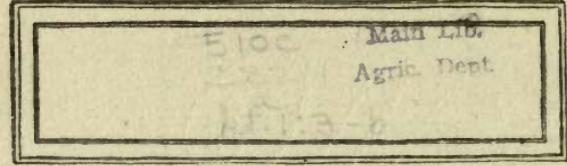
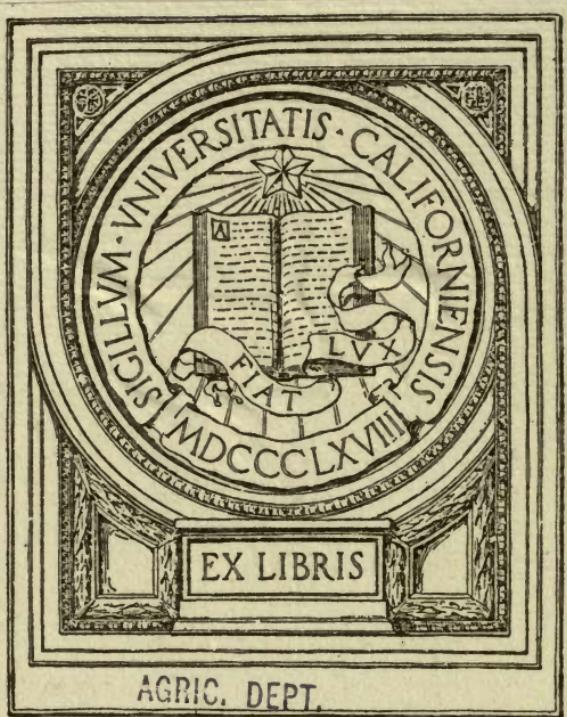
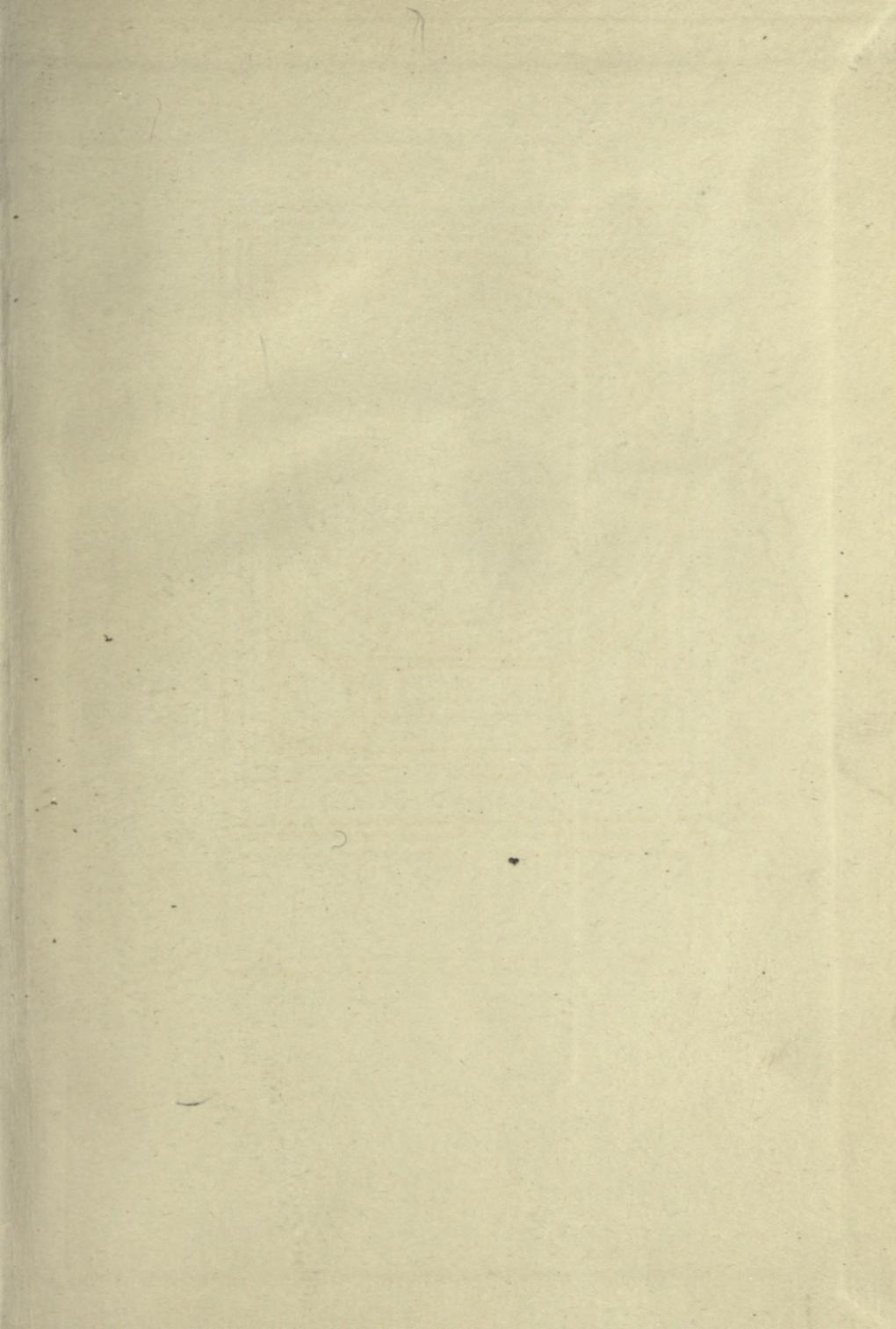


