required.

[2] Fruit becoming dry at end of season.

NOTE. — This and the lists of plants in succeeding pages have been inserted practically as they were published originally. No attempt has been made by the author to correct them or to bring the evanescent nomenclature up to date.

The plants given in the above list are selected from a much larger number, all of which are known to be favorites with birds, and are such as are likely to be secured through the ordinary channels of trade. The fruiting seasons include the earliest and latest dates recorded for New York and New England, and it cannot be expected that fruit will be available at any one locality throughout the entire season given, unless a large number of plants are set in a variety of situations. Mr. McAtee also gives the following valuable notes on the foregoing list: —

Bayberry. Usual trade name is *Myrica cerifera*.

Hackberry. Fruit scarce in late May and June. *Celtis serrata*, *C. bungeana* or *C. mississippiensis* may be substituted.

Mulberry. *Morus tatarica* may be used.

Pokeweed. Let it grow through shrubs or a trellis which will support it in winter.

Barberry. *Berberis amurensis*, *B. aristata*, *B. regeliana* and *B. rehderiana* are good substitutes. The universally planted *B. thunbergi* seems to be of very little value as bird food.

Sassafras. Appears in most catalogues as *S. officinale* or *S. sassafras*.

Flowering apple. The following may be substituted: *P. baccata*, *P. halliana*, *P. parkmanni*, *P. sargentii* and *P. toringo*.

Chokeberry. Often called *Pyrus* or *Aronia nigra*. *P. arbutifolia*, another native species, retains its fruit just as long, but the fruit becomes very dry toward the end of the season.

Cherry. *Prunus cerasifera*, *P. fruticosus*, *P. japonica pendula*, *P. sargentii* and *P. tomentosa*, all introduced, are worth adding.

Sumac. *Rhus copallina* or *R. hirta* (*typhina*) may be substituted for *R. glabra*.

June berry. *Amelanchier canadensis*, sold by nurserymen, is a composite species. Several species are now recognized, among which *A. lævis* is a notably early fruiter and *A. sanguinea* a late one. Some fruit of June berries occasionally hangs much later than the season indicated, but in very dry condition.

Thorns. The species recommended are those usual in the trade. So far as desirability is concerned many native species could be substituted. Cotoneasters, such as *C. coccinea*, *C. horizontalis*, *C. microphylla*, *C. rotundifolia* and *C. tomentosa*, may also be used.

Strawberry. Often called *Fragaria vesca* var. *americana*. *F. virginiana* is a fair substitute. Little dealt in, must usually be transplanted from woods and fields.

Blackberry. *Rubus triflorus* is frequently called *R. americanus*.

Rose. All native species have persistent fruit. The small-fruited ones

are best for birds. *Rosa carolina* and *R. nitida* are suitable for low grounds, and *R. humilis* (sometimes called *virginiana*) and *R. setigera* may be planted in drier places. *R. micrantha* and *R. multiflora* are among the best introduced roses.

Black alder. *Ilex lævigata* may be used instead of *I. verticillata*. *I. serrata* is a good introduced species.

Mountain holly. Drops most of its berries in the fall, only a few persist throughout the season indicated.

Bittersweet. *Celastrus orbiculatus*, introduced, may be used.

Buckthorn. *Rhamnus dahurica* is equally good.

Virginia creeper. Often sold under the names *Ampelopsis* and *Parthenocissus*. *A. heterophylla* and *P. vitacea* may be substituted.

Wild pepper. *Hippophaë rhamnoides* may replace it, especially along coast.

Oleaster. *Elæagnus longipes*, *E. multiflora*, *E. pariflora* and *E. umbellata* also are good.

Buffalo berry. *Shepherdia* (*Lepargyrea*) *argentea*, the true buffalo berry, furnishes good bird food.

Dogwood. *Cornus paniculata* (*candidissima*), native, and *C. alba* and *C. sanguinea*, introduced, are worthy substitutes.

Huckleberry. *Gaylussacia baccata* is often sold as *G. resinosa*.

Blueberry. Any species may be substituted.

Cranberry. Generic name often given as *Oxycoccus*.

Privet. *Ligustrum acuminatum*, *L. amurense*, *L. ciliatum*, *L. ibota* and *L. microcarpum*, all introduced, are equally good. Must not be clipped; berries borne on outer twigs.

Purple berry. Variety *japonica* is the hardy form.

Honeysuckle. *Lonicera glauca*, *L. canadensis*, *L. oblongifolia* and *L. sempervirens*, native, and *L. maackii*, introduced, may be substituted.

Snowberry. *Symphoricarpus occidentalis* is just as good.

Viburnum. *V. dentatum*, native, and *V. sieboldii*, introduced, are worth adding.

Elder. *Sambucus nigra*, introduced, also is valuable.

It will be noted that the list given by Mr. McAtee includes both native and introduced species, but for those who prefer to raise their own plants, or to encourage such native plants enticing to birds as already grow on their land, the following list, first published by Mr. F. H. Kennard in "Bird-Lore" for July–August, 1912, is recommended as showing the comparative attractiveness of the various species.

Those plants that are particularly tempting to birds are shown with three asterisks, while those with more than ordinary attractiveness are shown by one or two asterisks, in the

order of their attractiveness; and those species of which the fruits seem to be eaten so seldom as to make their planting barely worth while are marked with a dagger.

Deciduous Trees.

**Acer negundo*, ash-leaved maple, box elder.
***Acer saccharum*, sugar maple; and doubtless other maples.
Betula populifolia, American gray birch.
Betula lutea, yellow birch; and probably other birches.
Celtis occidentalis, hackberry.
Cercis canadensis, red-bud.
****Cornus florida*, flowering dogwood.
†*Corylus americana*, American hazel.
***Crataegus coccinea*, white thorn.
***Crataegus crus-galli*, cockspur thorn; and others of this genus.
†*Fagus americana*, American beech.
**Fraxinus americana*, American white ash; and probably other species.
†*Hicoria* sp. Several kinds of hickory.
Ilex opaca, American holly.
†*Liquidambar styraciflua*, sweet gum.
†*Liriodendron tulipifera*, tulip tree.
****Morus rubra*, native red mulberry.
***Nyssa sylvatica*, tupelo.
Ostrya virginiana, hornbeam.
†*Plantanus occidentalis*, sycamore.
†*Populus* sp. Various species of poplars are sometimes fed upon.
****Prunus pennsylvanica*, bird cherry.
****Prunus punila*, sand cherry.
****Prunus serotina*, black cherry.
****Prunus virginiana*, choke cherry.
***Pyrus americana*, mountain ash.
†*Quercus* sp. Several species of oaks.
Sassafras officinalis, sassafras.
Ulmus americana, American elm.
And other species.

Evergreen Trees.

***Juniperus virginiana*, red cedar.
***Juniperus communis*, prostrate juniper.
***Picea alba*, white spruce.
***Picea rubra*, red spruce; and undoubtedly other species.
**Pinus rigida*, pitch pine.
**Pinus strobus*, white pine.
**Tsuga canadensis*, hemlock.

Shrubs.

***Amelanchier canadensis*, June berry.
***Benzoin odoriferum*, spice bush.
**Berberis vulgaris*, barberry.
Comptonia asplenifolia, sweet fern.
Corema conradii, broom crowberry.
****Cornus alternifolia*, blue cornel.
****Cornus candidissima*, gray cornel.
****Cornus sericea*, silky cornel.
****Cornus stolonifera*, red osier cornel.
***Gaylussacia frondosa*, dangleberry.
***Gaylussacia resinosa*, huckleberry.
***Ilex glabra*, inkberry.
***Ilex verticillata*, black alder; and probably *I. lævigata*, winterberry, black ilex.
Ligustrum vulgare, privet.
***Myrica cerifera*, bayberry.
Prunus maritima, beach plum.
**Pyrus arbutifolia*, chokeberry.
Rhamnus catharticus, buckthorn.
****Rhus copallina*, shining sumac.
****Rhus glabra*, smooth sumac.
****Rhus toxicodendron*, poison ivy.
****Rhus typhina*, staghorn sumac.
****Rhus venenata*, poison sumac.
***Ribes floridum*, large-flowering currant.
***Ribes lacustre*, swamp gooseberry; and other species.
***Rosa* sp. It is probable that the fruits of all the native wild roses are eaten largely by birds.
****Rubus occidentalis*, thimbleberry.
****Rubus strigosus*, red raspberry.
****Rubus canadensis*, low blackberry.
****Rubus villosus*, high blackberry.

***Sambucus canadensis*, common elder.
***Sambucus pubens*, panicled elder.
Shepherdia canadensis, shepherdia.
**Symphoricarpos racemosus*, snowberry.
***Vaccinium caespitosum*, dwarf bilberry.
***Vaccinium corymbosum*, high-bush blueberry.
***Vaccinium pennsylvanicum*, low-bush blueberry; and doubtless other species, including *V. vitisidæa*, cow berry.
**Viburnum alnifolium*, hobble bush.
**Viburnum dentatum*, arrow-wood.
**Viburnum lentago*, sheepberry.
**Viburnum nudum*, withe-rod.
**Viburnum opulus*, high-bush cranberry.
**Viburnum prunifolium*, black haw; and doubtless *V. acerifolium*, *V. cassinoides*, and other species.

Vines.

**Ampelopsis quinquefolia*, Virginia creeper.
Arctostaphylos uva-ursi, bearberry.
Celastrus scandens, false bittersweet.
Menispermum canadense, moonseed.
Mitchella repens, partridge berry.
Vaccinium macrocarpon, cranberry.
Vaccinium oxycoccus, dwarf cranberry.
**Smilax rotundifolia*, bull brier.
**Vitis cordifolia*, frost grape.
**Vitis labrusca*, fox grape.
**Vitis vulpina*, frost grape.

Herbaceous Plants.

**Aralia nudicaulis*, sarsaparilla.
Fagopyrum esculentum, buckwheat.
**Fragaria virginiana*, strawberry.
Gaultheria procumbens, checkerberry.
Helianthus annuus, sunflower.
**Phytolacca decandra*, pokeberry.
Smilacina racemosa, false spikenard.
Solanum nigrum, nightshade.

It should be noted that the poison ivy and the poison sumac are undesirable for indiscriminate planting, and that the barberry, although generally regarded as a native, is, as Mr. Kennard remarks, an introduced species.

The first deciduous tree on the above list, the ash-leaved maple or box elder, is noteworthy as a favorite of the evening grosbeak while wintering here, and it seems probable that since this beautiful bird has become a winter resident here in recent years it might be induced to come and remain in larger numbers if many of these trees were planted.

The American beech, while not attractive to small birds, furnishes in its fruit a supply of food in autumn for ducks and grouse. The oaks, which supply much insect food for many birds, also furnish food in the form of acorns for ducks, grouse, jays and crows. My own experience goes to show that *Cornus alternifolia* is most important among the cornels. The Virginia creeper or woodbine is useful, as its fruit is sought by thrushes. Among the herbaceous plants the pokeweed and the sunflower

may be mentioned as favorites with birds. When raising sunflowers the giant Russian variety is best. If well fertilized it produces gigantic flowers and a large quantity of huge seeds which are much sought after by the brilliant goldfinch, the purple finch, the nuthatches and the chickadee. Buckwheat always attracts the mourning dove and is likely to lure bobwhite.

Food Plants for Native Sparrows and Ground Birds.

All native sparrows are fond of weed seeds. Doves, grouse, bobwhites and pheasants eat them also and wild fowl resort to them more or less. Hence weedy cultivated fields and gardens are favorite haunts for seed-eating birds in autumn.

I have found nothing better for attracting native sparrows than the Japanese millet (*Panicum crus-galli*), a cultivated weed or barnyard grass. A small patch of this sowed on land that has first been plowed, harrowed well and manured will attract all the native sparrows in the neighborhood when the seed ripens, as well as the migratory species from the north. If several patches be sown from early May to late June in different localities they will ripen their seed at different times and provide food from late August until winter. Mr. McAtee recommends also the following for sparrows: —

"Love-lies-bleeding (*Amaranthus candatus*), prince's feather (both *Amaranthus hypochondriacus* and *Polygonum orientale*), yellow chamomile (*Anthemis tinctoria*), chamomile (*Anthemis nobilis*), *Calandrinia umbellata*, bachelors button (*Centaurea cyanus*), African millet (*Eleusine coracana*), California poppy (*Eschscholzia californica*), tarweed (*Madia elegans*), miners lettuce (*Montia perfoliata*), millet (*Panicum miliaceum*), . . . German millet or Hungarian grass (*Setaria italica*), and sunflower. Several of the species of sunflower will serve, the common sunflower (*Helianthus annuus*) being one of the best, having named varieties especially prized for the abundance and large size of the seed. No seeds are more relished by graminivorous birds than the millets; in fact, they are so much preferred that they have been used with good effect for drawing the attention of birds from more valuable grain crops." [1]

In my "Useful Birds and their Protection," fourth edition, 1913, published by the Massachusetts State Board of Agricul-

[1] McAtee, W. L., Plants Useful to attract Birds and protect Fruit. Year book, United States Department of Agriculture 1909, p. 193.

ture, two lists of plants attractive to birds are given, pages 374 to 376 and pages 430 to 432. For lack of space and because they would largely duplicate the two lists above they cannot be repeated here, nor can the long lists of food plants of the ruffed grouse and bobwhite, printed in my "Game Birds, Wild Fowl and Shore Birds," be included in this circular, but for the convenience of those who wish to attract game birds the following by Mr. McAtee from the Yearbook of the United States Department of Agriculture for 1909 is appended: —

While the establishment of preserves for land game birds is yet a new movement in this country, it is certain to become of great importance. Hence it is desirable to disseminate information as to the food and covert plants that are favored by the grouse and quail. Bobwhites frequently use covers of rose, alder and blackberry bushes, and thickly set barberry, bayberry and dense banks of honeysuckle are suitable. These plants also furnish food for the birds, but they should be supplemented by others more exclusively adapted for this purpose. Sumac, Japanese clover, buckwheat, sorghum, millet, vetches, cowpeas, and any plants of the pea family producing small seeds, are valuable and should be sown in large quantities. The seeds of milk pea (*Galactia*), partridge pea (*Chamæchrista*), hog peanut (*Falcata*), wild bean (*Strophostyles*), and smartweeds (*Polygonum*) are important natural foods of the eastern quail, but should be encouraged only where they cannot become weed pests. The western quail are fond of the seeds of sumac, but clover, alfilaria, lupines, napa thistle and turkey mullein plants; but where these plants are liable to become nuisances the food plants recommended for the eastern quail will serve.

Coverts for grouse, as the sharptail, should abound in such plants as rose, sumac, blueberry, bearberry, buffalo berry, dwarf birch and alder. The ruffed grouse thrives among scrub oak, bayberry, rose, sumac, dwarf birch, alder, poplar, willow and such fruit-bearing plants as partridge berry, hawthorn, viburnum, wild grapes, mountain ash, blueberry, blackberry and cranberry. Cover of this nature is suited to the heath hen also, and to the imported pheasants and the Hungarian partridge, but in all cases it is well to supplement the food supply furnished by these shrubs and trees by planting small grains and legumes, as recommended for quail.

Some of the plants named in the above list are not native to New England, and probably the cowpea and the milk pea will not mature in Massachusetts, but most of them can be utilized here.

It is impossible within the limits of this circular to give even a list of the important plants which attract wild ducks

and geese, but information regarding some of the most useful of such plants may be found in the following publications of the United States Department of Agriculture: Bureau of Biological Survey, Circular 81, and Department of Agriculture Bulletins 58 and 205. All may be obtained of the Superintendent of Documents, United States Department of Agriculture, Washington, District of Columbia.

Plants for Protecting Cultivated Fruits.

The chief fruit-eating birds in Massachusetts are the robin, the catbird and the cedar waxwing. The flicker, English sparrow, Baltimore oriole and a few other species occasionally are mischievous, and the starling, a recent introduction from the Old World, seems likely to become most destructive of all. Cherries are most often attacked by fruit-eating birds, but all small fruits are eaten by them. It is not good biology to shoot birds for taking fruit. It is better to provide fruit enough for ourselves and the birds, and thus retain their services as insect destroyers. It will pay the fruit grower to lure them away from his cultivated cherries and berries, if possible, by setting out plants that bear earlier and more attractive fruit. My experiments with the native red mulberry were successful in protecting cherries, and I have watched a garden where a single tree of the Downing mulberry entirely protected several trees of cultivated cherries of the harder varieties. No native bird troubled the cherries although the English sparrows occasionally pecked one. I have learned from fruit growers in New Jersey that mulberry trees protected their cherry crops from robins even in a very dry season, when robins elsewhere had been destructive to the fruit. The Russian mulberry is very early and will grow in southeastern Massachusetts. Elsewhere in the State, as hereinbefore stated, the white mulberry, the red or the Downing or New American would serve. The advantages of the Downing or New American are that it is a quick grower and fruiter, bears very early in the season and appears to be perfectly hardy, at least in eastern Massachusetts.

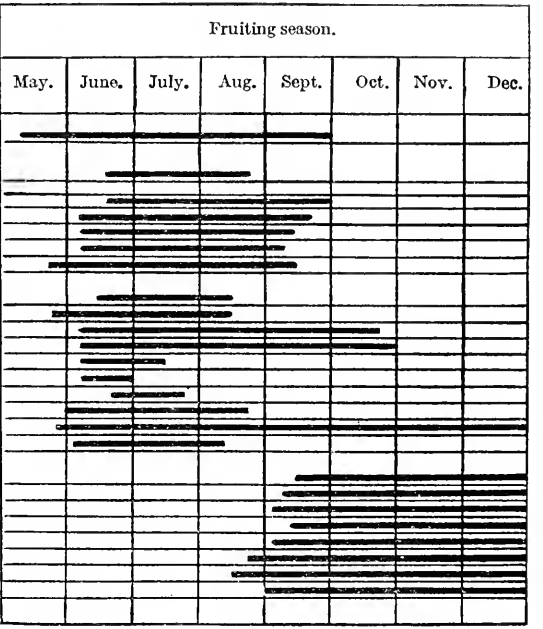
Mr. G. T. Powell tried the experiment of planting a row of soft early cherries known as the Governor Wood. The birds

took them, leaving untouched choice varieties, such as Montmorency and Richmond. Another fruit grower, having a row of soft cherries and finding that the birds took most of them, cut down the trees. The birds then attacked the main orchard.

Mr. McAtee in Farmers' Bulletin 621 gives the following table, showing the seasons of fruits useful in protecting cultivated varieties: —

TABLE 2. — *Seasons of Fruits useful to protect Cultivated Varieties.*

COMMON NAME.	Scientific Name.	Native or introduced.	To protect —
Wild strawberry,	*Fragaria americana,*	Native	Strawberries,
Baked-apple berry,	*Rubus chamaemorus,*	Native	Raspberries and blackberries,
Wild blackberry,	*Rubus canadensis,*	Native	Raspberries and blackberries,
Wild blackberry,	*Rubus allegheniensis,*	Native	Raspberries and blackberries,
Wild blackberry,	*Rubus triflorus,*	Native	Raspberries and blackberries,
Wild blackberry,	*Rubus frondosus,*	Native	Raspberries and blackberries,
Wild pepper,	*Daphne mezereum,*	Introduced	Raspberries and blackberries,
Red mulberry,	*Morus rubra,*	Native	Cherries,
White mulberry,	*Morus alba,*	Introduced	Cherries,
June berry,	*Amelanchier canadensis,*	Native	Cherries,
Wild red cherry,	*Prunus pennsylvanica,*	Native	Cherries,
Japanese cherry,	*Prunusjaponica pendula,*	Introduced	Cherries,
Sargent cherry,[1]	*Prunus sargentii,*	Introduced	Cherries,
Mahaleb cherry,	*Prunus mahaleb,*	Introduced	Cherries,
Fly honeysuckle,	*Lonicera canadensis,*	Native	Cherries,
Fly honeysuckle,	*Lonicera caerulea,*	Native	Cherries,
Red-berried elder,	*Sambucus racemosa,*	Native	Cherries,
Asiatic service-tree,[1]	*Amelanchier asiatica,*	Introduced	Apples and pears,
Silky-leaved pear,[1]	*Pyrus elaeagrifolium,*	Introduced	Apples and pears,
Flowering crab apple,	*Pyrus floribunda,*	Introduced	Apples and pears,
Dwarf crab apple,	*Pyrus toringo,*	Introduced	Apples and pears,
Hybrid crab apple,[1]	*Pyrus prunifolia,*	Introduced	Apples and pears,
Cockspur thorn,	*Crataegus crus-galli,*	Native	Apples and pears,
English thorn,	*Crataegus oxyacantha,*	Introduced	Apples and pears,
One-seeded thorn,	*Crataegus monogyna,*	Introduced	Apples and pears,



[1] Apparently procurable only from foreign dealers.