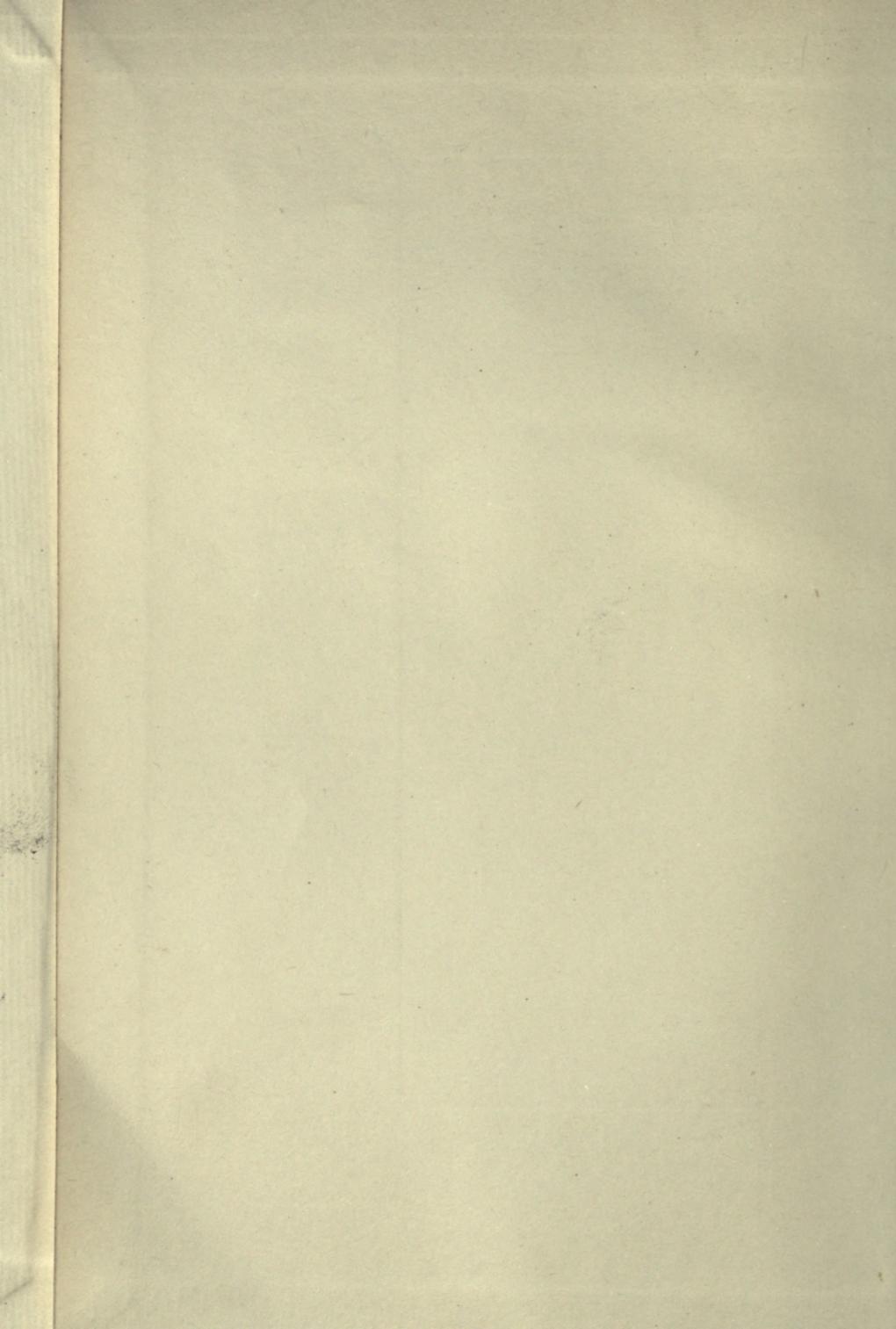
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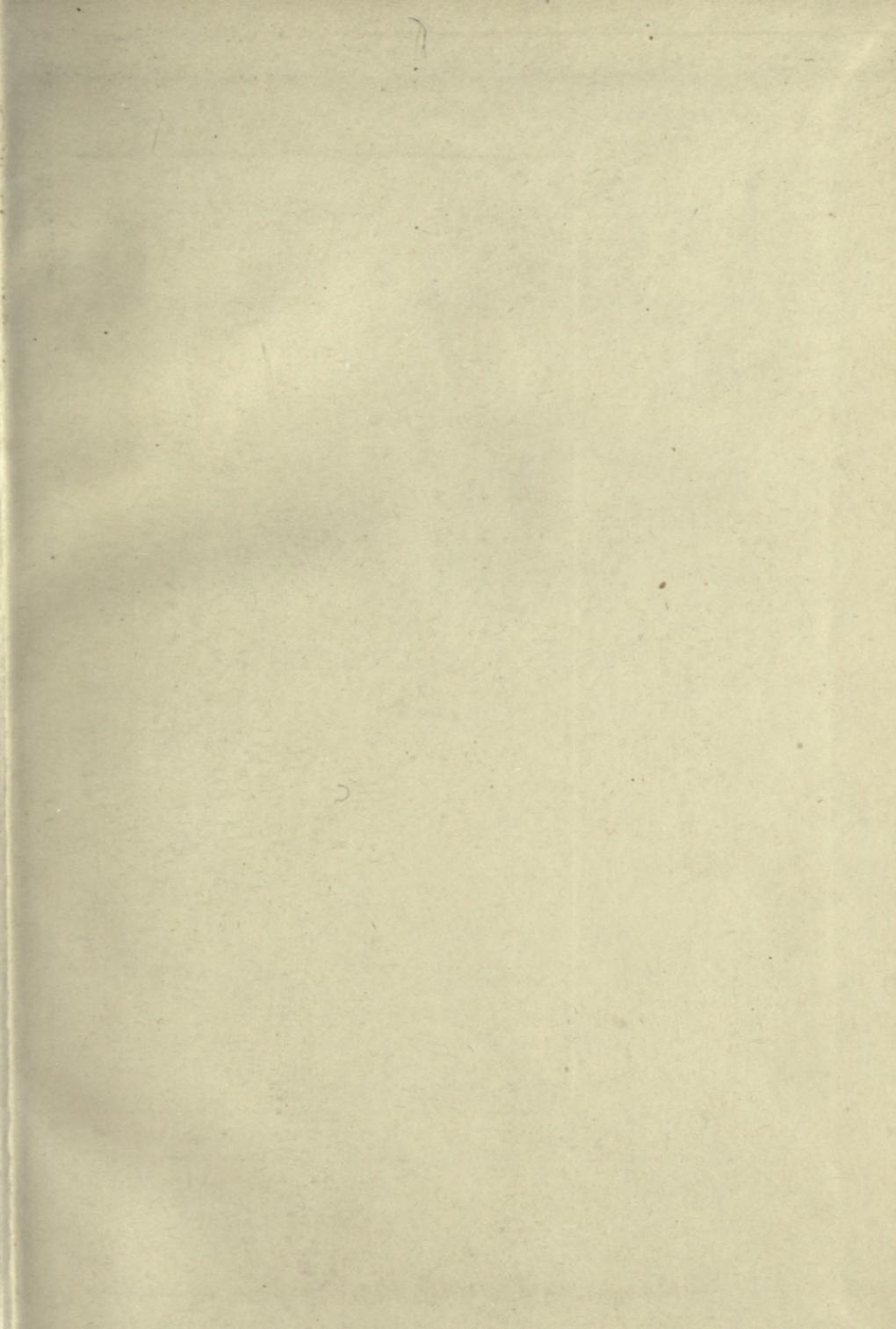