Other Means of Protecting Fruit.

Birds eat fruit not only for food but for the juices, which often serve to take the place of water in dry weather. A drinking fountain or a brook close at hand may serve to take some of their attention from the fruit. Newly turned sod also may attract robins and some other birds away from fruit, as they seem to prefer worms and grubs. A fertile, well-watered lawn sometimes answers the same purpose, as it keeps the earthworms near the surface where the robins can find them.

As a last resort, where one has but one or two cherry trees and no room for experiments, the trees may be covered with a fine-meshed fish net, but birds may become entangled in the net.

Plants for the Seashore.

Mr. McAtee in his excellent bulletin (621) gives the following hints regarding plants for attracting birds at the seaside: —

Where the coast is rocky and the soil of ordinary character, conditions are little different from those inland, and except in relation to exposure there need be no especial preference given in the choice of plants. It is worth mentioning, however, that several trees and shrubs are better adapted to withstand the winds so prevalent on the coast. These include three species of juniper (*Juniperus communis*, *J. horizontalis* and *J. virginiana*), common barberry, English thorn, hybrid crab apple, European and American mountain ashes, smooth and staghorn sumacs, privets, buckthorn and red-berried elder. Where the soil is chiefly sand, and that often shifting, conditions are not suited to many plants. Selection may be made, however, from the following, all of which are known to thrive in such surroundings: —

For Seed Eaters. — Beach grass (*Ammophila arenaria* and *Calamovilfa longifolia*), *Polygonum sachalinense* and sunflower.

For Fruit Eaters. — Bayberry (*Myrica cerifera*), sea buckthorn (*Hippophaë rhamnoides*), sand cherry (*Prunus pumila* or *P. cuneata*), beach plum (*Prunus maritima*), cranberries and bearberry (*Arctostaphylos uva-ursi*).

How to Plant.

Inexperienced planters are likely to fail even if provided with excellent plants or seeds. The common plan of sticking seeds into little holes in the sod or leaf mold is foredoomed to failure, as only a very small percentage of the seeds ever suc-

ceed. The resulting young plants are exposed to many enemies and must compete with other well-established plants which surround them. If seeds are used they should be planted in rows about nine inches apart, near the surface, in a box of good loam, where they can be watched, weeded and cared for, or in a well-prepared bed surrounded with boards and covered with "cellar wire" netting to keep out mice, rabbits, squirrels and other enemies. If planted in the fall they should be mulched the first winter. When they have outgrown this little nursery they may be replanted in nursery rows or set in the ground where they are to remain.

Plants from the nurseryman, if well cared for and properly packed, should be moist about the roots when received. The bundles should be unpacked as soon as possible, the bunches loosened enough so that all the roots may come in contact with the earth that is to receive them and they should be "heeled in" or covered at once in a trench in moist earth on the north side of a building or in a cool cellar. A brief exposure to sun and wind is enough to destroy both root hairs and rootlets. If at all dry when received the roots should be immersed in water before heeling in. Plants thus treated may be left with safety while the ground is being prepared to receive them. Young trees arriving with the roots dried out will sometimes recover if the top be cut back severely and the entire tree immersed for a few days in moist earth before planting.

The poorest possible way to set out a tree is to dig a little hole in old sod and set the tree in it.

The best way is to set all trees in land that has been well cultivated and manured for at least two or three years previous to the setting. Vigorous young trees from one to three feet high will make a better growth when transplanted than those that are older. There is no advantage for our purpose in bringing larger trees from the nursery. Trees may be started well in poor gravelly land by digging out a hole about two feet deep and large enough to hold a cartload of loam, in which the tree is set.

When setting out trees it is well to plow or trench the soil deeply and fine it well. I have had excellent success on poor

soil by digging holes about eighteen inches deep and five feet in diameter and putting in with the loam some ground bone and chip dirt.

Before setting a tree its roots should be examined, and if any have been mangled or broken they should be trimmed back with a sharp knife. The top should be cut back in proportion to the injury to the roots. It is better, as a rule, to have the tree more nearly resemble a bean pole in shape than a tree when set out. The soil should not be wet nor dry at planting time, but moist and crumbly, so that it may be readily worked in among the roots. While planting, the roots should be not exposed to sun and air but should be kept covered in moist earth or with wet burlap until wanted. Some nurserymen before planting puddle the roots in mud made of rich, fine loam. The tree is then set in the hole prepared for it, the roots spread in their natural positions and the earth packed firmly among and around them. In this work both hands and feet should be used and no cavities among the roots should be left unfilled. It is important that the soil about the roots be very fine and well packed, and the surface should be left light, to prevent evaporation. In light soil the tree should be set a little deeper than in the nursery row, and it may be necessary to water it or to mulch it deeply the first year.

When large trees are to be transplanted it should be done by an expert, as the novice is likely to make an expensive failure. The directions given for planting trees may be observed to advantage in setting out vines and shrubs, modifying the operation to suit the various sizes and conditions. Any capable nurseryman should be able to furnish information regarding plants suitable for dry or wet soil or for planting in sunny or shady places.

Note. — The author will be glad to receive any information on any of the subjects treated in this bulletin. Address Edward Howe Forbush, 136 State House, Boston, Mass.

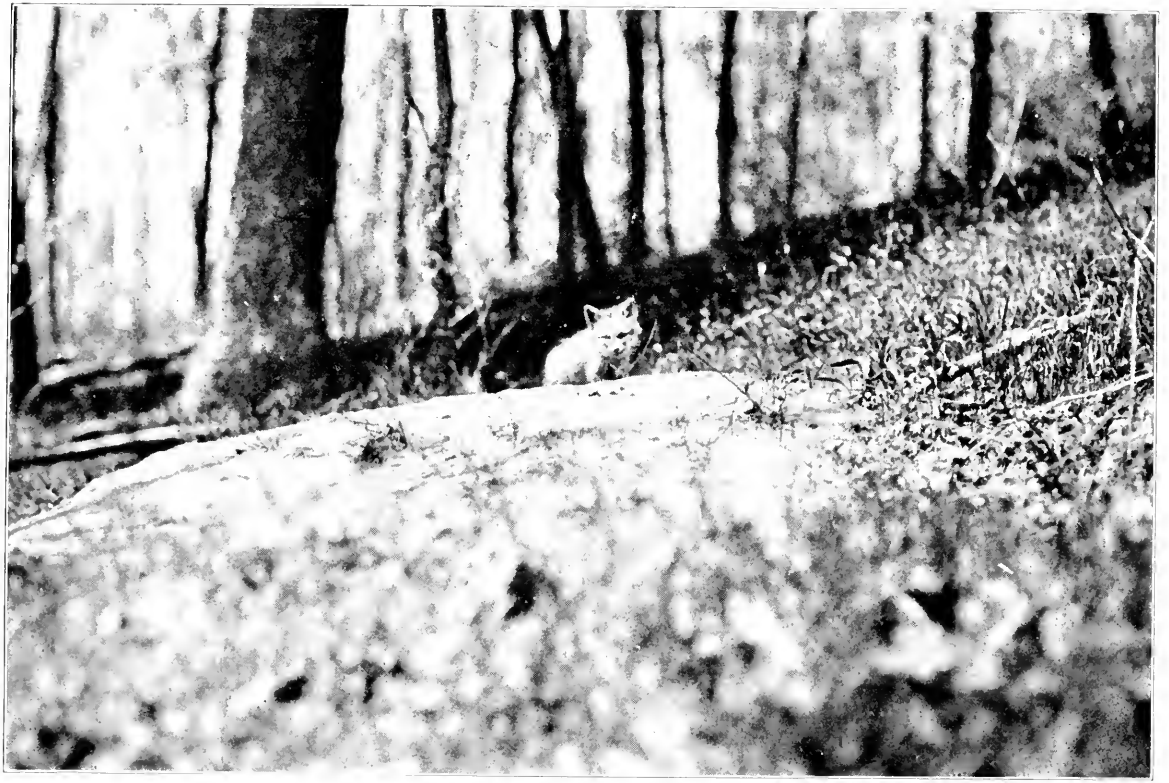
THE NATURAL ENEMIES OF BIRDS.

EDWARD HOWE FORBUSH, WESTBOROUGH, MASSACHUSETTS.

PREFATORY NOTES.

This bulletin has been written to exhibit the utility of native natural enemies of birds and to show the misfortunes that might follow their extermination, as well as to set forth the conditions under which they may need restraint, and to point out those species that are believed to be most destructive.

The present strong sentiment for bird protection, commendable as it is, has resulted in a war of extermination against the enemies of birds that may, in time, defeat its own ends. Bounties are paid on the heads of predatory creatures by individuals, towns, counties and States. Farmers, sportsmen, gunners, game keepers, game commissioners and wardens join with bird protectionists in destroying indiscriminately all creatures that are believed to kill birds or destroy their eggs or young, and the high and increasing prices now paid for furs offer an incentive to the trapper to pursue the fur-bearing animals as never before. It is true that some of the more crafty birds and mammals, such as the fox, the Cooper's hawk and the crow, may become too numerous and too destructive to bird life under some conditions, and that certain natural enemies of birds introduced by man from foreign countries, such as the cat and the English sparrow, persecute birds excessively at times and in certain places, but the majority of the larger and more destructive native enemies of birds always are held in check by the gunner, the farmer and the trapper, through motives of self-interest, and with the constant increase in the numbers of game preserves and bird preserves there is danger that we shall overdo the destruction of so-called vermin and thereby bring about serious consequences.



THE FOXES' DEN.

The fox is an enemy of all game birds and ground birds. (See page 225.) (From a photograph by James G. Parker.)

Much time, thought and care have been given by the writer of this paper to a study of the relations of birds and their enemies, and the experience of many other observers has been drawn upon in preparing this bulletin. Nevertheless, it may be noted that the statements concerning the economic value of the various creatures as set forth in these pages are supported by comparatively little evidence. Thus they lack the apparent authority that a fuller presentation of the evidence would have given them. Had the original plan been followed many more pages might have been filled with material fully confirming the conclusions arrived at, but lack of space forbade, and it was impracticable to secure the publication of the bulletin except in its present abridged form. Therefore, the statements and recommendations made and the conclusions drawn should be taken as the judgment of an observer who, having opportunity, has endeavored to inform himself fully, and who is confident that his conclusions have value as guides to all who seek to protect birds.

The names of mammals given in this bulletin have been brought down to date through the kindness of Dr. Glover M. Allen. Those of North American birds have been taken from the "American Ornithologists' Union Check-list," third edition (1910). Other zoölogical names are such as are given in the various publications quoted or cited.

THE NATURAL ENEMIES OF BIRDS.

INTRODUCTION.

It is well known to naturalists that in a state of nature the natural enemies of any species are as essential to its welfare as are food, water, air and sunlight. Unthinking people are slow to realize this, as they see only the apparent harm done by the so-called rapacious creatures, and fail to observe and reason far enough to perceive the benefits that such creatures confer upon the species on which they prey.

Insect-eating, fish-eating and flesh-eating animals are essential in the great scheme of nature, as they serve to check the increase and regulate the numbers of other species, which in turn, when so regulated, tend to perform a similar office for vegetation. Thus these predatory creatures may be regarded among the chief controllers of life upon this planet. Man, the savage, of course must be included among them, and civilized man, if guided by reason and wisdom rather than greed or folly, may exercise a beneficial control over many of the lower animals. In matters relating to the control of wild life, however, he is only beginning to exhibit reasoning powers somewhat superior to those of the ape.

NATURAL ENEMIES REGULATE THE NUMBERS OF ANIMALS.

All organic beings naturally produce a superabundance of offspring and thus tend to increase in numbers. This is a provision of nature intended to prevent the extinction of the species. The rate of multiplication varies greatly in different animals, but should any form increase without check it eventually would come to be so numerous that it would devour its entire food supply and become extinct from starvation, or it would compete with other forms which feed on similar food, until all became extinct for lack of food and from diseases

that accompany crowding, starvation and weakness. Natural enemies tend to prevent this by disposing of the surplus individuals.

Darwin says, truly, that the struggle for existence is greatest between individuals or varieties of the same species. Natural enemies protect a species against itself by keeping its numbers low enough to prevent serious competition for food.

NATURAL ENEMIES PRESERVE THE FITNESS OF THE ANIMALS ON WHICH THEY PREY.

Natural enemies also serve to preserve the fitness of a species by (*a*) acting to check the spread of disease and (*b*) operating to preserve by selection the most active, agile, cautious or otherwise efficient and mentally and physically fit individuals.

The spread of epidemics or contagious diseases is checked by the natural enemies of a species, which readily capture and destroy those slightly weakened by disease, as such animals are slower to act or react than those in robust health. Sick birds, for example, readily are captured, not only by enemies sly, swift or strong enough to catch healthy birds, but also by an additional number of slower enemies, which birds in full vigor would escape with ease.

On this subject Professor Spencer F. Baird of the Smithsonian Institution wrote as follows: —

> It has now been conclusively shown, I think, that hawks perform an important function in maintaining in good condition the stock of game birds by capturing the weak and sickly, and thus preventing reproduction from unhealthy parents. One of the most plausible hypotheses explanatory of the occasional outbreaks of disease amongst the grouse of Scotland has been the extermination of these correctives, the disease being most virulent where the gamekeepers were most active in destroying what they considered vermin.[1]

Mr. James Henry Rice says that in South Carolina the bob-white sometimes is attacked by a deadly disease which affects the head of the bird in such a way that it becomes stupid,

[1] Letter from Prof. Spencer F. Baird to Mr. J. W. Shorton, published in the Jour. of the Cincinnati Soc. of Nat. Hist., 1882, Vol. V., pp. 69, 70.

comes out in the open and lies in the sun. There it is readily detected and killed by hawks, and thus the progress of the contagion is stayed.

A similar selection is seen in the removal and destruction by natural enemies of the dull, slow-witted, deformed or otherwise unfit individuals which, in the long run, are the first to be caught and killed, while the active, quick-witted, strong and well-formed individuals are more likely to escape. A sharp-shinned hawk dashed into a flock of juncos feeding on the ground. All escaped by flight but one, which seemed to have lost its wits or failed to make use of them, and, crouching close to the ground while its companions were already in flight, fell a victim to its swift rapacious enemy. Individual birds which vary widely from the protective coloring of the species to which they belong are more readily seen, followed and destroyed by their enemies. Thus albinos, which because of their whiteness are conspicuous, are weeded out, and the protective color of the species is kept true.

Evidently, then, the tendency to increase is serviceable in maintaining a species, provided only that there exist effective checks to this increase to regulate the species, preserve its fitness and prevent it from increasing too much in numbers. Natural enemies provide such checks.

SOME NATURAL ENEMIES REGULATE OTHERS.

In a brief treatise like the present this subject cannot be handled exhaustively, but there is another way in which natural enemies benefit the species on which they prey which cannot be overlooked here, and that is the regulation by some of them of the numbers of certain other natural enemies. For example, one must count among the foes of birds hawks, owls, crows, jays, shrikes, foxes, weasels, minks, squirrels, snakes, rats and mice, but certain large hawks destroy smaller hawks; large owls destroy smaller owls; hawks and owls kill crows, jays, shrikes, weasels, minks, squirrels, snakes and rats; weasels destroy squirrels, snakes eat other snakes, and all catch mice. If rats, ground mice and climbing mice, lacking these and other checks, were allowed to increase too much in numbers they might exterminate most birds by destroying their eggs

and young, and this might be equally true of squirrels and weasels or crows and jays.

Rats and mice, although they must be classed as enemies of birds, do not constitute a menace to bird life if themselves held in check by their own enemies, and they perform a great service to birds by maintaining their own numbers at such a point that they furnish a great surplus of individuals, and become the main food supply for hawks, owls and other enemies of birds. Therefore rats and mice, while thus serving as food to maintain the numbers of birds' enemies also attract the attention of these enemies sufficiently away from the birds, and therefore tend to keep them from becoming too destructive to bird life.

As Professor Forbes says, the whole series of forces pressing one on another is like an arrangement of springs, working one against another, keeping all in place, thus maintaining the general equilibrium and safeguarding the general welfare.

USEFUL SPECIES MAY BECOME HARMFUL IF NOT HELD IN CHECK BY NATURAL ENEMIES.

There are certain bounds set by nature to the numbers of each species within which it serves a useful purpose, but whenever through any fortuitous circumstances, such as may arise by reason of man's interference, any species overflows this high-water mark, normal habits may change and severe injury to other species, even to man himself or his property, may result.

Animals considered serviceable to mankind, such as insectivorous birds, toads, bats, shrews, etc., are useful if they are kept within certain limits. The injurious species, so called, are mainly those which tend to increase beyond normal bounds. Then, by reason of abnormal multiplication and consequent shortage of food, they become destructive. The so-called useful species may become harmful under such circumstances by changing their food habits when they outrun their usual food supply. Insectivorous birds, mammals or insects may then attack grain, fruits or other products of man's industry. No one can tell what any animal may eat in case of necessity. Carnivorous creatures then may devour grass, leaves or fruit,

Vegetable feeders may prey on other animals. No mammal is considered more carnivorous than the wolf, yet at times it feeds voraciously on berries. My son saw a mink eating the bark and foliage of fruit trees. Wallace says that the carnivorous sable feeds partially on fruits or seeds in winter.[1]

It is a well-known fact that grain-eating birds have strong, muscular stomachs or gizzards lined with a hard, corrugated membrane which, with the assistance of pebbles, swallowed for the purpose, triturates or grinds up the grain or other seeds eaten, thus practically masticating them in the stomach. Nevertheless, most birds provided with such a stomach readily turn to animal food. It is well known, also, that flesh-eating birds have soft stomachs not fitted for grinding grain, but many of them will eat grain at need. Hon. John E. Thayer informs me that the hooded merganser (*Lophodytes cuculatus*), a fish-eating duck, readily learns to eat corn. In the Shetland Islands the herring gull (*Larus argentatus*) is said by Dr. Edmonstone to live on grain in summer and fish in winter.[2] In America our closely allied species has not been recorded as a grain eater.

A bird may vary its food habits by necessity, and such a change may even transform the lining of the stomach. Dr. Hunter fed a seagull for a year on grain and at the end of that time the appearance and structure of the stomach had so changed that it resembled the gizzard of a pigeon, and Dr. Edmonstone asserts that the herring gulls of the Shetland Islands thus produce a change in the structure of the stomach twice a year as they shift from grain to fish.

Similar transformations have been observed in the stomach of a raven and that of an owl, and Dr. Holmgrén has proved by experiment that the stomachs of pigeons, fed for a long time on meat, gradually come to resemble those of rapacious birds.[3]

When it is shown how all animals tend to increase in numbers, and how readily some of the most useful may change their feeding habits and become injurious under the spur of

[1] Wallace, Alfred Russell: Darwinism, 1890, p. 191.
[2] Semper, Karl: Animal Life as affected by the Natural Conditions of Existence, 1881, p. 61.
[3] *Ibid.*, pp. 67, 68.

necessity and competition, it becomes plain that the creatures which prey on such species and so keep their numbers within normal bounds are essential to the welfare of all.

NATURAL ENEMIES SUPPLEMENT AND CHECK ONE ANOTHER.