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Animal Husbandry

Series

Part I.

Kennedy.

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MAIN

LECTURE XXVI.

POINTS TO BE OBSERVED IN THE PREPARATION AND FITTING OF CATTLE FOR THE SHOW RING.

The first and most important step is to have the right kind of an animal. It matters little what you feed if you have not the right kind of beast to consume it, success will not come your way. Thus, before commencing the training and feeding you must determine whether or not the merits of the animal are such as to justify the owner to lavish the expense and trouble necessary to bring him out a prize winner in first-class company. If you are doubtful, better to throw him out at once, but if it is in the animal, go at him and lose no time in sending him to the very highest degree of perfection.

Conformation. Without good conformation it is impossible to make a good show animal. The feet and legs must be right, bone of good size, clean cut and joints well defined. The legs should be straight and well set under the body. The head should be short and broad, possessing a sweet countenance. The shoulders should be smooth and well laid in so as to leave no depression behind them which would indicate coarseness or lack of chest capacity. The ribs should be of good length and well arched so as to insure width of back and depth of body. The loin should be broad, the flank well let down, the hindquarters long, broad and well filled in the thighs and twist. The skin should be loose, and covered with a good thick coat of mossy hair.

Feeding. It is difficult to outline any method of feeding which will meet the needs of all animals. The wise and successful feeder will study the individual likes and dislikes of his animals and administer feed accordingly. In feeding show cattle there is but one real object in view, which is to present the animal in the best possible bloom at show time. Labor and cost of feed are of minor consideration to the ambitious and successful showman. In feeding steers for the

market twice a day or even once a day is regarded by many men as sufficient. The successful fitter of show cattle feeds little at a time and often. That prince of cattle fitters, the late "Willie" Watson, fed four times a day, viz.: at 5 a. m., at 11 a. m., at 4 p. m., and at 8 p. m.

Always feed a variety of food. Cutting, chopping, grinding and steaming may not be practical in cattle feeding operations, but they can all be practiced to good advantage in the feeding of show stock. They not only stimulate the appetite of the animal, but they also save labor in mastication. Every half hour saved in feeding is just so much added to rest—a most important consideration in fattening cattle. The feed troughs should be kept scrupulously clean, especially in warm weather, as fermentation will soon take place. The health of the animal must be carefully watched. The slightest indication of dullness or delicacy of appetite should be noted. Should sickness appear, avoid as much as possible the use of medicine and cure-alls. Overfeeding and irregular feeding is generally the cause of sickness in pampered animals. In such cases a good dose of linseed oil will usually give relief, but dieting is the surest and most effective method of combating such troubles. Keep the animals short of feed for a day or two and they will soon return to their normal state.

In our work we always aim to feed a variety of grain feed. At present we are using a mixture of ground corn, ground oats, ground barley, ground wheat, some gluten feed, bran, and flaxseed meal. In addition to this, roots and green forage crops should be fed at regular intervals to keep the digestive system in regular order.

The steamed feed can oftentimes be used to good advantage. Animals inclined to be soft in flesh may be very much improved by substituting cooked wheat for a considerable amount of the corn ration. Molasses sprinkled on the chopped grain or cut fodder will have a good influence in making the ration more appetizing.

Exercising. Exercise is very important. Different successful fitters practice somewhat different methods of securing the same. Some advocate the keeping of the cattle in box-stalls during the day in warm weather and allowing them the run of a grass lot at night. The disadvantages of such a system are that it is impossible to control the feed of the

animals; also, it may be the cause of great bodily waste and loss of fat. In case of animals which are badly off feed or very weak in their legs such a system will often prove very good. The other system is to keep the animals in comfortable, roomy box-stalls all the time except for a couple of hours in the cool of the evening when they are allowed the run of an open lot without any grass. On their return to the stalls they are given their evening ration and left to rest during the night. By adopting this method the feeder has complete control of the animal's feed, thus is not likely to be troubled with bloat, scours and other troubles caused by weeds in the grass lot, or too much washy grass, which so often mars the otherwise keen appetite. They should always be liberally bedded and given every comfort possible.

Grooming. This is a most necessary part of the care of animals intended for the show ring. It is just as essential during the last three months as careful feeding. Cattle which have been well bedded and kept clean can usually be gotten into good form by about three months grooming. It is half the battle in showing cattle to have their coats in good condition, and stock owners who fail to have their cattle in the very best possible form need not expect to win in strong competition. If you wish to shed the coat this may be done by the use of a warm blanket. If one is not sufficient, use two. The blankets need not be kept on except during the day. In addition wash the animals at least twice a week with carbolic soap and tepid warm water. This will cleanse the skin and do away with all dandruff and other scurf. In grooming use a good, soft brush and a piece of thick flannel or chamois skin and the skin will soon become soft under this treatment. The curry comb, if used at all, must be used very lightly, as it is likely to scratch and irritate the skin. A skillful user of the cloth does his rubbing in a quick manner, as then it is much more effective. Constant use of a good flannel cloth is the only sure and safe way of securing a soft and shining coat of hair. In putting on the final touch nothing is more effective than the use of the bare hand in rubbing. A good coat of hair and a soft mellow touch cannot be secured in a week. It will take at least two or three months of faithful work. In this connection the writer once labored for six months to secure the proper bloom on a yearling bull. It came, but it took elbow grease and persistence to secure the velvet touch.

Trimming the Feet. You must be very careful about the feet of your show animals. Overgrown hoofs are a great eyesore and sooner or later are likely to throw the animals off in their hocks and hind legs. They should be frequently dressed, kept clean and in good shape. The following tools have been used by the writer for this work: a heavy wooden mallet, an inch and a half chisel, a blacksmith's paring knife, a rasp and a file. By the careful use of the same the feet of any animal may be kept in good condition.

Clipping. The appearance of the head and neck of those animals which are not supposed to have long curly hair, may often be very much improved by the judicious use of the clippers and shears. This should always be done a few weeks before the show, so that in case an even job is not made in removing the hair, growth enough will have taken place to prevent it from being apparent to the public. The tail should always be clipped, to indicate refinement. Coarse hair on any of the other parts may be removed in the same way.

Fixing the Horns. The horns should always be polished and otherwise fixed so as to present a neat and attractive appearance. The same treatment is not applicable to all horns, as some are much more delicate than others. In some horns the quick is very close, thus care must be exercised in the scraping to prevent bleeding or the weakening of the shell.

If the horn is too long, the first step will be to shorten the same. This should be done with a fine-toothed saw, but care must be taken not to cut too deep. Saw off the amount you think necessary to make the horn the desired length. After the cutting is done, then commence and file the horn at the point to its natural shape, beginning about an inch from the point and filing from the outside inwards, making it look as natural as possible so as to avoid detection. If the animal be a Shorthorn, commence filing the inside of the horn, giving it a flat inside appearance, which is correct in a Shorthorn, although not necessarily in all horned animals. Next begin at the outside, smooth and round it, making it blend as nearly as possible with the already dressed inside, avoiding anything like a sharp edge along the top of the horn, which would indicate at once that the horns had been fixed. If you are real careful to reduce all unnatural sharp edges

about the points of the horns, not even an expert will be able to detect your handiwork.