When we examine broadly the relations of birds and their enemies we find that some species appear far more destructive to bird life than others. Certain swift hawks, for example, seem to feed almost wholly on birds whenever they can obtain them, while other slower hawks rarely take any except helpless, sick or disabled birds, but feed largely on small mammals, such as squirrels and field mice. Thus one species is seen to take an excess of birds while the other takes an excess of their enemies, the effect of the activities of one tending to balance those of the other. Again, a certain animal may be a destroyer of certain birds and a protector of others. The skunk, for example, is known occasionally to destroy the eggs and young of grouse and other birds which nest on the ground, as well as those of domestic fowls. On the other hand, the skunk is the appointed guardian and protector of young water birds, which are unsafe except in shallow waters, where there are no great fish to eat them. Therefore they frequent such shallow waters, and there their greatest enemy is the snapping turtle. Wherever these great turtles are numerous practically no young water birds can be raised, as these cold-blooded monsters hide in the mud of the bottom or swim under water, and pull down the young birds by their feet.

During four summers I watched many of these turtles depositing their eggs and burying them in the earth near the shores of a river, and in every case within twenty-four hours the skunk unearthed and ate every egg laid. Where skunks are numerous it seems impossible for any snapping turtles' eggs to hatch, but where skunks have been extirpated turtles increase rapidly in numbers and in time prevent the multiplication of wild ducks or geese.

Although the turtle is an enemy of wild fowl, it may unwittingly befriend the ground-nesting birds locally by providing the skunk with a tempting supply of turtle eggs at a time

when the eggs of the ground birds are in the nest, and thus so occupying its attention and attracting it away from birds-egging as to save many early broods of birds.

The marsh hawk (*Circus hudsonius*) feeds to some extent on marsh birds and their young, but a much larger part of its food consists of meadow mice and frogs. These mice certainly would be very destructive to young birds were they not held in check, and large frogs are known to swallow the young of water birds. Marsh hawks and other enemies prevent many frogs from reaching a size when they would be dangerous to young birds.

The larger hawks feed commonly on snakes, which are known to be destructive to birds. Even the rattlesnake is a common prey of the large red-tailed hawk (*Buteo borealis*).

NATURAL ENEMIES TEND TO KEEP THE NUMBERS OF BIRDS AT THEIR NORMAL LIMIT.

Under natural conditions, wherever man and his satellites — cats, rats, dogs, hogs, goats, etc. — have not interfered with the balance of natural forces the native natural enemies of birds do not tend, on the whole, to reduce the numbers of any species to a point much below that at which its natural food supply will maintain it. Any species having a bountiful food supply constantly tends to increase rapidly in numbers, and natural enemies and meteorological checks are necessary to keep its increase below the limit of its supply of food. If for any reason these forces were unable to do this, and a species became too numerous, starvation and disease would follow.

A school of writers has risen of late who refer to the natural enemies of birds as far more destructive than the hunter, and assert that it is useless to attempt to protect birds and increase their numbers anywhere unless natural enemies (which they denominate as vermin) be first destroyed. It even is asserted positively that if a certain tract of land be set aside, and all shooting upon it be stopped for a series of years, the game and birds will lessen rather than increase, because of the unrestrained destructiveness of their natural enemies. This contention apparently is not supported by facts.

If we go back to the times of the early settlers we find that

birds and game were remarkably numerous, far more so than now, and that not only were eagles, hawks, owls, skunks, weasels, raccoons and other foes of birds far more abundant then than now, but there were also pumas, wolves, lynxes, bears and ravens, which are now rarely or never found in southern New England. It must be accepted as a fact that the natural enemies of birds did not then tend to diminish their numbers. Going back only to the days of the civil war we find that in the southern States, when white men were practically all in the army, when negroes had no guns and when very little hunting was done, game increased to enormous numbers it spite of its natural enemies.

In 1877-78, when I was on the Indian River, Florida, game was more abundant than I have ever seen it anywhere since. Hosts of wild fowl blackened the waters. Bobwhites and wild turkeys were plentiful, and myriads of herons, egrets, shore birds and land birds were seen, some of which are now nearly extinct. But eagles were more than common, so common that a collector secured nearly 100 sets of their eggs. Seven nests of the great horned owl were found in a limited region on Merrit's Island; barred owls and hawks were numerous and breeding; raccoons, lynxes and opossums were abundant; while bears, panthers and alligators were so common that, allowing such creatures to be game exterminators, it would seem an unfavorable country for game. All these animals have been much reduced in numbers now, but the game also has decreased enormously.

We are told that in France to-day (1916), now that nearly every able-bodied man is in the army and little is done to protect the game or to destroy vermin, game has increased so since the war began in 1914 as to become a menace to agriculture.

These instances tend to disprove the contention that the natural enemies of birds, and not the hunters, are responsible for the decrease of birds and game. They give no support to the theory, so often advanced, that it is necessary to shoot into the coveys of game birds to "break them up" in order that the individuals may pair and breed. It may be that hawks and other natural enemies attend to such breaking up

of flocks as is necessary. In any case, the birds breed rapidly under natural conditions when undisturbed by man. If birds and game are below their normal numbers in any region they will increase if *protected from poachers, lawbreakers, cats* and *dogs,* under a law prescribing a long close season. If they do not, it is a sure indication that *adverse human influences are at work.*

Darwin said that if not one head of game were "shot during the next twenty years" in England, and if at the same time no vermin (natural enemies) were destroyed, there would in all probability be less game than "at present," although hundreds of thousands of game animals were then shot annually. But Darwin spoke of a *probability, not* of a *fact* observed. He was merely stating this probability to sustain one of his theories. Even if such a thing might have been probable in England the conditions there, under a system of game preserving by the landowners, were absolutely different from the more natural conditions obtaining here; and if recent articles in the press can be relied on, it is a fact that since England has been recruiting by wholesale for the war, — sportsmen, keepers and poachers having gone to the front, — and since shooting has been given up, the game in England and Scotland has increased rather than diminished. But it must be borne in mind that whereas the natural enemies of a species tend to allow an increase in its numbers up to nearly the limit of its food supply, they tend to decrease them after that limit is reached, as the birds that first feel the effects of want, being weak, are first caught and killed, while the well-nourished birds survive.

If nature is undisturbed, therefore, all the birds are reared and maintained that the land will support, but when civilized man steps in and disturbs the natural arrangement and balance, then, and perhaps then only, the natural enemies of birds may become unduly destructive, and must be checked.

NATURAL ENEMIES OPPOSE MAN'S ATTEMPTS TO SECURE ABNORMAL INCREASE.

Whenever man, in poultry raising or gamekeeping, attempts to produce, by excessive feeding and artificial means, more birds to the acre than the land naturally will support, nature

brings her destructive forces to bear against the project. The natural enemies of game and poultry, finding in the crowded birds a numerous, easily accessible source of food, attack eggs, young and adults, and unless every resource is used to protect them, the poultryman, the sportsman or the gamekeeper will reap neither pleasure nor profit from his venture in propagation.

Bearing in mind that only when man steps in and in some way disturbs the biologic balance does it become necessary for him to destroy the natural enemies of birds, let us inquire under what circumstances this destruction may be proper.

WHEN MAN MUST REDUCE NATURAL ENEMIES.

Man must reduce (not exterminate) certain natural enemies of birds: (1) when he attempts to rear poultry or game birds in excessive numbers; (2) when, because of the disturbance of the biologic balance caused by extensive agricultural operations, he needs to increase the number of insectivorous birds beyond what the land naturally would support; (3) when the most sagacious natural enemies of birds, like the fox and the crow, — their own enemies having been reduced or exterminated by man himself, — take advantage of the extra protection and food afforded them in civilized communities and thus become too numerous and too destructive: (4) wherever man hunts and destroys wild game he may also reduce somewhat the numbers of the enemies of the game and thereby relieve the game of a part of the pressure brought to bear against its increase. In all such cases discrimination must be used, and it is unsafe to reduce too far the numbers of any but the most powerful predatory animals.

MAN THE ONLY EXTERMINATOR.

It is now believed that even before historic times man became the greatest natural enemy of birds and the chief exterminator of species. There is every probability that giant Pleistocene birds, such as the moas of New Zealand (the largest being able to reach a height of twelve feet) and the Æpyornis of Madagascar, were exterminated by primitive man.

There is no evidence, however, to sustain the belief that

primeval man ever exterminated any bird that possessed more than very limited powers of flight. Most of the species that were extirpated by the aboriginal inhabitants of all countries were great flightless land and water birds. The swift flying birds were able in a great measure to escape the destructive weapons of early man, and it has remained for civilized man to create a demand for dead birds in great quantities and to produce weapons to strike unerringly the bird in the air. Thus the nineteenth century saw the extinction of far more species of birds than any other within historic times.

Since the beginning of history, man (assisted by his satellites the cat, dog, rat, hog, etc.) has been responsible, directly or indirectly, for the extermination of most if not all of the species of birds that have disappeared from the earth; but I have referred to this at length in other papers[1] and cannot repeat my observations here.

MAN'S SATELLITES AND ASSISTANTS IN EXTERMINATION.

Man's protégés, which, by reason of his care or protection and because of introduction by him into new countries, become unduly destructive to bird life, consist first of the species that he domesticates or partially domesticates and then allows to run at large. Such are the cat, the dog and the hog, in the order of their significance. Next in importance are the creatures which he introduces intentionally or inadvertently from one country into another, and which being free in the new country from the restraint exercised in their native land by their natural enemies, increase unduly. Such are the rat, the mongoose, the English sparrow and the starling. Finally we may consider the domesticated animals which ordinarily are confined or controlled, such as the horse, ox, sheep and goat. The hog may be included in this group in New England, as hogs are not allowed to run wild here.

[1] Special Report on the Decrease of Birds and its Causes, pp. 477-486; Useful Birds and their Protection, pp. 356-361; Game Birds, Wild Fowl and Shore Birds, Part II., pp. 399-494.

ESKIMO DOG.

Any dog allowed to run at large in the nesting season is likely to destroy birds' eggs and young. Dogs not fed meat are most destructive. Eskimo dogs are a scourge to bird life. (Original photograph.)

Introduced Domesticated Enemies.

CAT (*Felis libyca domestica*).

The cat, because of its numbers and intelligence, has no rival in this country as a bird destroyer, except perhaps the dog in States where there is no dog tax. Undoubtedly there are other mammals and some birds which kill more birds individually than the average cat; but the species, including strays, vagabonds and those that have run wild and bred in the woods, has become far more abundant now than any other animal of equal individual destructiveness. I have already devoted a bulletin to this subject (Economic Biology, Bulletin No. 2, Massachusetts State Board of Agriculture, 1916), and cannot spare more space to it here.

DOG (*Canis familiaris*).

The dog is believed to be individually even more deleterious than the cat to certain birds which breed on the ground, but it is not so skillful and crafty as the cat and cannot climb. In Massachusetts dogs are not one-tenth as numerous as cats, and most of them are kept under better control, while many are confined to buildings or kept under the eyes of the owners.

Dogs are readily taught to obey their masters, while cats are not, and the dog license law has reduced tremendously the number of dogs kept as well as the number of vagrant dogs. In South Carolina, where there is no dog license law, Miss Belle Williams, secretary of the State Audubon Society, who has conducted a painstaking investigation of the decrease of birds, finds that dogs are terribly destructive to birds in nearly all parts of the State. Indigent negro families keep many dogs, which are obliged largely to pick up their own living, and therefore range the fields and woods, eating quantities of eggs and young birds. The conditions in regard to the dog there are similar to those that obtain in relation to the cat in Massachusetts. Even here dogs are so numerous that they have practically ruined the sheep industry, and driven sheep from New England pastures where once many thousands grazed. Many dogs here are allowed to roam and hunt at will. Some owners never feed their dogs meat but permit them to

run in the fields and woods, where they kill and eat young birds, birds' eggs, mice, squirrels and any living thing that they can find. One might as well turn out a ravenous wolf to prey on eggs and young birds as to loose such a dog in the country. In the winter some dogs are almost as expert as the fox in catching ruffed grouse in the snow. Others become skilled in picking up the young in spring, and will snap up young bobwhites almost as quickly as a toad will catch a fly. There are instances on record where dogs, given their liberty on islands occupied by breeding sea birds, have destroyed all the eggs and young. In the North the Eskimo dogs, allowed to forage for themselves, are very destructive to land birds and sea fowl.

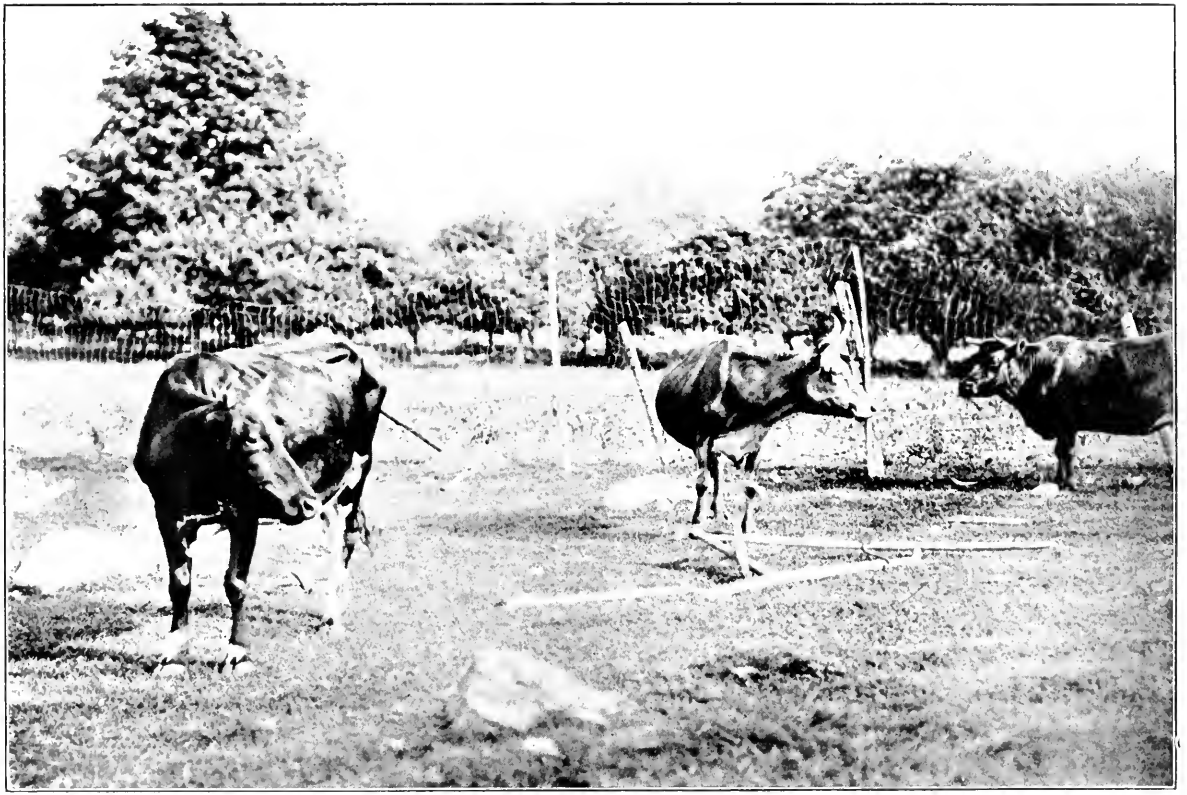
No dog should be permitted to hunt alone during the breeding season of the birds. There is no reason why a dog should be allowed at large in the country at this time except under the care and control of the owner, who should be compelled by law and public sentiment to manage a dog just as he is compelled to keep within bounds larger domestic animals.

Hog (*Sus scrofa*).

The hog is not allowed to roam at large in Massachusetts but when hogs are turned out in large enclosures they exterminate or drive out practically all animal life occupying the ground within the boundaries of their pasture. In some parts of the South, where hogs are allowed to run practically wild, they destroy the eggs and young of birds that nest on the ground.

Grazing Animals.

Horses, cattle, sheep and goats often trample the nests of birds or the young before they are able to fly well. The cropping of the grass, where such animals are pastured intensively, exposes the nests of ground birds to enemies, and sometimes results in the extirpation of species over wide areas. Goats when introduced on islands have been known to destroy the shrubbery, thus removing all cover and driving out the birds that hide or nest in such cover. Close pasturing by sheep has a similar tendency.



GRAZING ANIMALS DESTROY BIRDS.

The cropping of the grass and the trampling are destructive to birds' nests in the pasture. Quail have been nearly exterminated on great cattle ranges and grouse on islands occupied by sheep. (Original photograph.)

BROWN RAT (*Rattus norvegicus*).

The status of the rat is peculiar. It may be domesticated but ordinarily it is neither a wild nor domesticated animal but is domiciled as a parasite on mankind. Rats when numerous destroy eggs and attack the young of many species of birds. I have treated this subject in Bulletin No. 1 of this series.

FERAL ENEMIES.

Mammals.

The larger native carnivorous, mammalian enemies of birds, the bear, puma and wolf, have been extirpated from Massachusetts and need not be considered. The two species of lynx, or so-called wildcats (*Lynx ruffus ruffus* and *Lynx canadensis canadensis*), are now rare and local, and where they are found they feed more on mammals, such as hares, than on birds. Of all the larger native enemies of birds, next to the wild house cat the fox is the most important because of its ability to maintain itself in considerable numbers in a thickly settled country.

RED FOX (*Vulpes fulva fulva*).

In the natural order of things the fox, no doubt, is beneficial as a regulator of the numbers of mice, insects and other small animals, but we have destroyed its natural enemies, and it is so crafty that it is able to exist, thrive and multiply unduly in settled communities where, unless held severely in check, it may become destructive to poultry, game and birds, and so detrimental to the public welfare.

If I were to consult only my own experience in tracking foxes for many miles and studying their food habits I should regard them as almost wholly beneficial, and as living mainly on mice, insects, refuse scraps and wild fruit, varying their fare with an occasional cat or a woodchuck, but many correspondents have sent me notes which go to show that foxes when numerous may become nuisances or even pests. I have published elsewhere a little of this evidence.[1]

[1] Special Report on the Decrease of Birds and its Causes, fifty-second annual report, Mass. State Board of Agr., 1904, pp. 490–498.

Foxes have been seen to follow people who were photographing or observing birds' nests, and the nests were robbed after the investigators had passed. Foxes find and destroy the eggs and young of many ground-nesting birds, including those of the ruffed grouse and bobwhite. They spring after birds on the wing and catch them. Ruffed grouse, woodcock and bobwhites have been found in fox stomachs. They catch both young and old game birds in summer, even wild ducks. In winter they catch grouse, pheasants and bobwhites under the snow, or under the lower branches of coniferous trees where the birds take shelter for the night.

Long experience of many observers leads to the belief that where foxes are too plentiful game becomes scarce and when foxes are reduced in number game increases. Quantities of feathers and other remains of birds, particularly those of the ruffed grouse, have been found where fox dens have been opened. In a region in western Massachusetts where foxes were plentiful I was unable in two days to find a ruffed grouse or hear one drumming, and the only traces of the species that could be found were feathers at the entrance of two fox dens. Although it is true that foxes live chiefly on mice and insects, they destroy many species of birds, domestic fowls (including turkeys, geese and pigeons), also lambs, fawns, cats, young pigs, porcupines, hares, rabbits, woodchucks, muskrats, mice, moles, shrews, frogs and insects. Foxes often kill numbers of turkeys and chickens that are allowed to run at large in or near woods or to roost in the trees. In one such case that came under my observation a poultryman lost more than two hundred hens and chickens in a short time and gave up the business. Foxes were the only creatures seen to take them. Those who doubt the destructiveness of the fox should consult the "Diseases and Enemies of Poultry," by Drs. Pearson and Warren, published by the State of Pennsylvania. All that is said here of the red fox will apply to the Cross fox and the black fox. The northern gray fox (*Urocyon cinereoargenteus borealis*) is almost equally destructive to birds and game, but is not common in Massachusetts.

MINKS (*Mustela vison vison* and *Mustela vison lutreocephala*).

The mink may be regarded as a large, robust, water-loving weasel. It feeds largely on fish, mussels and other aquatic forms of life, on muskrats, rats, mice and other small mammals, birds, earth worms and possibly insects, but the birds that it takes are believed to be mainly rails, ducks and similar species that inhabit the marsh. Its predilection for fresh fish is such that it sometimes becomes a serious detriment to the industry of fish culture, as it is fond of trout and kills more than it can eat.

People living on streams that are frequented by minks occasionally lose large numbers of ducks or chickens. Minks have been known to kill from thirty to forty of these fowls in a single night. The high price of its fur acts as a continual bounty for the destruction of the mink, and its numbers are not very large.

WEASELS (*Mustela noveboracensis noveboracensis* and *Mustela cicognanii cicognanii*).

In all my observation and research very little conclusive evidence has been found to convict weasels of destroying wild birds. European naturalists assert that weasels kill birds and suck eggs, but give little proof of it, and American writers have passed their statements along. Field observers seem to have seen very little destruction of birds by weasels. I have tracked and followed weasels for miles, and never yet have seen any evidence of the killing of a wild bird or the destruction of nests or eggs. They are, nevertheless, in proportion to their size the most rapacious of all mammals that roam the woods. Their thirst for blood seems insatiable, and, like the domestic cat, they often kill apparently for the mere joy of killing or for the pleasure of sucking blood, leaving their victims to lie where they fall. No fiercer slayers exist. Size considered, their courage and strength are greater than that of the lion or the tiger. They follow their prey by scent, and are as keen as bloodhounds on the trail. Their chief food supply in my experience consists of rats and mice, particularly white-

footed mice, and many insects. With the possible exception of some of the hawks and owls, the weasel family seems to contain the world's greatest mouse destroyers. Weasels follow mice into their holes and kill enormous numbers. Wherever they appear they slay or drive out all rats, and in these respects they appear to be the most useful of all mammals. Grain stacks and barns filled with grain are almost always infested with swarms of rats and mice, but let a weasel or two appear and the rodents quickly vanish. When mice and rats grow scarce, however, weasels often have been known to enter poultry houses and kill considerable numbers of fowls. Individuals sometimes become pests on the game farm or preserve. Weasels can enter such small holes that only mouse-proof buildings and pens are a sure protection against them. In winter they sometimes destroy many hares or rabbits, and trail or hunt down ruffed grouse or bobwhites in or under the snow. Hence they are regarded as pernicious by the sportsman and are killed at sight. I have not known them to be destructive to any squirrel except the chipmunk, which they sometimes exterminate locally, but weasels can climb well, and probably they destroy some young birds in their nests, although I have no conclusive evidence of this. Mr. Hugh Malloy of Freeland, Pennsylvania, found thirteen out of fourteen newly hatched ruffed grouse chicks which he believes were killed by a weasel. He slew the weasel and thus, he says, saved one chick.[1] Mr. A. W. Rhoads of Wilkesbarre, Pennsylvania, has known a weasel to destroy eleven out of thirteen ruffed grouse eggs about to be hatched.[2] Dr. J. L. Warren avers that he has twice known weasels to kill small birds,[3] and tales are told of weasels springing up like a cat or a fox and catching low-flying birds or young birds in flight. In nature the weasel no doubt serves a useful purpose in keeping down the increase of rats, mice and insects, but is it not a creature to be tolerated about a poultry yard, game farm or game preserve.

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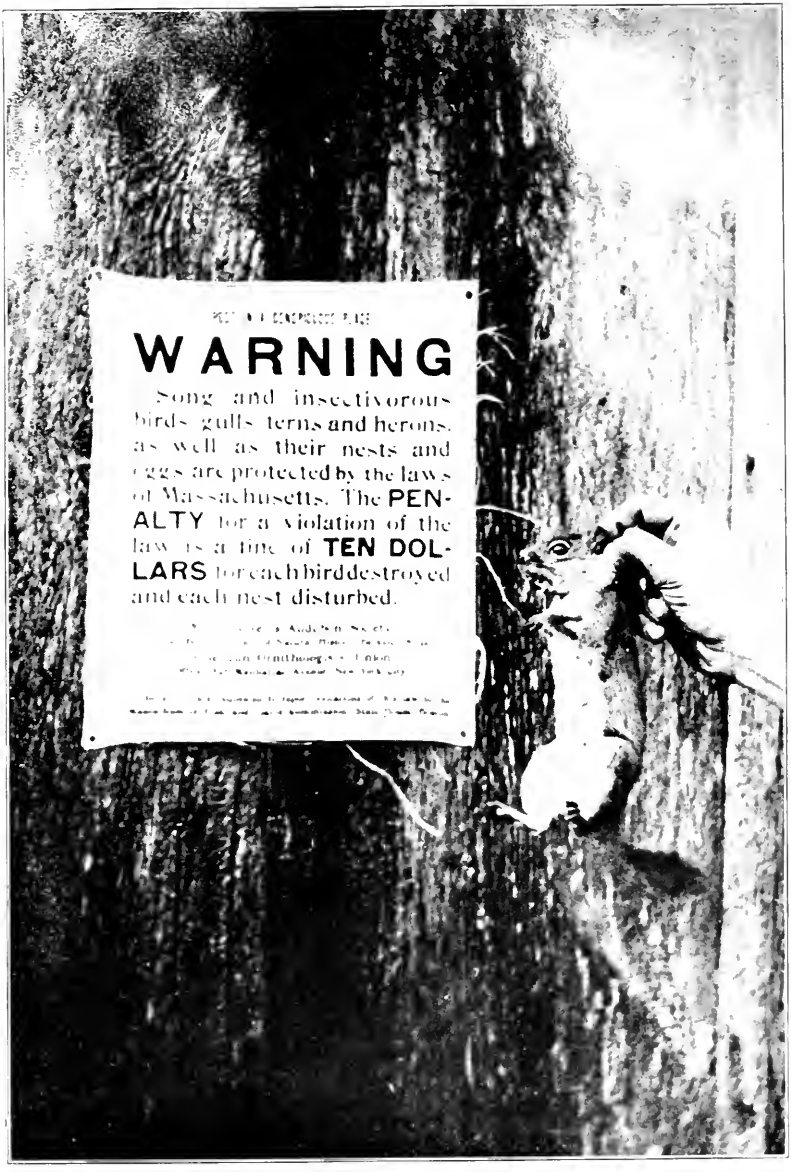
[1] Pearson, Leonard, and Warren, B. H.: Diseases and Enemies of Poultry, 1897, p. 430.
[2] *Ibid.*, 1897, p. 432.
[3] *Ibid.*, p. 439.



The Red Squirrel is Destructive to Birds

The squirrel shown here cleaned out a flicker's nest, but has not killed any young birds since
Photograph by Walt E. McMahon

Skunk (*Mephitis putida*).

This much detested animal is looked upon commonly as a nuisance and a pest, but every naturalist who has made a study of its food and food habits has come to regard it as useful if not indispensable to the farmer. Its animal food consists largely of rats, mice, snakes, frogs, turtles' eggs and insects; it is fond of refuse animal matter and will feed on waste meat or carrion. Occasionally it takes the eggs from under a sitting hen not properly shut in at night, and has been known to kill and eat both fowls and chicks. I fed two skunks regularly on garbage in a henhouse for weeks where forty fowls roosted two and one-half feet from the ground. The skunks killed mice and rats but never troubled the fowls. Later a pair of skunks reared their young in a yard of about one acre, fenced in by chicken wire in which were several hundred chickens. They never touched a chicken. In all my experience I have only once known a skunk to break up a nest of a wild bird. The bird was a ruffed grouse, and I saw the skunk eating the eggs while the bird hovered close by. I have been able to learn of but one other such case where the skunk was actually seen to destroy the eggs. Nevertheless, the animal is accused continually by gunners and sportsmen, and it is very destructive to turtles' eggs. Its animal food in summer, however, consists largely of noxious insects. It spends the greater part of its time in turning over stones and clods under which insects hide, in digging out the white grub of the May beetle, and in taking from the foliage such pests as the Colorado potato beetle. Any one who examines the dried droppings of the skunk will find them filled with remains of insects. It is rather remarkable that this animal, slow and clumsy as it is, has learned how to catch mice and rats. It is practically unable to capture adult wild birds, and its fur is now valued so highly that it is not likely to become too numerous.

Raccoon (*Procyon lotor lotor*).

There is some evidence to the effect that the raccoon robs birds' nests, but it is not numerous enough now in settled regions to be very destructive. Its fondness for green corn

has not endeared it to the farmer, and the sportsman and angler believe that it destroys game and fish. Add to these alleged reasons for its destruction the increasing price of its skin in the market, and we can see why the "coon" is not destined long to be a great factor as an enemy of birds, except possibly on lands where all animals are protected.

Squirrels.

Semper considers squirrels the greatest enemies of "our singing birds, whose eggs and young they devour in great quantities,"[1] but he probably refers to European species. Squirrels compete with birds for nesting places and food, destroying their nests, eggs and young, and are said even to catch and kill adult birds, but this must be very uncommon, as it has been very rarely observed. Apparently there are many squirrels that do not attack birds. At my place at Wareham, Massachusetts, battles between birds and squirrels are frequent, and many birds' nests in or near woods frequented by squirrels are pillaged, but at Concord, on the estate of Mr. William Brewster, I have known only one nest to be robbed by squirrels in four years, and have seen but two pairs of birds attempt to defend their nests against squirrels. There I have seen a red squirrel look into a bird's nest without any objection from the parent birds, which were close by, but at Wareham the presence of a squirrel in a tree inhabited by birds is resented by them at once. Where birds attack squirrels it is safe to say that there is a reason for it, but where birds never molest squirrels in nesting time it is probable that the squirrels are innocent of nest-robbing. Ordinarily, however, squirrels cannot be tolerated in large numbers where it is purposed to increase birds.

Red Squirrel (Sciurus hudsonicus loquax).

The red squirrel everywhere has the reputation of a bird destroyer. Many people have reported it as eating eggs and young birds. One was seen on my place in the act of eating the brains of a young catbird. Another, taken from its nest in a bluebird box when so young that its eyes were still closed,

[1] Semper, Karl: Animal Life as affected by the Natural Conditions of Existence, 1881, p. 59.

and then reared by hand until nearly full-grown, when released climbed an apple tree to a robin's nest, took a young bird and ate out its brains. The red squirrel appears to be as fond of meat or fish as is the cat. It eats the trappers' baits, gnaws the carcasses of animals that he has skinned, takes meat, suet and other fats put out for birds in winter, and, like all other squirrels, feeds more or less on insects in spring and summer. Many of my correspondents have reported that they have seen it robbing the nests of birds.[1] Two have noted it as catching adult birds in the air as they flew at or by it, but in all my experience in the woods I have not been able to corroborate this. There is some evidence in favor of the theory that individual squirrels which acquire the habit of robbing birds' nests are the chief culprits. I am now inclined to the belief that nest-robbing sometimes becomes a habit with certain squirrels, and that in some places the habit is communicated to many individuals and perhaps over considerable areas, while in other localities it is not common. Such practices are likely to spread as a consequence of any undue increase in the numbers of squirrels, and are in a fair way to become widespread, when such increase begins to outrun the normal food supply. This squirrel is said to destroy the eggs of the ruffed grouse, and Dr. B. H. Warren records the killing of an individual in the act of carrying off a small chicken from a coop.

Gray Squirrel (*Sciurus carolinensis leucotis*).

We have protected gray squirrels by destroying their greatest enemies, the red-tailed hawk and the great horned owl. Therefore, wherever shooting is forbidden the gray squirrel may become numerous, even in some cities, where there are trees

[1] Most writers on the habits of mammals seem to agree that the red squirrel is a nest-robber. John Burroughs says that he thinks that the mischief it does can hardly be overestimated (Signs and Seasons, 1886, p. 92). Stone and Cram say that in summer it robs birds' nests high and low (American Animals, 1902, p. 173). Ernest Ingersoll asserts that it destroys far more birds' eggs and young than any other squirrel, and that not even the Baltimore oriole's nest is safe from it (Our Animal Competitors, 1911, p. 129). Ernest Harold Baynes avers that he has known so many nests destroyed by it that he will not allow one of these animals in any place where he is trying to attract birds (Wild Bird Guests, 1915, p. 28). On the other hand, Mason A. Walton asserts that in his neighborhood birds do not fear the red squirrel, which occasionally examines nests but never, so far as he has observed, molests them. He tells of one which investigated a chickadee's nest frequently and did no harm, and another which examined a vireo's nest in which young were later safely reared. He asserts that nineteen nests built near his cabin in one season were not troubled by squirrels (A Hermit's Wild Friends, 1903, pp. 68, 70, 98).

enough to serve as a safe refuge. The gray squirrel is not regarded generally as detrimental to bird life, but in some respects it is more so than the red squirrel. Wherever both species are protected in Massachusetts the gray squirrel increases several times as fast as the red, as it has two litters annually, while the red squirrel has but one. Young gray squirrels may be seen in the woods in June and in September, and may be found in the nests in May and in August, even in the northern part of the State. Although I have not heard of a second litter on the higher elevations of western Massachusetts it would not be surprising if even there two were raised in the lowlands. Much has been written about gray squirrels being driven out or mutilated by the red, but in my experience they have occupied the same woods without serious friction. The grays, if protected from gunners, constantly increase in number, until they have utterly destroyed quantities of corn, pumpkins, nuts, pine seeds, apples, pears, strawberries and other useful products. Birds feed lavishly on Juneberries, but in some places where gray squirrels are numerous it is useless to plant Juneberries for the birds, as these squirrels often take all the berries before they are ripe enough to attract birds. Thus squirrels compete with birds for food.

This species when numerous is perniciously successful in driving out birds from hollow trees. All species of arboreal squirrels occupy hollow trees for nesting purposes, and where gray squirrels are abundant, bluebirds, tree swallows and other birds that build in tree cavities will find little chance to nest unmolested. If we provide nesting boxes for birds, squirrels keep them out or drive them away, enlarging the entrances with their teeth if these holes are too small for squirrel uses, and often destroying eggs or young birds.

Near my camp in Wareham a gray squirrel was seen to leap from a small tree into a bevy of bobwhites, in an apparent attempt to catch one, and frequently I have seen individual squirrels chasing small chickens, and have since suspected them of killing chickens. A friend who kept pigeons in a loft complained that rats got in somewhere and destroyed the squabs, eating the grain from their crops. As there was no entrance for rats except a window high up in the building I suggested that

GRAY SQUIRREL.

An enemy to birds that nest in hollow trees, driving them away from their nesting places and sometimes killing the young. (Photograph by Walt F. McMahon.)

this window be protected from climbing animals by sheets of zinc, nailed on the outside of the building. This was done and no more squabs were lost, but gray squirrels were seen to fall to the ground in their attempts to climb or jump into the window. Years passed without absolute proof of chick killing, but recently Mr. O. L. Curtis, assistant manager of the great estate called Seven Gates, formerly the country home of Professor N. S. Shaler at North Tisbury, told me that many chickens on the place were killed, as was supposed, by rats, but not eaten, only the grain being taken from their crops. One of his men saw a gray squirrel in the act. Mr. Curtis then watched, saw a squirrel go into a coop through a hole in the wire, kill a chicken and eat the grain from its crop. He shot the squirrel and several more that came to the coop later. This habit of the gray squirrel probably is exceptional.

Flying Squirrel (*Glaucomys volans volans*).

Hundreds of nesting boxes for birds that have been put up in trees in Massachusetts have been occupied by squirrels, and while the two preceding species have been the chief trespassers in most cases, flying squirrels sometimes have outnumbered the reds, where the nesting boxes have been put up in woods. The flying squirrel moves about mainly at night and little is known about its habits, but I once found one occupying the recently completed nesting hole of a downy woodpecker, and suspected that it had robbed the nest. So far as I know, however, no one has yet convicted the species of nest-robbing.

Chipmunk (*Tamias striatus lysteri*).

This species is not much complained of as a nest-robber, and although well able to climb trees it is more at home on the ground. It is a meat eater and has been known to rob nests. It is said to *swallow* young birds. Three observers have reported this, and Mr. W. L. McAtee informs me that remains of a young bird were found in the stomach of a chipmunk dissected at the Biological Survey. I have recorded elsewhere the killing of a wounded bird by a chipmunk.[1] As a

[1] Special Report on the Decrease of Certain Birds and its Causes, with Suggestions for Bird Protection, fifty-second-annual report, Mass. State Board of Agr., 1904, p. 505.

matter of justice to the squirrels they should be given credit for great service in distributing and planting the seeds of forest trees.

Muskrat (*Ondatra zibethica zibethica*).

Ingersoll names the muskrat among the mammals that rob the nests of ground-nesting birds.[1] Dr. Abbott asserts that muskrats sometimes eat young green herons that fall from the nest.[2] Wounded ducks are said to be attacked occasionally by muskrats, and some dead ducks are eaten by them, but beyond this I have been unable to find any evidence that the muskrat is destructive to birds under normal conditions. What it may do when in abnormal numbers is shown by recent experience in Austria, where it has been introduced and is said to have increased rapidly, devouring wheat and other cereal crops, fruit and vegetables. It has almost ruined industries of crayfish and carp breeding; has raided poultry, carrying off young chickens, and has even attacked game animals. It undermines railway embankments, ruins dikes and seems to have become a first-class pest. Muskrats normally feed very largely on vegetable matter and thus tend to prevent vegetation from choking up ponds and streams. They eat mussels or so-called fresh-water clams. Ordinarily the demand for their fur will prevent abnormal increase.

Mice.

The importance of mice as enemies of small birds and game birds is not generally understood. If not held in check they may quickly become the most destructive of all the agencies for the suppression of birds. If an irruption of field mice should occur in early summer they would destroy the grass and clover, and the callow young of the small ground birds that nest in the field would be left unshaded from the hot sun, which would kill most of them even if they escaped the swarming, hungry mice or the other enemies to which they would be exposed. The eggs and young of game birds which nest on the ground would not escape the latter fate. If deer mice and pine mice were to increase half as fast as nature provides for

[1] Ingersoll, Ernest: The Wit of the Wild, 1906, p. 54.
[2] Abbott, C. C.: A Naturalist's Rambles about Home, 1885, pp. 188, 189.

their multiplication, hardly a bird's nest in the woods would escape them, from the ground to the treetops. Deer mice are so small and light that they can climb to any nest where even a squirrel might fail, and they are quite as fond of young birds as are the squirrels. Field mice of various species have from four to six litters of young each year, with from two to thirteen young in each litter, therefore the estimate by Professor Lantz that a single pair of our common meadow mice is potentially capable of producing nearly a million young in five years is not excessive.[1]

Knowing the capacity of a single field mouse to be from twenty-four to thirty-six pounds of green vegetation annually, Professor Lantz calculates that a thousand field mice (which might ordinarily inhabit a meadow) would require at least twelve tons of grass or its equivalent each year. A million would require twelve thousand tons annually. History shows that under favorable conditions countless numbers are produced in a few years, and that when such invasions occur they destroy or ruin grass, clover or alfalfa, hay in stacks, all small grain growing or in shocks or stacks, garden and hotbed plants, potatoes, beets, turnips, carrots, cabbage, celery and other vegetables, apples, pears and other standard fruits, small fruits and the plants that bear them, orchard trees and shrubbery, nursery stock, young forest trees, and nearly all kinds of bulbs, tubers and roots. These mice ruin lawns and pastures for the time being, and become at times in the old world the most important of all pests.

The great swarms of lemmings that have appeared from time to time on the Scandinavian peninsula, and the destruction brought about by their numbers, are historic. In my "Useful Birds and their Protection," pages 76 to 78, I have noted similar occurrences in Scotland and England, and the effectiveness of owls and other natural enemies of birds in destroying the pests. Figuier says that in France "Whole districts have been reduced to destitution by this scourge," and that the Department of La Vendee experienced a loss in two years estimated at £120,000 (nearly $600,000), caused by these creatures.[2]

[1] Lantz, David E.: U. S. Dept. of Agr., Biol. Surv., Bull. No. 31, An Economic Study of Field Mice, p. 12.