The next step is to smooth the horn. This may be done by first taking the section blade of a mower and scrape the horn thoroughly smooth. A piece of glass may be used to finish smoothing the same. For a final finish use sand paper of the different grades from coarse to fine, then use emery paper. Then take a piece of soft cloth, dip the same into sweet oil and rub the horns. After this use the same cloth to apply some whitening which, when rubbed well, will leave a beautifully polished and handsomely formed horn. A piece of oily flannel should be used to give the last touch. The hoofs should be cleaned in the same way. Before entering the show ring, rub both the horns and the hoofs with an oily piece of flannel.

Showing in the Ring. Before leaving home you should have all of your animals taught to lead well and to stand well and for any length of time. The nearer the animal is made to stand in its natural state the better he will usually show. Do not twist your cattle around in the show ring into every conceivable shape. Many people think that to show an animal its head should be high in the air. This is oftentimes a serious mistake, for usually when the head is high the back is low. Some animals have to be shown with their heads low to show a strong back. The best showmen are those who keep their eyes on the animal and the judge. It is best to stand on the same side of the animal as the judge, for then you can see exactly how the animal appears before him. Some men try to deceive the judge by hiding some fault in the animal. As a general rule when you hide one fault you add a couple more in some other part of the animal.

LECTURE XXVII.

REARING CALVES DURING MILKING PERIOD.

At present there are two general methods of raising calves, viz.: by hand feeding and by allowing the dam to raise them. The former method is vastly different from the latter and is of most interest to calf raisers in this portion of the country or any other country where the land is high priced.

After the calf is dropped and has been licked dry by the mother, it is usually strong enough to rise and suck. However, in case it is a very weak calf, assistance from an attendant is sometimes needed in securing its first meal. A calf that is to be raised by hand should not be allowed to remain over three or four days with its dam; in fact, some prefer to wean it at once. The reason for this is that, as a rule, the calf is not so hard to teach to drink as when allowed to suck the cow for several days or weeks. There is one exception in which this method should not be employed. That is, when the cow has a hard or caked udder. In such cases it has been found by experienced breeders and herdsmen that the calf by sucking and rubbing tends to reduce the inflammation and soften the udder. Where the calf is allowed to remain with the cow, say two or three weeks, it is a good plan to starve it a day. By so doing it will become hungry enough so that it will not require a great deal of patience to make it drink.

The nature of the milk and quantity to be fed is an all important factor in raising calves successfully. In nature, or from the cow, the calf gets its milk often but in small quantities, and always at blood temperature. Thus we should strive to imitate nature as nearly as possible. During the first few weeks of the calf's life, ten to twelve pounds of milk per day; when two months of age, fourteen to sixteen pounds per day; and when three or four months, eighteen to twenty

pounds per day is sufficient. A calf is such a greedy sort of an animal that the above allowance may not seem to suffice him; however, one must bear in mind that a calf's stomach is a very delicate organ, and when subjected to all the milk the average calf will take, disastrous results are usually the outcome. Care should be taken to keep the milk sweet, and it should also be warmed before feeding. Since creameries have been distributed throughout the country many calves have been raised on skimmed milk. This method of raising calves is the most economical of any now in vogue. It greatly enhances the profit of a cow, because the butter is obtained which would otherwise be consumed by the suckled calf. It has been found possible to raise a calf on skim milk when the milk was separated at the creamery; but since the hand separators on the farms have come into use the problem has become very much simplified.

Under all conditions calves should be fed whole milk for two or three weeks. In changing from whole to skim milk the change should be made very gradually. About one to two pounds per day, if the calf is getting twelve pounds per day, is a sufficient change. That is, if the calf is getting twelve pounds whole milk, the first day of the change feed eleven pounds whole milk and one of skimmed milk; the second, ten pounds whole and two of skimmed, and so on until the complete change has been made. Where the hand separator is available the change can be brought about by regulating the skimming of the milk. That is, by simply removing a small portion of the cream at first and gradually skimming closer until you practically remove all the cream. If the calves are consuming about ten or twelve pounds per day, the complete change from whole to skim milk should cover a period of eight to twelve days. When calves are about two or three weeks old they will begin to nibble at hay and commence to eat grain; and when they are about a month or five weeks old they will eat from one-half to three-fourths of a pound of grain per head per day.

Whatever supplement to the milk one feeds, care should be taken to see that it is perfectly clean. That is, hay, grain and roots should be clean and wholesome. Clover hay is the best kind of roughage; and a ration of grain composed of corn meal or oats instead of oil meal is much cheaper and has been found to form a better combination, all things considered. Dried blood is not only a good supplement but also

a splendid substitute for skim milk when fed in the right proportions. Those who have fed it in connection with a small quantity of whole milk have found it superior to linseed or other meal slops. Dried blood should be diluted with water until the quantity is equal to that of the milk fed in connection with it.

When a number of calves are to be fed, stanchions are indispensable, because several can be fed at the same time without the slightest trouble. Calves will also learn to eat from boxes made in connection with the stanchions and will be prevented from sucking each other, which is so common where they are fed at random.

If calves have been kept in a stable for some time, considerable difficulty is usually experienced when turning them out on pasture. In order to avoid the sudden change, if possible feed a small quantity of green matter for a few days previous to turning them out into the field. Thus the change will be brought about gradually and without any serious effects. Fresh water should always be kept in the stalls or pens. In winter, when the weather is chilly, the cold water should be warmed. When the calves are allowed to suck the cows the whole milking season, very little, if any, care is required in the summer. On the other hand, if the cows and calves have to be housed the greater portion of the time, as is the case in winter, it is generally necessary to separate the cows from the calves. While the calf is quite young and its mother is giving more milk than it can take, the cow should be milked out twice a day. Never allow the milk to become stale in the udder, or serious trouble to both cow and calf will be the result.

Under the best of care calves are often affected with scours and infested with lice. Lice are most commonly found in warm stables, but can be easily killed by washing the animals with some of the common disinfectants, such as Chloro-Naphtholeum Dip, kerosene emulsion, etc.

Scours are the worst enemy the calf has to contend with, and under the best of care some are affected with this malady. Calves are subject more or less to this disease during any time of the year. However, it seems to be most frequent in February and March and about the time calves are turned on pasture. The principal causes are over-feeding, feeding of sour milk, feeding of cold milk, dirty pails and feed boxes, and irregular feeding. Every precaution should be employed

in order to keep the disease out of the barn. Always keep the stalls clean and well bedded, and do not keep too many calves in a small stall.

When the weather is mild allow the calves plenty of sunshine and exercise, and during cold, windy weather keep them out of draughty places so that they will escape colds.

In addition to the above two systems, sometimes calves are fed on whole milk during the entire milk period. However, such a system is rather rare and is somewhat impractical for the average farmer, especially those on high priced land.

LECTURE XXVIII.

FEED, CARE AND MANAGEMENT OF A CALF AFTER THE MILK PERIOD.

As a rule calves are dropped in the spring and are weaned in the fall. This system seems the most natural; however, there are many features in favor of having them come in the fall. If they are dropped in the fall they can be turned out on grass immediately after weaning and grow more rapidly than on a dry winter ration. When they are weaned in the spring and turned out on grass they need practically no attention. However, if weaning occurs in the fall or winter much attention is required.

Calves that are weaned in fall or winter should get food of a nitrogenous nature, especially those that are designed for dairy purposes. A mixture of oats and bran with a small quantity of oil meal will make a good grain ration, while silage, corn fodder, timothy hay and clover or alfalfa will make a good roughage for a dairy calf. The clover or alfalfa are the best kind of roughage because they are rich in protein, or muscle forming material, and are usually more palatable than corn fodder or timothy. Whatever feed be fed to dairy calves, it should be of such a nature that it will tend rather to form muscle and frame than fat. The chief object in feeding a dairy calf is that of producing plenty of bone and muscle, together with a capacious barrel or paunch. In order to do this considerable protein and roughage must be consumed by the individual. If plenty of good clover or alfalfa hay, a small amount of roots or ensilage and sorghum or corn fodder be available, very little, if any, grain need be fed to a growing dairy calf.