[2] Figuier, Guillaume Louis: Mammalia, Their Various Orders and Habits, popularly illustrated by typical species, 1870, p. 445.

Already, because perhaps of the excessive destruction of the enemies of birds and mice in some parts of the United States, these little rodents are causing serious loss. The greatest outbreak in this country of which I have seen definite records occurred in the Humboldt valley, Nevada, in 1907-08. Here four great ranches suffered an estimated loss of $86,500, and the damage in the immediate region was estimated at about $300,000, with injury less severe extending up the river and its tributaries.[1]

Field mice when properly held in check by their natural enemies perform several useful offices. Then, according to Rhoads, the food of the common meadow mouse (*Microtus pennsylvanicus pennsylvanicus*) consists mainly of rushes, sedges, salt grass and other coarse grasses and weeds, and from 70 to 80 per cent of the whole number of field mice ordinarily live in bogs and low moist lands, where they do little if any harm, while those on uplands nearly all confine their foraging to fence rows, brush patches and neglected places, rarely eating any except waste grain.[2]

Thus when in normal numbers they do good rather than harm, by converting worthless rushes, grains and weeds into a supply of food for fully two-thirds of the natural enemies of birds which, by means of the superfluous mice, easily taken, are fed sufficiently to prevent them from becoming too destructive to birds. Exterminate mice and the problems of the farmer and those of the economic zoölogist would be wonderfully increased, but exterminate the natural enemies of mice — then the deluge. The only effective artificial method of meeting the great invasions of mice that occur through lack of natural enemies is to use poison, which is likely to be destructive to birds and other animals as well as mice. Therefore it is suicidal to destroy too many shrikes, crows, hawks, owls, herons, bitterns, gulls, foxes, skunks, weasels and other creatures which feed on mice, even though they may feed to some extent on birds also.

The two forms of mice which are, perhaps, the most widely disseminated, and prolific of all native mice are the common meadow mouse and the deer mouse.

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[1] Piper, Stanley E.: U. S. Dept. of Agr., Farmers' Bull. No. 352, The Nevada Mouse Plague of 1907-08, 1909, pp. 9, 10.

[2] Rhoads, Samuel N.: Mammals of Pennsylvania and New Jersey, 1903, pp. 98, 929.

Field Mouse or Meadow Mouse (Microtus pennsylvanicus pennsylvanicus).

Rhoads says that under normal conditions only about 5 per cent of the food of this species consists of animal matter. It destroys some insects and eats dead animals, birds and eggs. Dr. George W. Field informs me that this species interfered with some experiments in rearing bobwhites undertaken by the Massachusetts Commission on Fisheries and Game, as it destroyed many eggs. Whenever the numbers of field mice increase, so that their food supply is threatened, they will turn quickly to animal food, eating dead animals, destroying live ones and even killing and eating one another. I am not aware that the effect produced upon bird life by these swarms of mice has been investigated, but it is easy to understand that it must be very serious.

Deer Mouse (Peromyscus leucopus noveboracensis).

The habits of the deer mice, now separated by the systematists into several forms, are somewhat like those of the garden dormouse of Europe. Although quite at home on the ground the deer mice or white-footed mice are very partial to trees, and often make their nests in hollow trees or in birds' nests, no doubt in some cases depriving birds of their homes. Dr. Abbott says that they are skillful hunters of birds' nests, and that he has known them to rob the nests of the robin, song sparrow and chewink, and asserts that he has seen young robins, nearly fledged, killed by them. The mice returned to the nest when the parents were absent and ate the young birds.[1] Mr. M. A. Walton of Gloucester, Massachusetts, wrote me in detail that he had known these mice to destroy birds on many occasions. The birds killed were young or injured. When he placed nests with young birds in his cabin in the woods for safety over night he found invariably that they were eaten by these mice unless protected by wire netting. He asserts that the mice robbed the nest of a white-throated vireo near by and brought one of the dead young into the cabin. Stone and Cram assert that these mice appropriate the nests of birds in

[1] Abbott, Charles Conrad: A Naturalist's Rambles about Home, 1885, p. 70.

bushes and low trees, and that they have been caught often in the act of devouring eggs and young birds.[1] Dr. Merriam says that he has found their nests in holes in trees more than seventy feet from the ground.[2] Many nesting boxes put up for birds in or near the woods are occupied by these mice. It is fortunate that owls keep them in check. I have no information regarding the destruction of birds by pine mice, jumping mice or any other species, but it is probable that any of them might destroy birds should their numbers increase unduly, as all small rodents are likely to become more or less carnivorous under such circumstances.

DEER (*Odocoileus virginianus virginianus* and *Odocoileus virginianus borealis*).

Dr. George W. Field assures me that deer eat the eggs of ground birds. It seems probable that if this is the case they may devour young birds also. Mr. F. C. Walcott quotes Mr. C. C. Worthington's statement that thirty-four deer on his preserve were killed by eating poisoned sparrows. The birds were found in the stomachs of the dead deer.[3]

Birds.

SHRIKES (*Lanius borealis* and *Lanius ludovicianus migrans*).

Shrikes or butcher birds are believed to be beneficial. Dr. Judd of the Biological Survey reports on stomach examinations of shrikes as follows: —

The food of the butcher bird and loggerhead, as shown by one hundred and fifty-five stomachs collected during every month in the year, and in an area extending from California to the Atlantic coast, and from Saskatchewan to Florida, consists of invertebrates (mainly grasshoppers), birds and mice. During the colder half of the year the butcher bird eats birds and mice to the extent of 60 per cent, and ekes out the rest of its food with insects. In the loggerhead's food birds and mice amount to only 24 per cent. The loggerhead's beneficial qualities outweigh 4 to 1 its injurious ones. Instead of being persecuted it should receive protection.[4]

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[1] Stone, Witmer, and Cram, W. E.: American Animals, 1902, p. 132.
[2] Merriam, Clinton Hart: The Mammals of the Adirondack Region, 1884, p. 263.
[3] Job, Herbert K.: The Propagation of Wild Birds, 1915, p. 71.
[4] Judd, Sylvester D.: Bull. No. 9, U. S. Dept. of Agr., Div. of Biol. Surv., Cuckoos and Shrikes, 1898, p. 24.

Blue Jay at Nest.

Jays destroy the eggs and young of other birds. (Original photograph.)

Dr. Judd records the killing of a young chicken by a loggerhead shrike which is credited to the "Florida Dispatch,"[1] and Mrs. B. R. Buffham of Roswell, New Mexico, saw a shrike, probably of the same species, hang up a dead chicken seemingly just out of the shell.[2]

Grackles or Crow Blackbirds (*Quiscalus quiscula quiscula* and *Quiscalus quiscula æneus*).

The purple grackle, which is resident here in summer, is known to destroy the eggs and young of other birds at times, and when in large flocks in autumn it devours corn in the field. The destruction of the eggs and young of birds by it is not considered very serious and it is not believed to be very generally addicted to this habit. Professor F. E. L. Beal made an examination of the stomachs of two thousand two hundred and fifty-eight crow blackbirds obtained from twenty-six States.[3] Only thirty-seven stomachs contained any trace of birds' eggs and only one the remains of a young bird, but we are not told how many of the stomachs were taken during that part of the year when eggs and callow birds are not obtainable. He concludes that crow blackbirds are so useful that no general war should be waged against them. They are not protected by law now (1916) in Massachusetts.

Blue Jay (*Cyanocitta cristata cristata*).

The blue jay is, at times, even more destructive to the smaller birds than is the crow. It has been known to attack and kill adult birds, young chickens and young pheasants, and to eat the eggs and young of most of the smaller birds. I will venture to say that every close observer who has watched the jay long and carefully is familiar with its nest-robbing habits. It is so sagacious and cunning that it is sure to establish itself wherever shooting is prohibited, and there it increases apace, to the detriment of small birds. Jays often become numerous even in cities, and in recent years have learned to build their nests about houses in very thickly settled communities, where

[1] Judd, Sylvester D.: Bull. No. 9, U. S. Dept. of Agr., Div. of Biol. Surv., Cuckoos and Shrikes, 1898, p. 21.

[2] Nature and Culture, January, 1911, p. 21.

[3] Beal, F. E. L.: Crow Blackbirds and their Food, Yearbook, U. S. Dept. of Agr., 1894, p. 233.

no shooting is allowed. Wherever they become unduly numerous through such protection the small birds are likely to become their victims. In defense of the jay, however, it must be said that he is an efficient caterpillar hunter, and destroys numbers of those pests, the gypsy moth and the brown-tail moth.

Professor Beal, who has dissected the stomachs of more than two hundred and ninety blue jays, believes this species to be useful. Remains of small birds were found in only two stomachs, and shells of their eggs in only three.[1] Dr. B. H. Warren failed to find any traces of birds or eggs in twenty-three blue jays' stomachs which he examined, fifteen of which were taken in the nesting season.[2]

The blue jay is not protected by law in Massachusetts.

Crow (*Corvus brachyrhynchos brachyrhynchos*).

Ornithologists are divided in opinion regarding the economic value of the crow. Professor W. B. Barrows, who has spent more time investigating the crow's economic status than has any other living man, wrote for the United States Department of Agriculture a report on the crow. In presenting it for publication Dr. C. Hart Merriam, chief of the division, declared that the evidence showed the crow to be beneficial. Since that time Dr. Barrows has expressed the opposite opinion. In his work on the birds of Michigan, he states his belief that the crow is more injurious than beneficial to the farmer.[3] In my report entitled "The Crow in Massachusetts" the facts for and against the crow were considered and I cannot recapitulate them here.

Whatever may be said about the value of the crow to agriculture it is not a good bird for the game farm or bird refuge. Its habit of robbing the nests of birds from the size of the sparrow to that of the wild duck or the great blue heron is well known. It is a habit of crows the world over, and some individuals are remarkably destructive. Nevertheless, the local extermination of crows has been followed in more than one in-

[1] Beal, F. E. L.: The Blue Jay and its Food, Yearbook, U. S. Dept. of Agr., 1896, p. 199.
[2] Warren, B. H.: Birds of Pennsylvania, 1890, p. 201.
[3] Barrows, Walter B.: Michigan Bird-Life, 1912, p. 427.

stance by such an increase of grubs and grasshoppers as to destroy the grass crop over large areas, and it would be very unwise to allow the extirpation of this bird.

Hawks and Owls.

Many hawks are not only useful in nature as regulators of mammal life but they are beneficial to the farmer by destroying grasshoppers and other large insects, squirrels, rats and mice. Among the most useful of all is the rough-legged hawk (*Archibuteo lagopus sancti-johannis*), which very rarely has been known to kill birds, and never, so far as known to me, to molest poultry. The species is large, flaps and sails rather slowly, and thus makes a good mark for a shotgun, or, sitting upon a dead tree or stake, furnishes an excellent target for a rifle. Many are shot annually in fall, winter or spring, mistaken for "hen hawks." The number of mice killed by these birds is enormous, and the shooting of the species is a serious detriment to agriculture. Nevertheless, farmers often boast of the number that they have killed and gunners shoot them at every opportunity. They would much better devote their energies to shooting vagabond cats, which do far less good and much more harm.

One can hardly write of the economic relations of hawks and owls in this country without referring to the work of Dr. A. K. Fisher of the Biological Survey. During his researches he has examined the contents of more than two thousand seven hundred stomachs of these birds, with the result that out of the seventy-three species investigated only six in all the United States were found harmful, and all the rest were classed as beneficial. Omitting the six species that feed largely on poultry and game, two thousand two hundred and twelve stomachs were examined, 56 per cent of which contained mice and other small mammals, 27 per cent insects, and only $3\frac{1}{2}$ per cent poultry or game birds. Of the six harmful species, three are so rare that they have little effect, and in New England only two, the cooper's hawk (*Accipiter cooperi*), and the sharp-shinned hawk (*Accipiter velox*), are really common and generally injurious.[1]

[1] The goshawk (*Astur atricapillus atricapillus*), the duck hawk (*Falco peregrinus anatum*), and the pigeon hawk (*Falco columbarius columbarius*) are exceedingly destructive to birds, but are uncommon in Massachusetts.

Nevertheless, individual birds of several other species may at times become destructive to poultry or game, and may have to be killed, but the indiscriminate shooting and trapping of these birds is likely to do more harm than good.

The owls, with the exception of very few species, are now believed to be among the most useful of all birds. They destroy destructive insects and mammals at night which escape other birds by day. The great horned owl (*Bubo virginianus virginianus*) usually is regarded as pernicious, as it destroys game and poultry, particularly chickens and turkeys when they are allowed to roost in trees at night, but it is now becoming rare and should be killed only where it is known to attack poultry or game. The fact that there are robbers among hawks and owls is not good ground for exterminating all. Mr. E. O. Niles records the finding of the remains of one hundred and thirteen rats on the ground beneath a horned owl's nest, all taken within a period of about ten days. It is a habit of these rapacious birds to regurgitate or reject, through the mouth, bones, fur, feathers, and other indigestible portions of their food. Dr. Fisher found about the nest of a barn owl (*Aluco pratincola*) four hundred and fifty-three skulls of mice, rats and other small mammals and only one of a bird.[1]

Eagles.

The bald eagle (*Haliœtus leucocephalus leucocephalus*) has been observed to pursue and strike down water fowl on the wing, and also to catch them on or in the water, but it lives chiefly on fish, captures few except crippled water fowl and is now becoming generally rare in New England. The golden eagle (*Aquila chrysaëtos*) is only accidental here.

Introduced Bird Enemies.

The English Sparrow (Passer domesticus).

This is the one bird that if not destroyed or driven away will dispossess the smaller native birds of all bird houses and nesting boxes. All who cultivate its acquaintance will learn eventually the truth of this statement. Like most birds it is serviceable in destroying insect pests, but less so than most native species.

[1] Fisher, A. K.: U. S. Dept. of Agr., Div. of Orn. and Mam., Bull. No. 3, The Hawks and Owls of the United States, 1893, p. 136.

Like the following species and the domestic cat, it is an introduced species and when allowed at large disturbs the balance of nature and so makes trouble. As I have already treated of this bird in Circular No. 48 no more space can be devoted to it here.

The Starling (Sturnus vulgaris).

The starling is increasing and spreading rapidly, and may yet prove to be a greater enemy to native birds than the sparrow now is, but it cannot enter nesting boxes with an entrance hole one and one-half inches in diameter. Therefore, nesting boxes for the smaller birds may be made starling proof. It is said to kill small birds at times. I have already treated of the bird at some length in Circular No. 45.

Ringed-neck Pheasant (Phasianus torquatus).

Whatever may be said for pheasants by the advocates of the introduction and propagation of these exotic birds there can be no doubt that if they ever become unduly numerous they will interfere with native birds. The ringed-necked pheasant is a good bird for a game preserve, particularly on land where no other gallinaceous bird is wanted. It thrives along the coast, especially near salt marshes where the winters are not too severe. The border of the marsh is its native habitat, but on high land where winters are inclement, with heavy snowfalls, it must be fed and cared for. In winter it feeds on weed seeds, bayberries and other low-growing fruits and seeds, of which it eats great quantities and thus deprives bobwhites and other native birds of their chief winter sustenance. Eyewitnesses have told me that they have seen the pheasant kill both the bobwhite and the ruffed grouse. I have seen a pheasant strike a bobwhite on the head and drive it away from the pheasant's feeding ground. As a game bird the pheasant cannot compare with either of these native birds, and it is not a desirable species to supplant them with. It will never become very abundant, however, if the seventy thousand licensed gunners of Massachusetts have their chance at it annually, and as it is well adapted to the game preserve it has come to stay. It is destructive to the gypsy moth and other insect pests.

Minor Bird Enemies.

Certain exceptional individuals of some species of birds have been known to destroy other birds even though such habits are not generally characteristic of the species to which these predatory individuals belong. There are other species which occasionally or commonly attack birds but have now become so rare that they do little harm. Gulls, herons and cranes may be mentioned as belonging to the first class and eagles to the second. Some individuals among gulls are more or less predatory. The herring gull (*Larus argentatus*) sometimes kills young birds of its own species, but so far as I know has not been known to eat them. When short of food, herring gulls have been known to kill and eat young chickens. The western gull (*Larus occidentalis*) and the blackbacked gull (*Larus marinus*) destroy the eggs and young of other birds, and European species have been seen to kill small birds, but such habits seem to be exceptional with most American gulls.

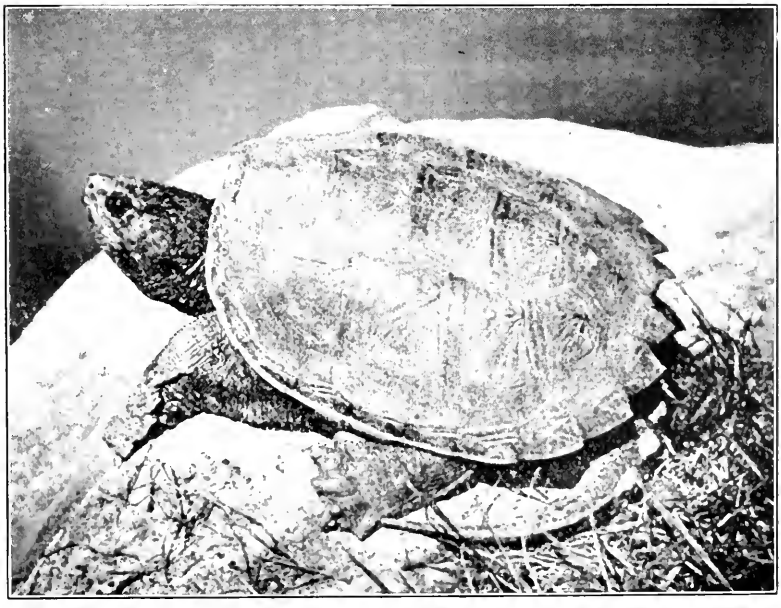
European herons are said at times to prey upon fledglings which stray near their retreats (Nuttall). The black-crowned night-heron (*Nycticorax nycticorax nævius*) has been seen to kill ducklings (Crandall), and bitterns are said occasionally to eat the eggs and young of other birds. The red-headed woodpecker (*Melanerpes erythrocephalus*), now rare in Massachusetts, has been accused of being a nest-robber. Bad habits have been attributed occasionally to cuckoos, catbirds, wrens, orioles and other small birds, but in most cases they may be considered more or less individual and unusual.

Turtles or Tortoises.

So far as I have been able to learn only one turtle, native to Massachusetts, can be counted as an enemy of birds. This is the snapping turtle (*Chelydra serpentina*). It has been known to kill and eat young night herons that had fallen from their nests, and is considered the greatest enemy of young waterfowl. It frequents muddy ponds, to which waterfowl resort, and drags them down by the feet. I have known one in this way to tear a leg from a living adult Canada goose, which escaped but afterward died. All who attempt to raise wild fowl in the

The Bird-killing Cat.

The destruction of birds by cats is illustrated in Economic Biology, Bulletin No. 2, published by the Massachusetts State Board of Agriculture. (Photograph by William L. Finley.)



The Snapping Turtle.

Destroyer of young waterfowl and wading birds. (See page 244.) (Photograph by Professor H. A. Surface.)

natural way must first clear the breeding pond of this terrible enemy; else it will be difficult to rear young birds.

Professor H. A. Surface records the stomach contents of nineteen individuals of this species. Only one had eaten a bird.[1] It is probable that young ducklings were scarce in the region of Pennsylvania where these turtles were taken. Hay found a robin in one stomach.[2] These turtles often are taken by a strong fishhook baited with tainted meat attached by a wire to a strong but springy stake driven into the bank.

The wood turtle or sculptured turtle (*Clemmys insculptus*) is reported as taking ducklings and goslings, but I can find no convincing evidence in proof of the charge. This is a small turtle and it is probable that most of the birds eaten by it are such as it finds dead. Professor Surface found remains of birds in two out of twenty-six stomachs.[3]

Snakes.

Snakes are carnivorous and insectivorous. It is well known the world over that they destroy birds, their eggs and young. It has been asserted often that they are able to charm birds and thus render them defenseless, — a statement hardly borne out by the facts. Occasionally, careful observers have reported a case where a bird seemed unable to escape from a snake but drew nearer and nearer. Mrs. Olive Thorne Miller narrates such an occurrence in "A Bird Lover in the West" (pages 251 to 253), but as she drove the snake away the observation was inconclusive. The theory that sometimes birds are attracted to the head of a motionless snake by its flickering tongue, which they mistake for a worm or insect, is supported by good evidence.

Some snakes seem to live almost wholly or altogether on forms of life other than birds, but there are some species so destructive to bird life that their suppression is important to the bird protectionist. Ingersoll tells of an African snake that

[1] Surface, H. A.: Zoöl. Bull., Div. of Zoöl., Penn. Dept. of Agr., Vol. V., Nos. 4 and 5, for August and September, 1908, First Report on the Economic Features of the Turtles of Pennsylvania, p. 129.

[2] *Ibid.*, p. 131.

[3] *Ibid.*, p. 163.

feeds so exclusively on eggs that it has a mouth especially fitted for containing and breaking them.[1]

There is a genus *Dasypeltis* among the snakes, the species of which, native to Africa, are believed to live entirely on eggs. The eggs are swallowed whole and broken in the stomach, where teeth which grow out as processes from the vertebræ pierce through the lining of the stomach so far that they seem perfectly fitted for breaking the eggs that pass through it. If these are true teeth it is the only instance of their occurrence in the whole animal kingdom, except in the mouth or on the

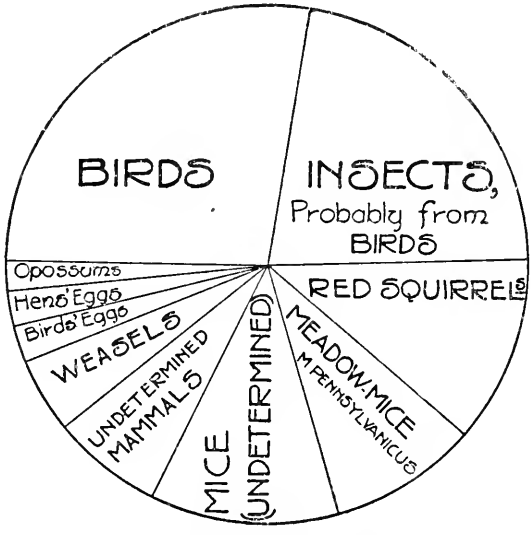


Diagram showing the percentages of food items of pilot snake (*Callopeltis obsoletus*) for the year: 11½ per cent red squirrels; 2 per cent opossums; 28 per cent birds; 2 per cent birds' eggs (undetermined); 4½ per cent weasels; 10 per cent meadow mice (*Microtus pennsylvanicus*); 2 per cent hens' eggs; 21 per cent insects (probably from birds); 7 per cent undetermined mammals; 12 per cent mice (undetermined). (After Surface.)

jaws. It may be doubted, however, if eggs form the only food of these snakes.

In New England the larger and more active snakes are most destructive to birds, while most of the smaller species are now considered as beneficial to man on account of their insectivorous habits. The bird-killing snakes will be considered here in the order of their destructiveness.

The pilot snake (*Callopeltis obsoletus*) should not be confused

[1] Ingersoll, Ernest: The Wit of the Wild, 1906, p. 57.

with other species, such as the copperhead or the hog-nosed snake, both of which are known locally as the pilot snake, or with the black snake, which it resembles in color. This snake grows from about 50 to 75 inches in length and is lustrous black above with some of the scales white-edged. It is lighter but still blackish below. Its ventral plates number about 235, and it is not venomous. It is found from Massachusetts to Illinois and Texas, and south through the middle States. It is one of the largest black snakes, climbs trees rapidly, and I have seen it run fast over and through the tops of a thicket

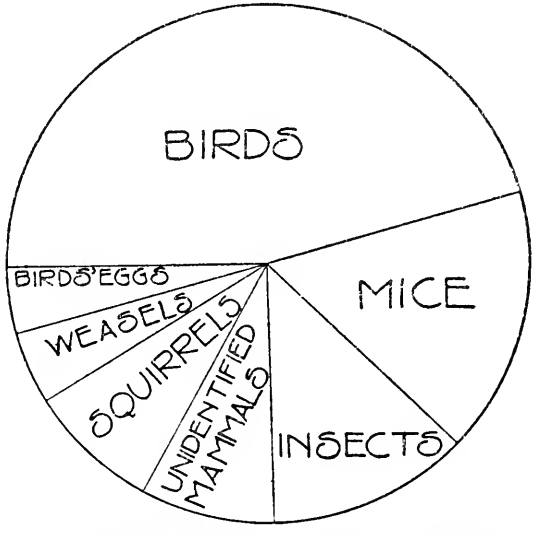


Diagram showing the percentages of food items of pilot snake (*Callopeltis obsoletus*) found during the months of June and July only: 46 per cent birds; 16½ per cent mice; 12½ per cent insects; 8½ per cent unidentified mammals; 4 per cent weasels; 4 per cent birds' eggs. (After Surface.)

of young pines 10 to 15 feet in height. This species, like the black snake, sometimes will chase a fleeing person, but, in turn, will run if pursued. It takes hens' eggs and those of other birds, climbs to nests, and kills and swallows both old and young birds, which form a very considerable part of its food during the nesting season. This and the following species enter the holes of woodpeckers, destroying eggs, adults and young, and have been known even to extirpate colonies of barn swallows nesting on the rafters. Their skill and activity in climbing are unsurpassed among serpents. Mrs. L. H.

Touissant of Rio, St. Lucie County, Florida, says that a black snake (probably of this or the following species) actually crawled up the weather boards of a house to a window where a canary was swinging in a cage, and swallowed the bird, which so increased its size that it could not get out of the cage.[1]

Professor H. A. Surface, who has made the most complete study of the food of the serpents of Pennsylvania yet undertaken, finds that during the late spring and early summer the eggs and young of birds form the predominating food of the pilot snake; later it feeds more on mice, insects, etc. The diagrams show this plainly.

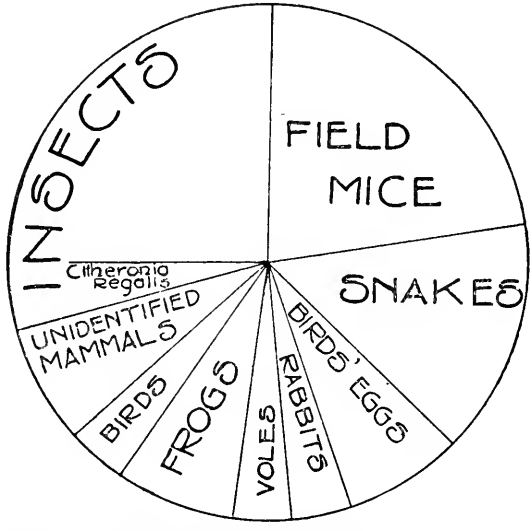


Diagram showing the percentages of food items of black snake (*Bascanion constrictor*) for the year: 25 per cent insects; 15 per cent snakes; 22 per cent field mice; 8 per cent birds' eggs; 4 per cent rabbits; 4 per cent voles; 7½ per cent frogs; 4 per cent birds; 7 per cent mammals (unidentified); 3½ per cent larvæ of royal moth (*Citheronia regalis*). (After Surface.) The percentage of birds for June and July, when the young are in the nests, would be very much larger; but the insects, mice and snakes eaten go far to balance the destruction of birds.

The black snake or blue racer (*Bascanion constrictor*) differs from the pilot snake in having no white except upon the chin and throat and in having all the scales smooth instead of keeled. The ventral plates are about 185 in number. The snake is lustrous black in color, bluish or greenish below and in length usually 5 feet or less, although larger specimens have been taken.

[1] The Bluebird, Junior Audubon Monthly, Vol. VII., No. 8, May, 1915, p. 222.

The young are grayish olive, with short livid black blotches or spots. This is the common black snake of New England and is found mainly in regions more or less wooded. According to Professor Surface it feeds to some extent on large insects but more on other insectivorous creatures, such as small snakes, frogs and birds, but it is believed to be a destroyer of the rattlesnake and the copperhead. The diagram on page 248 gives an idea of its food. It is not a creature for the bird protectionist to protect.

Next to the black snake, the house, milk or chicken snake (*Lampropeltis doliatus triangulus*), sometimes called in Massa-

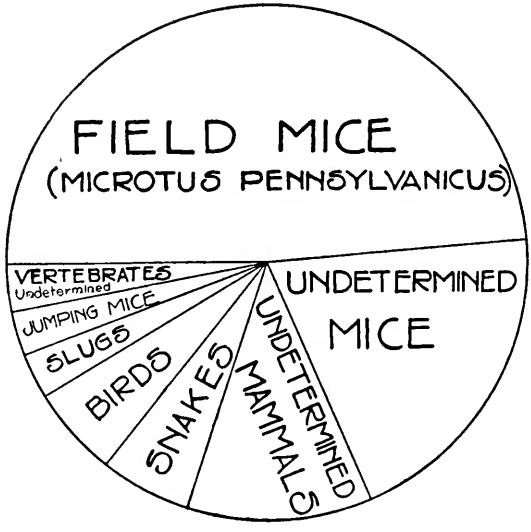


Diagram showing the percentages of food items of milk or house snake (*Lampropeltis doliatus triangulus*) for the year: 48½ per cent field mice (*Microtus pennsylvanicus*); 20 per cent undetermined mice; 11 per cent unidentified mammals; 6 per cent snakes; 5½ per cent birds; 3 per cent slugs; 3 per cent jumping mice; 3 per cent undetermined vertebrates. (After Surface.)

chusetts the spotted or checkered adder, is believed to be most destructive to birds. This is a rather slim, active serpent and may be distinguished from the other species by a series of small square or rectangular black blotches on its light under parts. It is so active and so proficient in climbing that it can go almost anywhere that it is possible for a snake to go. Mrs. Touissant describes how she saw a snake, apparently of this species, climb up the side of a building, hook its chin over the

top of a window frame, draw its body up and so reach a rafter of the roof, where it caught a rat hiding there.

The diagrams show the proportions of the different kinds of food found in fifty-two stomachs of this species examined by Professor H. A. Surface.

The so-called spreading adder or blowing viper (*Heteredon platirhinos*), a non-venomous snake common in parts of Massachusetts, resembling in appearance a viper, destroys birds and eggs to some extent, but like the rattlesnake (*Crotalus horridus*), which also kills birds, is rather slow and not a good climber.

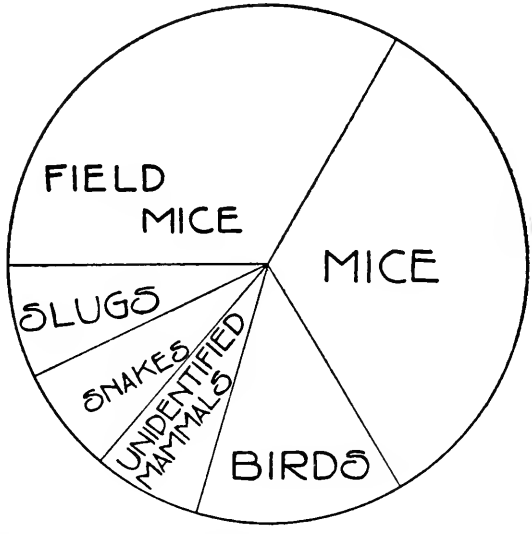


Diagram showing the percentages of food items of house snake (*Lampropeltis doliatus triangulus*) found during July and August only: 33½ per cent field mice; 33½ per cent mice; 13 per cent birds; 7 per cent unidentified mammals; 7 per cent snakes; 6 per cent slugs. (After Surface.) Apparently this snake eats mice enough to more than pay for the birds that it destroys, for mice also eat eggs and young birds.

Both these snakes, as well as the different forms of garter snakes or striped snakes (*Thamnophis*), feed to a limited extent on the eggs and young of birds that nest on the ground or in low shrubbery, as also does the copperhead (*Agkistrodon contortrix*). This venomous and dangerous reptile has the habit of lying concealed beneath the dead leaves of the forest floor, with only its reddish head visible, looking like an acorn amid the leaves, thus no doubt luring many a bird or squirrel to its death. Like the rattlesnake it is rare now in New England, but may still be found in the Blue Hills region near Boston.

Even the water snake (*Natrix sipedon*) is said at times to rob the nests of marsh wrens and to eat the eggs and young of rails, but it is not believed to feed commonly on birds. Probably all field ornithologists of large experience have witnessed the robbing of birds' nests by snakes. The parent birds occasionally are killed in defense of their homes, and it is probable that now and then an adult bird, while feeding, is surprised and caught by a snake, although I have never known this to happen. Snakes probably do not require a great quantity of food. Individuals have been known to live without food for more than a year, and investigators, capturing snakes, find a large proportion of stomachs empty. The digestion of snakes is slow, and probably they do not consume nearly as much food in proportion to their size as would a bird or even a mammal. Hence they probably are not individually as destructive to birds as are warm-blooded rapacious creatures, but where the larger snakes become too numerous they may exert a serious depressive influence on the numbers of birds.

Frogs.

There are many tales of frogs swallowing ducklings but no such case has come under my observation. Mr. Robert B. Lawrence reported that a frog in his brother's duck pond was killed after it had devoured a young pin-tail duck, and that, as many young wood ducks had disappeared, it was believed that frogs had eaten them.[1] This observation is corroborated by others. Only very large frogs are able to catch and swallow birds and such frogs should not be allowed in ponds with young ducklings.

Fish.

Trout, salmon and other large fish capture young birds which fall or alight upon the water. Pike and pickerel are so destructive to the young waterfowl, it is said, that young ducks cannot live in water where they abound.

Insects.

The insect world is potentially the greatest of all dangers to bird life. Wherever birds and other natural enemies of

[1] Huntington, Dwight W.: Our Wild Fowl and Waders, 1910, p. 88.

insects fail to keep down the increase of insect pests, even man himself becomes unable to protect birds. In recent years I have seen this illustrated in the increase of the gypsy moth and the brown-tail moth in eastern Massachusetts, — two first-class pests introduced into this country in the same region without their natural enemies and therefore increasing inordinately. Native birds and other enemies of insects are not numerous enough to check their increase. Although State governments, the national government, towns, cities and individuals are expending probably a million dollars each year in the effort to suppress them, although the United States Department of Agriculture has introduced and propagated parasites and predaceous insects, although about fifty species of native birds eat the moth pests, still their increase and spread go on. Last year I went over a large tract many square miles in extent where the leaves had been stripped from the trees. Everywhere the young birds or eggs in the nests in those trees had been destroyed by the heat of the sun or exposure to their enemies. In such a case no young birds can be reared except those on the ground or those in hollow trees or nesting boxes. Similar irruptions of grass-eating insects expose the nests of ground birds in the same way. Birds are among the chief enemies of ticks, but wherever for any reason the numbers of birds are reduced, ticks increase and still further deplete the numbers of birds by destroying their young. This happened in Jamaica after the introduction of the mongoose, which so lessened the numbers of birds that ticks, no longer controlled by birds, destroyed most of the young birds that escaped the mongoose and rendered it almost impossible to raise domestic fowls on the island.

Birds which nest in colonies often suffer severely from parasites, particularly mites, which attack them at night.

MISTAKES MADE IN ATTEMPTING TO CONTROL THE NATURAL ENEMIES OF BIRDS.

In considering the methods of controlling the natural enemies of birds we must divide these enemies into two classes: (1) Those introduced from foreign countries and which therefore tend to disturb the balance of nature, and should be elim-

inated so far as possible except when under control, either in domestication, or in captivity; such are the dog, house rat, ferret, cat, hog, ox, horse, sheep and goat, the English sparrow and the starling. (2) The native natural enemies, which have through thousands of years become perfectly adjusted in their relation to the species on which they prey. These should not be eliminated, with the exception of those few that threaten our lives or our material welfare, but should be conserved and controlled according to our needs. When a species becomes too numerous it should be reduced in numbers; if too few it should be allowed to increase. The general and indiscriminate slaughter of all carnivorous species should not be permitted. Even the poultryman and the gamekeeper should use some discretion.

An English gamekeeper felt sure that he had seen barn owls killing young pheasants, and as chicks had disappeared with no other visible cause he was told by the master to shoot any owl that was actually seen to take a chick. He saw a barn owl swoop down among the young birds, shot it and found that it had a rat in its claws. It was proved later that it was the rats and not the owls that had been taking the birds. The gamekeeper had shot a friend. A similar incident happened in New Hampshire, where a farmer killed a marsh hawk that was supposed to be eating his chickens and found that it had killed a rat. Some individual barn owls may kill young pheasants. Some marsh hawks kill birds, and in the Cape Cod region many birds and chickens are killed by marsh hawks, but the killing of all birds or all mammals of any species because one or more individuals have been known to destroy birds or poultry is as illogical as would be the killing of all men possessed of guns, knives or axes because some few are known to be murderers and others are suspected. Some allowance should be made for individuality among animals as well as among men.

Millais, in his magnificent work on "British Surface-feeding Ducks," relates that in 1884 brown-headed gulls began to increase in the bog at Murthly. The keeper said that the gulls were killing young teal. Another experienced keeper suggested that this was probably the work of a single gull. The gulls were watched; a pair of birds were seen together, one of which

began to kill ducklings. Both birds were shot, and no more ducklings were killed that year. In 1890 another pair of gulls began killing young teal; sixteen were found dead. The two culprits were shot, and no more young teal were killed that season. Millais considers that individual gulls are as dangerous to young ducks as are any of their numerous enemies; and yet probably only two, or at the most four, of the large number at the bog actually were doing the killing.[1] Had not the gamekeeper been an intelligent observer, a hundred innocent gulls might have been shot, and the guilty birds might have escaped, to continue their nefarious work elsewhere. Millais confidently advances the theory that a few individual birds do the mischief for which perhaps the whole race is blamed. He believes that the individual criminal among birds does his work stealthily, and so is seldom observed; that his family is fed on the results of his rapacity; and that the young acquire similar tastes and habits, which in time may spread from family to family and from one community to another. He asserts that years ago the rooks of southern England were practically innocent of stealing eggs or young birds, though their cousins in the north were nest-robbers even then. He says that now there is hardly a community of rooks in the south of England that does not contain individuals with the nest-robbing habit.

Care and discrimination in the control of natural enemies is imperative. In destroying carnivorous creatures the gun is a better weapon than trap or poison. The gunner can discriminate. Traps and poisons destroy both friend and foe. Poisons should not be used except in the dead of winter and should then be concealed in hollow trees or logs, or holes in the ground, or so covered that only the animals for which they are intended are likely to get them.

It is not the purpose of this paper to describe in detail methods of controlling and destroying predatory creatures but rather to indicate the mistakes ordinarily made in using these methods, the most common of which is the indiscriminate shooting and trapping of hawks and owls. In general it may

[1] Nevertheless, observers agree that the habits of bird-killing and egg-eating are quite general among certain species of gulls.

be said that the larger soaring hawks, with long broad wings, belong to the beneficial species, which feed chiefly on mice and rats, while the smaller, swifter hawks, with comparatively short wings and long tails, which rarely soar or circle but flap and sail in a more direct course, are very destructive to birds, game and poultry. Nevertheless, at least ten of the first class are killed by farmers, poultrymen, and sportsmen to one of the latter, because they are slower, more numerous and more conspicuous, and therefore more readily seen and shot. It should not be inferred from the above that hawks of the first class never kill birds, game or poultry, but they are mostly too slow to catch swift birds often. Nevertheless, any of them can catch a young bird or a chicken. Some individual hawks of the soaring species become very destructive to young poultry at times or to young game on a preserve, but it is not difficult for a good hunter who is also a good shot to follow such a bird and kill it while it is eating its prey. The great horned owl sometimes acquires the habit of coming to a game preserve at night and taking birds. When this happens it must be stopped, even if the pole trap has to be resorted to, for it is not always possible to shoot a bird that comes after dark. Pole traps kept set, however, will not only destroy useful hawks but will catch and kill many useful insect-eating song birds. Pole traps should be used mainly in the dead of winter, when they will be most likely to destroy principally those creatures that are most harmful to the game. It is only the occasional skunk, mink or weasel that becomes destructive in the poultry house or the game pen, but it is useless to talk thus to gamekeepers or poultrymen, most of whom would gladly shoot any predatory bird or mammal at sight.

Gamekeepers exert themselves to destroy all natural enemies of birds indiscriminately, and it must be admitted that such a policy, coupled with attention to breeding, tends to increase the stock of game on a preserve. Such a policy regarding sheep would lead to the destruction of all dogs. No doubt it would be effective in increasing the numbers of sheep, as both the innocent and the guilty would be destroyed, but it would be better to save the innocent, and particularly the dogs known to protect sheep.

Let us hope, then, that preserves will never become so numerous in this country as to bring on, through too much destruction of so-called vermin, the evils that, at times, have attended such a policy of extermination in other lands.

The Failure of Bounty Laws.

Laws offering a price on the heads of rapacious creatures have been passed from time to time in many States because of the belief that such statutes would be beneficial by procuring the destruction of noxious species. In most cases they have failed utterly to bring about the desired result, and, in so far as they have been successful, have accomplished more harm than good. Dr. T. S. Palmer asserts that it is safe to say that $3,000,000 were expended on bounties in the United States in the five years prior to 1896.[1] Probably most of this money has been worse than wasted, and much of it never would have been expended if the advice of competent biologists had been heeded. County and State treasuries have been emptied to keep the scalp hunter afield. Useful as well as noxious creatures have been slaughtered in large numbers, but the benefits to the taxpayer have been conspicuously absent, and lawless hunters have been the chief beneficiaries. Most bounty laws have been proposed and enacted with the ostensible purpose of securing the extermination of the animals thus proscribed on account of the mistaken idea that this would greatly benefit the community by protecting game, birds and poultry. We may grant that in settled regions the extirpation of the wolf, puma and rattlesnake would be desirable, but the complete destruction of birds of prey and the smaller predatory animals would have precisely the opposite effect from that intended and hoped for. In a recent letter to Mr. B. S. Bowdish of Demarest, New Jersey, Professor H. A. Surface, State zoölogist of Pennsylvania, writes as follows: —

It is to be presumed that the object in paying a bounty for the heads of hawks, owls, weasels and foxes is to protect birds and game animals, but it will not do this. Mice and rats are more serious enemies of the

[1] Palmer, T. S.: Extermination of Noxious Animals by Bounties, Yearbook, U. S. Dept. of Agr., 1896, p. 59.

eggs and young of birds than most persons believe. Where these are abundant, no ground-nesting birds will be found. Weasels and even foxes feed chiefly on rodents such as mice and rats, and also rabbits. Only occasionally do they find their way to the poultry yard.

Bounty laws never have exterminated any wide-ranging animal, and in most cases where the smaller species were concerned bounties have not even reduced their numbers permanently. On the Island of Bermuda, with an area of less than twenty square miles, an attempt to exterminate the English sparrow by bounties cost $2,500, and was abandoned as impracticable. Similar efforts in several American States have caused the expenditure of large sums of money without producing as much reduction in the numbers of the sparrow as has followed a single severe winter. If a standing price sufficiently large could be offered for an animal throughout its entire range its extinction might ensue because of continuous persecution everywhere, in the same way that birds have been extirpated when followed throughout their range by hunters working under the stimulus of a continually rising market price, or as the fur seal may yet be exterminated, despite the efforts of the United States government to protect it; but local or State bounty laws, even if effective within prescribed limits, do not reduce greatly the numbers of a species throughout its range. When a bounty law works effectively in any one State it soon gets to be so expensive that its repeal becomes a necessity and then the persecuted species again increases in numbers. Bounties alone have never brought about the extermination of any species in the United States, and they have never secured results commensurate with the expenditure involved. Several States have paid premiums on bears for many years without much decrease in their numbers. If an animal as large as a bear can survive under a bounty system, how can such a system be expected to extirpate smaller animals? Iowa, Minnesota, South Dakota, Washington and Montana have expended very large sums in bounties on small rodents, but have made little impression on the multitude of these creatures.

Bounty Laws do not protect Birds.

In my "Decrease of Birds" the following in substance appears: The main object of all bird legislation is to protect the birds. This can be done by restricting both the number of shooters and the time during which shooting is allowed. Bounty laws have precisely the opposite effect. They encourage boys, foreigners and unemployed persons to roam with guns in their hands through the woods and fields at all seasons of the year, and furnish an excuse for the lawbreaker. This is sure to result in the destruction of game birds and insectivorous birds at all seasons, to say nothing of the poultry and other property of the farmers that, perforce, must suffer. Probably every State that has offered bounties in recent years has had this experience.[1]

Bounty Laws do not protect the Farmer.

The following extract from the letter from Professor Surface, hereinbefore quoted in part, shows plainly how bounty laws eventually result in injury to crops: —

> History, which is yet vivid in the memories of most of us, has shown the evils of the bounty system. In the 90's Ohio passed a bounty law; and as that was my native State, in which I was living at the time, I had an opportunity to see the disastrous results. Mice and rats, which are the chief food of such creatures, became so abundant, not only in buildings around the farms but also all over the farm, that a large percentage of the farmers' crops was destroyed by them. I have seen many a clover field with the roots of the clover plants gnawed down several inches by mice. I found it not uncommon for every shock containing corn also to be the abode of several mice of two or more species, and in every case the loss of grain to amount to several dollars per acre. This increase in destructive vermin was so marked that the citizens themselves had to cry aloud for the removal of the bounty law in order that the natural enemies of the pests could increase.

Bounty Laws encourage Fraud.

Bounty acts no doubt are urged by many persons who honestly believe in their effectiveness, but usually the beneficiaries of such laws are among the chief movers for them, and often

[1] Special Report on the Decrease of Birds and its Causes, with Suggestions for Bird Protection, fifty-second annual report, Mass. State Board of Agr., 1909, p. 527.

a large share of the money paid out by the State goes to comparatively few people and is collected largely through fraud and deceit. In my "Decrease of Birds" this is alluded to in the following words: —

> Bounty laws always put a premium upon dishonesty. Under the so-called scalp act of 1885, in Pennsylvania, upwards of $2,000 were realized for a buffalo hide and a mule skin in one county by a party of hunters. These hides were cut up and "fixed" to resemble the scalps or ears of predatory animals. Whether the magistrates also were "fixed" is not recorded. A red fox was slain in one of the mountainous districts and its pelt cut into sixty-one parts, for which the hunter received $61. Bounties were paid on the heads of domestic fowls, grouse, cuckoos, and even English sparrows, which were supposed to have been palmed off on the authorities as the heads of hawks and owls. Birds and mammals were killed in other States and shipped into Pennsylvania, and large amounts of money thus were fraudulently obtained.[1]

This but repeats the history of local and State bounty laws everywhere.

In Massachusetts we had for years a law which provided for the payment of a bounty of $5 each for seals' tails. Some of the Passamaquoddy Indians shot a few seals in Maine and manufactured from their skins imitation seals' tails enough to take from the different towns in Massachusetts some $2,500 in bounties. That resulted in the repeal of the bounty law.

Dr. George W. Field, former chairman of the Massachusetts State Commission on Fisheries and Game, asserts that he recalls one instance where one town paid $1,800 in bounties fraudulently obtained, and another where nearly a bushel of crows' heads was used in collecting bounties repeatedly in a Massachusetts town. In Pennsylvania a single owl furnished three heads on which premiums were paid. When bounties on the same species have been offered in adjacent States premiums have been collected in both States on the same identical trophies.

The heads or other remains of the following mammals and birds are given by Dr. Warren as having been presented in different counties of Pennsylvania where bounties were paid on

[1] See Warren, B. H.: Birds of Massachusetts, annual report, Mass. State Board of Agr., 1890, p. 45.

most of them by magistrates or commissioners who either had no zoölogical knowledge or were influenced by other considerations than that of saving money for the Commonwealth: calf, dog, jack rabbit, cat, squirrel, herring gull, turkey, vulture, osprey, ruffed grouse, sharp-tailed grouse, horned grebe, whip-poorwill, nighthawk, shrike. Such heads or other remains were presented, accepted and paid for with the understanding that they were those of wolves, foxes, wildcats, minks, weasels, hawks or owls. Bounties were paid not only on one head of some of these species but on many. The heads of grouse presented for bounty probably were trimmed from birds dressed in the market.

On February 25, 1916, Dr. Joseph Kalbfus, secretary of the Game Commission of Pennsylvania, gave at the More Game Convention of the Michigan Wild Life Conservation Association at Saginaw, Michigan, some experience with the Pennsylvania commissioners in regard to bounty frauds. He said he would not have believed there were so many men in Pennsylvania who would commit perjury for a dollar. One man claimed to have killed 102 goshawks in four days in July. The goshawk is a bird that is not found in Pennsylvania except in autumn, winter or early spring. He also claimed to have killed 347 weasels in two months. The man was convicted of perjury and sent to jail. In one of the northern counties of Pennsylvania tens of thousands of weasel skins were brought in, some of them brought from Pennsylvania, some from Canada, New York, Indiana, Ohio, etc., bought at 6 or 8 cents apiece, and sold to the State of Pennsylvania for $2 each. One boy was convicted for conspiring with a justice of the peace to make out claims for $74. The boy did not bring in a feather or a hair, but he got his money. Such frauds were common. Many affidavits were made out in the names of men who knew nothing of the matter. Certificates were raised in amount from $2 to $22. These were raised by the claimants or by some one in the offices of the county officials. Justices of the peace simply assumed that men had killed certain animals, filled out papers, signed claimants' bogus names and drew the money. Frauds such as these have been perpetrated on the State of Pennsylvania within the past two years.

In some States one county has required the presentation of the head of an animal for the bounty while another exacted the tail. As a consequence the hunters readily collected a fee from each county. Every State offering bounties while surrounding States did not has had to pay premiums on the heads of predatory creatures from other States.

Such protection as is needed by birds, game and poultry against their natural enemies must and will be given without the stimulus of bounty laws. Self-interest will teach the farmer, poultryman and gamekeeper to destroy any animal that is known to prey on his particular charge. The trapper will keep down fur-bearing animals because of the increasing value of their pelts.

Sufficient protection will be given to birds against their natural enemies by the shooters themselves when they learn what protection is needed. All gunners will shoot the cooper's and sharp-shinned hawks at sight when they know them and know their character. They will also shoot cats, foxes, crows, squirrels and all the enemies of birds indiscriminately, whenever they recognize them as enemies. Hence, so long as we allow the shooting of game, the shooters are likely to keep the enemies of birds within reasonable limits. Crows, foxes and bird-hawks may increase in some cases, owing to their well-known ability to take care of themselves, but the law does not protect any of these creatures, and they may be kept in subjection without bounty laws.

Some of my published observations regarding the operations of special bounty laws follow: —

While the effect of bounty laws in general is bad, the practical operation of laws directed at particular species is certainly vicious. We may regard a bounty on the heads of cats as impracticable for obvious reasons, not the least among which might be the encouragement of a new industry, — the raising of kittens for the bounty. A bounty on cats, foxes, weasels and skunks would encourage trapping, which is already exterminating some of the smaller fur-bearing animals. The experience of States which have placed bounties on the head of the English sparrow has not been encouraging. These acts are said to have resulted in a slight decrease of the sparrows, and the destruction of great numbers of native birds killed and ignorantly offered for bounty. To put a bounty on the head of the sparrow is practically equivalent to offering a bounty on all our

native sparrows, many of the warblers, the thrushes, wrens and a few other species. Anything that at a distance looks like a sparrow would be killed, and probably in most cases the bounty would be paid, unless a competent naturalist could be appointed in each town or county seat to pass on the heads.

If we offer a bounty on the crow, most of the native crows which do the mischief probably will escape, and the bounty will be paid mainly on birds that come from the north in winter. The difficulty of killing crows in the summer prevents many being taken at that time. In the winter most of the crows that summer here probably go farther south, their places being taken by crows from farther north. It is at this time that crows are most readily killed, either by baiting or at their roosts; and therefore most of the crows offered for bounty would be those which never do any injury here, while the guilty ones would escape.

A bounty on hawks or owls would work injury to the agricultural interests. Hawks, with a few exceptions, are useful birds. Owls, most of which are among the most useful of all birds, should be protected by law, rather than proscribed. When in 1886 the people of Pennsylvania became aware of the injurious effects of the "scalp act," Dr. C. Hart Merriam, then ornithologist and mammalogist of the United States Department of Agriculture, his assistant, Dr. A. K. Fisher, and Dr. B. H. Warren, examined over three hundred and fifty stomachs of the hawks and owls killed under the act. Ninety-five per cent of the food materials of these birds was found to consist, not of poultry and game, but of "mice and other destructive mammals, grasshoppers and many injurious beetles." Dr. Merriam says, in his report for 1886: "By virtue of this act about $90,000 has been paid in bounties during the year and a half that has elapsed since the law went into effect. This represents the destruction of at least 128,571 of the above-mentioned animals, most of which were hawks and owls. Granting that five thousand chickens are killed annually in Pennsylvania by hawks and owls, and that they are worth 25 cents each (a liberal estimate, in view of the fact that a large proportion of them are killed when very young), the total loss would be $1,250, and the poultry killed in a year and a half would be worth $1,875. Hence it appears that in the past eighteen months the State of Pennsylvania has expended $90,000 to save its farmers a loss of $1,875. But this estimate by no means represents the actual loss to the farmer and the taxpayer of the State." Dr. Merriam then goes on to show the vast loss that must result to the people of Pennsylvania, who, by killing these hawks and owls have saved the field mice and other harmful creatures on which the birds otherwise would have preyed. The Legislature of Pennsylvania appointed a State ornithologist, and repealed the scalp act. We do not need a "scalp act" in Massachusetts.

The following from Dr. Palmer's summary shows tersely the principal objections to any system of premiums for the destruction of animals: —

Objections to the bounty system may be grouped under four main heads: (*a*) expense, which is usually out of all proportion to the benefit gained, and may be greater than the county or State can afford; (*b*) impossibility of maintaining bounties in all parts of an animal's range for any length of time; (*c*) impossibility of maintaining equal rates in all States; (*d*) impossibility of preventing payments for animals imported from other States, for counterfeit scalps or for animals raised especially for the bounty. These objections have never been satisfactorily overcome, and most laws have failed through one or another of these causes.[1]

CONCLUSION.

In recapitulating, it may be said that this bulletin shows that (1) natural enemies of birds are necessary and desirable, as they tend to maintain within proper bounds the numbers of the species on which they prey; (2) organized attempts to increase the numbers of birds over large areas by destroying indiscriminately all natural enemies are undesirable; (3) under certain circumstances enemies which have been able to adapt themselves to man and his works and have become unduly numerous may require reduction in numbers; (4) individuals of useful species which may become particularly destructive should be eliminated; (5) self-interest on the part of the people most concerned eventually will bring about such reduction of predatory animals as is needed without the stimulus of bounty laws, which in most cases are pernicious and which if enacted at all should be directed only against the larger predatory animals or those which are dangerous to human life or exceedingly destructive to domestic animals or crops.

[1] Palmer, T. S.: Extermination of Noxious Animals by Bounties, Yearbook, U. S. Dept. of Agr., 1896, p. 68.

AGRICULTURAL LEGISLATION, 1916.

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PART I. — LEGISLATION CONFERRING POWERS AND DUTIES ON THE STATE BOARD OF AGRICULTURE.

MEMBERSHIP OF STATE BOARD.

GENERAL ACTS, CHAPTER 49.

AN ACT RELATIVE TO THE MEMBERSHIP OF THE STATE BOARD OF AGRICULTURE.

Be it enacted, etc., as follows:

SECTION 1. Chapter eighty-nine of the Revised Laws, as amended in section one thereof by section four of chapter one hundred and sixteen of the acts of the year nineteen hundred and two, is hereby further amended by striking out said section one and inserting in place thereof the following: — *Section 1.* The governor, ex officio, the president of the agricultural college, the state forester, the secretary of the state board of agriculture, the commissioner of animal industry, one person appointed by and from the state federation of county leagues and farm bureaus, one person appointed by and from the Massachusetts society for promoting agriculture, one person appointed by and from each agricultural society which receives an annual bounty from the commonwealth, and three other persons appointed by the governor, with the advice and consent of the council, shall constitute the state board of agriculture.

SECTION 2. This act shall take effect upon its passage. [*Approved March 21, 1916.*

DAIRY BUREAU — SECRETARY OF BOARD.

GENERAL ACTS, CHAPTER 46.

AN ACT RELATIVE TO THE POWERS OF THE DAIRY BUREAU AND TO THE SALARY OF THE SECRETARY OF THE STATE BOARD OF AGRICULTURE.

Be it enacted, etc., as follows:

SECTION 1. Section eleven of chapter eighty-nine of the Revised Laws is hereby amended by striking out the words "disseminate such information", in the seventeenth line, and inserting in place thereof the words: — take such action, — and by inserting after the word "thereof", in the eighteenth line, the words: — and improve the dairy industry, — and by inserting after the word "officer", in the nineteenth line, the words: — and secretary, — and by striking out all of the said section after the word "direction", in the twentieth line, so as to read as follows: — *Section*

11. The dairy bureau of the board of agriculture shall consist of three members of said board, one of whom shall annually, before the first day of July, be appointed by the governor, with the advice and consent of the council, for a term of three years, or for such shorter term as he may continue a member of the board. The governor may, at any time, terminate the service of any member of said bureau, and thereupon, or upon any member thereof ceasing to be a member of the board, he may appoint another member in his place. Each member of such bureau shall receive five dollars for each day of actual service and his travelling expenses, which shall be paid by the commonwealth out of the fund provided for in the following section. The bureau, under the general direction of the board of agriculture, shall inquire into the methods of making butter and cheese in creameries or cheese factories, investigate all dairy products and imitation dairy products bought or sold within the commonwealth, enforce the laws for the manufacture, transfer and sale thereof, and shall take such action as will tend to produce a better quality thereof and improve the dairy industry. The secretary of the board of agriculture shall be the executive officer and secretary of the bureau, subject to its control and direction.

SECTION 2. Section four of chapter eighty-nine of the Revised Laws, as amended by chapter one hundred and eighty-six of the acts of the year nineteen hundred and eleven, and by chapter two hundred and fifty of the General Acts of the year nineteen hundred and fifteen, is hereby further amended by striking out the words "twenty-five hundred", in the third and fourth lines, and inserting in place thereof the words: — three thousand, — so as to read as follows: — *Section 4.* The board may appoint, and prescribe the duties of, a secretary, who shall receive an annual salary of three thousand dollars, and who, with the approval of the board, may employ a first clerk at an annual salary of eighteen hundred dollars, and may annually expend for other clerical service a sum not exceeding five thousand dollars. The secretary may arrange for lectures before the board, and may issue for general distribution such publications as he considers best adapted to promote the interests of agriculture; but the expense of such lectures and publications, unless otherwise provided for, shall be paid out of the appropriation for the dissemination of useful information in agriculture by the board.

SECTION 3. This act shall take effect as of the first day of December in the year nineteen hundred and fifteen. [*Approved March 17, 1916.*

INSPECTOR OF APIARIES.

GENERAL ACTS, CHAPTER 45.

AN ACT RELATIVE TO THE STATE INSPECTOR OF APIARIES AND TO HIS DEPUTIES.

Be it enacted, etc., as follows:

SECTION 1. Section one of chapter two hundred and twenty of the acts of the year nineteen hundred and eleven is hereby amended by striking

out the last two sentences and inserting in place thereof the following: — The inspector of apiaries, with the approval of the said board, may appoint such deputies as he may deem necessary. The inspector shall receive five hundred dollars annually for his services under this act, and his travelling and other necessary expenses, and may expend for office assistance such amount as may be necessary. Each of his deputies shall receive a sum not exceeding five dollars for each day of service, to be fixed by the inspector of apiaries with the approval of the said board, and his travelling and other necessary expenses, — so as to read as follows: — *Section 1.* The state board of agriculture shall annually appoint some person qualified by scientific training and practical experience in bee keeping to be state inspector of apiaries, who shall be responsible to said board for the performance of his duties under this act, and may be removed from office by said board for neglect of duty or malfeasance in office. The inspector of apiaries, with the approval of the said board, may appoint such deputies as he may deem necessary. The inspector shall receive five hundred dollars annually for his services under this act, and his travelling and other necessary expenses, and may expend for office assistance such amount as may be necessary. Each of his deputies shall receive a sum not exceeding five dollars for each day of service, to be fixed by the inspector of apiaries with the approval of the said board, and his travelling and other necessary expenses.

Section 2. This act shall take effect upon its passage. [*Approved March 16, 1916.*

STATE NURSERY INSPECTOR.

General Acts, Chapter 91.

An Act relative to nursery agents and to define the powers of the state nursery inspector.

Be it enacted, etc., as follows:

Section 1. Section three of chapter five hundred and seven of the acts of the year nineteen hundred and twelve is hereby amended by striking out the words "desire to", in the second line, and by adding at the end thereof the words: — All persons except growers who sell, or who take or solicit orders for nursery stock shall be regarded as nursery agents for the purposes of this act, — so as to read as follows: — *Section 3.* Agents or other persons, excepting growers, who sell nursery stock shall make application to the state nursery inspector for an agent's license, and shall file with him the names and addresses of all persons or nurseries from which they purchase their stock. On receipt of such application, the state nursery inspector shall issue an agent's license, valid for one year, in such form and with such provisions as the state board of agriculture may prescribe. The license may be revoked at any time for failure to report the names and addresses of persons or nurseries from which stock is purchased, or for such other cause as may be deemed sufficient by the state

nursery inspector and the secretary of the state board of agriculture. All persons except growers who sell, or who take or solicit orders for nursery stock shall be regarded as nursery agents for the purposes of this act.

SECTION 2. Section seven of said chapter five hundred and seven is hereby amended by inserting after the word "treated", in the twentieth line, the words: — or destroyed, — so as to read as follows: — *Section 7.* The state nursery inspector, either personally or through his deputies, may inspect any orchard, field, garden, roadside or other place where trees, shrubs or other plants are growing out of doors, either on public or private land, which he may know or have reason to suspect is infested with the San José scale or any serious insect pest or plant disease, when in his judgment such pests or diseases are liable to cause financial loss to adjoining owners; and may serve written notice upon the owner, or owners, occupant or person in charge of trees, shrubs or other plants thus infested, of the presence of such pests or plant diseases, with a statement that they constitute a public nuisance, together with directions to abate the same, giving the methods of treatment for the abatement thereof, and stating a time within which the nuisance must be abated in accordance with the methods given in the notice. If the person or persons so notified shall refuse or neglect so to treat or destroy such trees, shrubs or other plants within the time prescribed, the state nursery inspector may cause such property to be so treated, or destroyed, and may employ all necessary assistants for this purpose, and such assistants shall have the right to enter upon any public or private property, if such entry is necessary for this purpose. Upon the completion of said treatment the state nursery inspector shall certify in writing to the owner or person in charge of the treated property the amount of the cost of such treatment, and if this be not paid to the secretary of the state board of agriculture within ninety days thereafter, the same may be recovered by suit, together with the costs of suit.

SECTION 3. Section nine of said chapter five hundred and seven is hereby amended by inserting after the word "treated", in the thirteenth line, the words: — or destroyed, — so as to read as follows: — *Section 9.* When the secretary of the state board of agriculture has heard an appeal and has rendered a decision that the action of the state nursery inspector from which the appeal was taken is sustained, the state nursery inspector shall notify in writing the owner or owners, occupant or person in charge of the trees, shrubs, or other plants concerned, of the decision of the secretary, and shall direct him or them within a given time to treat or destroy the trees, shrubs or other plants in accordance with a method prescribed in the notice. If the person or persons so notified shall refuse or neglect so to treat or destroy such trees, shrubs or other plants within the time prescribed, the state nursery inspector may cause such property to be so treated, or destroyed, and the cost of the treatment to be collected as provided in section seven of this act.

SECTION 4. For the investigation and suppression of the white pine blister rust there may be expended under the direction of the state board

of agriculture during the year nineteen hundred and sixteen a sum not exceeding ten thousand dollars, and any unexpended balance of this sum remaining at the end of the fiscal year nineteen hundred and sixteen may be expended in the fiscal year nineteen hundred and seventeen.

Section 5. Chapter one hundred and sixty-one of the General Acts of the year nineteen hundred and fifteen is hereby amended by striking out section two and inserting in place thereof the following new section: — *Section 2.* Said chapter five hundred and seven is hereby further amended by inserting after section seventeen the following new section: — *Section 18.* Every person, firm or corporation, except common carriers, 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 6. This act shall take effect upon its passage. [*Approved April 3, 1916.*

APPLE GRADING.

General Acts, Chapter 63.

An Act relative to the packing, grading and sale of apples.

Be it enacted, etc., as follows:

Section 1. Chapter two hundred and sixty-one of the General Acts of the year nineteen hundred and fifteen is hereby amended by striking out section two and inserting in place thereof the following: — *Section 2.* The standard grades of apples when packed or repacked in closed packages within this commonwealth shall be as follows: — "Massachusetts Standard 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 "Massachusetts Standard Fancy".

"Massachusetts Standard A" shall include only apples of one variety which are well matured specimens, 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 "Massachusetts Standard A".

"Massachusetts Standard B" shall include only apples of one variety, which are well matured, 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 "Massachusetts 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 2. Section three of said chapter two hundred and sixty-one is hereby amended by striking out the word "two", in the fifth line, and by inserting in place thereof the word: — five, — so as to read as follows: — *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 five of this act.

SECTION 3. Section eight of said chapter two hundred and sixty-one is hereby amended by adding at the end thereof the words: — or if the faced or shown surface gives a false representation of the contents of the package, — so as to read as follows: — *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, or if the faced or shown surface gives a false representation of the contents of the package.

SECTION 4. Section ten of said chapter two hundred and sixty-one is hereby amended by striking out all of said section after the word "agriculture", in the fifth line, so as to read as follows: — *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 regulations to be prescribed by the secretary of the state board of agriculture. [*Approved March 22, 1916.*

PUBLIC MARKETS.

GENERAL ACTS, CHAPTER 79.

AN ACT RELATIVE TO THE USE AND MANAGEMENT OF PUBLIC MARKETS ESTABLISHED BY CITIES AND TOWNS.

Be it enacted, etc., as follows:

SECTION 1. Chapter one hundred and nineteen of the General Acts of the year nineteen hundred and fifteen is hereby amended by adding at the end thereof the following section: — *Section 3.* Any city or town which maintains a public market or market place in accordance with the provisions of this act may make rules and regulations for the use and management thereof, subject to the approval of the secretary of the state board of agriculture, and may attach penalties for their violation.

SECTION 2. This act shall take effect upon its passage. [*Approved March 29, 1916.*

PART II. — LEGISLATION OF GENERAL AGRICULTURAL INTEREST.

MOUNT TOBY FOREST.

General Acts, Chapter 234.

An Act to establish the Mount Toby State Demonstration Forest and to provide for instruction therein by the Massachusetts Agricultural College.

Be it enacted, etc., as follows:

Section 1. The trustees of the Massachusetts Agricultural College are hereby authorized to take or acquire by purchase, gift or otherwise, land not exceeding one thousand acres in extent, situated on and about Mount Toby, so-called, in the towns of Sunderland and Leverett, and now owned by John L. Graves and others.

Section 2. The land acquired under the provisions of this act shall be known as the Mount Toby State Demonstration Forest, and title to the land shall be in the commonwealth.

Section 3. The said trustees shall have the same power to acquire land for the Mount Toby State Demonstration Forest which is given to the metropolitan park commission in respect to other land by chapter four hundred and seven of the acts of the year eighteen hundred and ninety-three, and acts in amendment thereof, and shall be vested with full power and authority to care for, protect and maintain the same in behalf of the commonwealth.

Section 4. The trustees of the Massachusetts Agricultural College are hereby further authorized and directed to use the lands acquired under the provisions of this act, or so much thereof as they shall determine, for the instruction of students in forestry and as a laboratory for the purposes of research and illustration in economic questions and practical work relating to the conservation and use of forest tracts and farm wood lots.

Section 5. To carry out the purposes of this act, a sum not exceeding thirty thousand dollars shall be allowed and paid out of the treasury of the commonwealth.

Section 6. This act shall take effect upon its passage. [*Approved May 19, 1916.*

AGRICULTURAL COLLEGE REPORT.

General Acts, Chapter 233.

An Act relative to the annual report of the trustees of the Massachusetts Agricultural College.

Be it enacted, etc., as follows:

Section 1. Section one of chapter four hundred and fifty-nine of the acts of the year nineteen hundred and eight, as amended by section one of chapter four hundred and twenty-nine of the acts of the year nineteen

hundred and ten, and by section one of chapter ninety-one of the acts of the year nineteen hundred and fourteen, is hereby further amended by striking out the said section and inserting in place thereof the following: — *Section 1.* The annual report of the trustees of the Massachusetts Agricultural College may be printed in five parts, which shall severally consist of the following: — part one, of the report of the president and other officers of administration; part two, of the catalogue of the college; part three, of the report of the director of the Massachusetts agricultural college experiment station and other officers; part four, of the detailed reports of the experiment station; and part five, of the report of the director of the extension service.

Section 2. Section two of chapter four hundred and fifty-nine of the acts of the year nineteen hundred and eight, as amended by section two of chapter four hundred and twenty-nine of the acts of the year nineteen hundred and ten, and by section two of chapter ninety-one of the acts of the year nineteen hundred and fourteen, is hereby further amended by striking out the said section and inserting in place thereof the following: — *Section 2.* Of part one there may be printed three thousand copies, of which two thousand copies may be for the use of the trustees of said college; of part two, ten thousand copies for the use of the said trustees; of part three, as many copies, not exceeding twenty thousand, as may be requested by the director of the experiment station for the use of the said trustees; of part four, which may be offered for publication in instalments to be known as bulletins, as many copies of each instalment as shall be requested by the said director, but in no case exceeding twenty thousand copies, for the use of the said trustees, and in addition, for the use of the state board of agriculture, as many copies of each instalment, not exceeding twenty-five hundred, as may be requested by the said board; and of part five, five thousand copies for the use of the said trustees.

Section 3. This act shall take effect upon its passage. [*Approved May 19, 1916.*

SALE OF MILK.

General Acts, Chapter 228.

An Act relative to the production and sale of milk.

Be it enacted, etc., as follows:

Secton 1. Section one of chapter seven hundred and forty-four of the acts of the year nineteen hundred and fourteen is hereby amended by inserting after the word "the", in the seventh line, the words: — milk and of the, — and by inserting after the word "produced", in the eighth line, the words: — and handled, — and by striking out all after the word "for", where it first occurs in the fourteenth line, and inserting in place thereof the words: — said permit or for said inspection, — so as to read as follows: — *Section 1.* It shall be unlawful for any producer of milk or

dealer in milk to sell or deliver for sale in any city or town in the commonwealth any milk produced or dealt in by him without first obtaining from the board of health of such city or town a permit authorizing such sale or delivery. Said boards of health are hereby authorized to issue such permits after an inspection, satisfactory to them, of the milk and of the place in which and of the circumstances under which such milk is produced and handled, has been made by them or by their authorized agent. Any permit so granted may contain such reasonable conditions as said board may think suitable for protecting the public health and may be revoked for failure to comply with any of such conditions. No charge shall be made to the producer for said permit or for said inspection.

SECTION 2. This act shall take effect upon its passage. [*Approved May 17, 1916.*

AGRICULTURAL SCHOOLS IN CITIES.

GENERAL ACTS, CHAPTER 185.

AN ACT TO AUTHORIZE CITIES TO MAINTAIN SCHOOLS OF AGRICULTURE AND HORTICULTURE.

Be it enacted, etc., as follows:

SECTION 1. Any city which accepts the provisions of this act may establish and maintain schools for instructing families and individuals by means of day, part-time or evening classes in gardening, fruit growing, floriculture, poultry keeping, animal husbandry, and other branches of agriculture and horticulture. The location and organization of the said schools, and the instruction given therein shall be subject to the approval of the board of education.

SECTION 2. After the acceptance of this act by any city and before further action hereunder is taken, the school committee shall cause to be circulated a description of the purposes and scope of the instruction to be given hereunder with a request for applications from those desiring such instruction.

SECTION 3. The city council or other board or officer having power to take land for school purposes in any city which accepts the provisions of this act may, in conformity with the provisions of general law relative to the taking of land by municipalities, take in fee any land in said city not already appropriated to public uses for the purpose of maintaining a school hereunder, or may lease or purchase in fee any land, either within or without the city limits, for the said purpose. The school committee of the city may erect suitable buildings upon the land so acquired, and may make provision, on terms that will not involve loss to the city, for the use of plots of ground and for the temporary housing of those attending the school, and complying with its regulations, who have not access to other land suitable for giving proper effect to the instruction of the school.

SECTION 4. This act shall be submitted to the voters in the several

cities of the commonwealth at the next annual state election for their acceptance or rejection, and shall take effect in any city if a majority of the voters of that city voting thereon shall vote in the affirmative. The act shall be submitted in the form of the following question to be placed upon the official ballot: "Shall an act, passed by the general court in the year nineteen hundred and sixteen, to authorize cities to maintain schools of agriculture and horticulture and to make provision, in certain instances, for the temporary housing of persons attending the school, be accepted?" [*Approved May 9, 1916.*

YES.	
NO.	

MILK CONTAINERS.

General Acts, Chapter 151.

An Act relative to containers used in the sale of milk at wholesale.

Be it enacted, etc., as follows:

Section 1. Any person selling milk at wholesale to any purchaser who furnishes containers for the same may petition in writing a sealer or deputy sealer of weights and measures to have such containers tested in the manner provided by law and the capacity thereof, thus ascertained, plainly stamped or otherwise indelibly marked thereon; and such official may direct any such purchaser to have such containers so tested and marked.

Section 2. Any person, firm or corporation who neglects or refuses to have any such containers tested and marked as provided in section one after being directed so to do by any sealer or deputy sealer and who continues to use the same for the purpose of containing milk purchased from any person who has petitioned any such official as provided in said section shall be punished by a fine of not more than ten dollars. [*Approved April 24, 1916.*

DEPARTMENT OF ANIMAL INDUSTRY.

General Acts, Chapter 147.

An Act relative to the disposition of certain returns made to the department of animal industry.

Be it enacted, etc., as follows:

Section 1. Chapter ninety of the Revised Laws is hereby amended by striking out section fifteen and inserting in place thereof the following: — *Section 15.* An inspector shall keep a record of all inspections made by him and of his doings therein, and shall make regular returns thereof to the department, but such returns need not be retained for more than two years, and may then be destroyed or disposed of by their lawful custodian, and any proceeds received in the course of their disposal shall be paid into the treasury of the commonwealth. The depart-

ment shall prescribe the form in which and the times at which such records and returns shall be made, and it may at any time inspect them and make copies thereof.

SECTION 2. This act shall take effect upon its passage. [*Approved April 24, 1916.*

SLAUGHTER OF FARM ANIMALS.

GENERAL ACTS, CHAPTER 139.

AN ACT RELATIVE TO THE SLAUGHTERING OF NEAT CATTLE, SHEEP OR SWINE NOT INTENDED FOR SALE.

Be it enacted, etc., as follows:

Section one hundred and five of chapter seventy-five of the Revised Laws, as amended by section two of chapter three hundred and twelve of the acts of the year nineteen hundred and two, by section two of chapter two hundred and twenty of the acts of the year nineteen hundred and three, by section six of chapter three hundred and twenty-nine of the acts of the year nineteen hundred and eight, and by section two of chapter two hundred and forty-eight of the acts of the year nineteen hundred and twelve, is hereby further amended by inserting after the word "animals", in the fifth line, the words: — intended for sale, — so as to read as follows: — *Section 105.* The provisions of the six preceding sections shall not apply to a person not engaged in such business, who, upon his own premises and not in a slaughter house, slaughters his own neat cattle, sheep or swine, but the carcass of any such animals, intended for sale, shall be inspected, and, unless condemned, shall be stamped or branded according to the provisions of section one hundred and three of chapter seventy-five of the Revised Laws, as set forth in chapter two hundred and twenty of the acts of the year nineteen hundred and three, and as amended by chapter four hundred and seventy-one of the acts of the year nineteen hundred and nine and by section five of chapter two hundred and ninety-seven of the acts of the year nineteen hundred and eleven, by an inspector at the time of slaughter. [*Approved April 20, 1916.*

STATE FOREST COMMISSION.

GENERAL ACTS, CHAPTER 136.

AN ACT TO AUTHORIZE THE STATE FOREST COMMISSION TO TAKE LAND AND TO SELL OR EXCHANGE UNSUITABLE LAND.

Be it enacted, etc., as follows:

Section two of chapter seven hundred and twenty of the acts of the year nineteen hundred and fourteen is hereby amended by striking out the said section and inserting in place thereof the following: — *Section 2.* The commission shall have power to acquire for the commonwealth by

purchase or otherwise, and hold any woodland or land suitable for timber cultivation within the commonwealth. The commission shall have power to take such lands in fee with the approval of the governor and council. The commission may, after a public hearing, sell or exchange any land thus acquired which in the judgment of the commission can no longer be used advantageously for the purposes of this act. The average cost of land purchased by the commission shall not exceed five dollars an acre. The commission shall have the same powers in acquiring land under this act which are given to the metropolitan park commission established by chapter four hundred and seven of the acts of the year eighteen hundred and ninety-three, and acts amendatory thereof, and any person aggrieved by a determination of damages made by the commission may have the same assessed by a jury of the superior court in the manner and subject to the limitations specified in said chapter four hundred and seven, as amended. [*Approved April 18, 1916.*

INSPECTORS OF MILK.

General Acts, Chapter 134.

An Act relative to inspectors and collectors of milk.

Be it enacted, etc., as follows:

Inspectors of milk and collectors of milk samples shall have authority to take samples from milk, intended for sale in their respective cities and towns, wherever, within the commonwealth, such milk is produced, stored or transported, but this act shall not be construed to permit of any interference by such inspectors or collectors with milk in the course of interstate commerce. [*Approved April 18, 1916.*

SALE OF FRUITS AND FLOWERS.

General Acts, Chapter 48.

An Act relative to the sale of wild fruits, berries and flowers.

Be it enacted, etc., as follows:

Section 1. Chapter sixty-five of the Revised Laws, as amended in section fifteen thereof by chapter three hundred and seventy-seven of the acts of the year nineteen hundred and five, and by chapter three hundred and forty-five of the acts of the year nineteen hundred and six, is hereby further amended by striking out all of said section fifteen and inserting in place thereof the following: — *Section 15.* Hawkers and pedlers may sell without a license books, newspapers, pamphlets, fuel, provisions, ice, live animals, brooms, agricultural implements, hand tools used in making boots and shoes, wild or uncultivated fruits, and berries and wild flowers, and the products of their own labor or of the labor of their families, including among such products fruits and agricultural products, if such sale is not made in violation of an ordinance or by-law

of the city or town. Cities and towns, may by ordinance or by-law not inconsistent with the provisions of this chapter regulate the sale and exposing for sale by hawkers and pedlers of said articles, and may affix penalties for the violation of such regulations; and may require hawkers and pedlers of fruit and vegetables to be licensed, provided that the license fee does not exceed that prescribed by section nineteen of chapter sixty-five of the Revised Laws and amendments thereto for a license embracing the same territorial limits. But a person engaged in the pursuit of agriculture who peddles fruits and vegetables shall not be deemed a hawker or pedler under the provisions of this chapter. [*Approved March 21, 1916.*

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