Calves intended for beef production after weaning should get a ration that will not only keep them in growing condition, but also have a tendency to put on flesh and fat. A mixture of bran, oats and corn meal with a small quantity of oil meal, will make a good grain ration. One-half pound of grain per cwt. of calf per day, gradually raised to one

pound, should make a good, liberal feed. A variety of fodders and roots or ensilage should be fed in connection with the above mentioned grain ration in order to obtain the best results. For roughage, clover or alfalfa is the best; however, timothy and millet hay, or corn and sorghum fodder give good results. As the greatest gains can be made on a given amount of feed with a young animal, liberal feeding during the first winter is advisable. It is certainly poor policy to allow the calf to lose its calf fat, because such cannot be produced as economically at any other stage of life. Thus while abundance of pasture is available during the summer on nearly every farm, and while it furnishes the cheapest and best feed, yet one should always strive to keep the young animals in a sappy growing condition on winter feed.

In the corn belt good warm sheds furnish sufficient shelter for young stock. Sheds constructed so that they open to the south will give ample protection, providing good yards surround them. Calves in such quarters will become more hardy than those that are kept in warm, poorly ventilated barns. Whatever kind of sheds or quarters calves be kept in, they should be warm enough so that no extra feed be needed to keep the animals warm. Although exercise is not the most conducive to gains, yet every young animal should have access to yards and sunshine if the best results are expected. Racks, feed bunks and water tanks should be located in as well a protected place as can be obtained in the yard. The water in the tanks should be kept from freezing as much as possible by placing covers on the tanks at night; and in the severest weather, if ice forms in tanks, tank-heaters should be employed. Always keep sheds well bedded and as dry as possible.

In case the animals become infested with lice they should be sprayed with a kerosene emulsion or some of the commercial disinfectants which can be readily obtained. Much depends on the care of the calf the first winter. In fact every breeder and feeder should bear in mind that the younger the animal, the cheaper the gain can be made. Thus instead of just keeping the calf in growing condition in winter, it should rather be pushed ahead as rapidly as possible. The succeeding summer the calf should be put on good pasture. If the pasture is short, a supplement of green feed such as sorghum, peas, soy beans, etc., can be fed very profitably. Always keep animals growing and gaining.

LECTURE XXIX.

FEED, CARE AND MANAGEMENT OF A BREEDING HERD OF BEEF CATTLE.

On the average breeding farm in the corn belt, corn, hay and grass are the most common feeds available. In summer good pasture furnishes plenty of feed for breeding animals. However, as a rule the majority of breeders feed calves, young bulls, and cows that are milking, a small quantity of grain.

In winter when the herd is housed it is necessary to feed considerable grain in order to keep the animals in a good sappy condition. Corn being the most plentiful and cheapest cereal in the corn belt, it invariably furnishes a large proportion of the grain ration. Although corn is cheap feed, it should not be fed alone, because it does not furnish a well enough balanced ration for growing or breeding animals. Corn fed in connection with the nitrogenous feeds, such as oats and bran, renders the most satisfactory results. A mixture of one-third each of corn and cob meal, ground oats, bran and a little oil meal, makes a very desirable and palatable grain for all kinds of breeding stock. A grain ration for calves might be advantageously modified by adding corn meal instead of corn and cob; in fact, eliminating the corn entirely and simply feeding them a mixture of oats, bran and oil meal, is often advisable.

Clover and alfalfa are the best variety of roughage; however, timothy and millet will do. Corn and sorghum fodder, if well cured, can be fed outside and thus economize the higher priced fodder. When ensilage and roots are available less grain is needed and the herd can be kept in a very thrifty condition at much less expense. In case the breeder grows very little, if any, of the grain he feeds, it is sometimes economical to feed a small quantity of gluten meal. Avoid feeding foods of a carbonaceous nature, especially to the young animals of the herd. Calves should have grain rich in protein and bone-producing elements, such as oats, bran,

etc., and their roughage should consist of clover or alfalfa, if possible.

Cows may be tied in double stalls, and their calves kept in box stalls near by them. By feeding the cows twice each day and allowing the calves to suck at the same time, the cows can be turned out in the middle of the day to water and rough fodder.

Young bulls may be kept two in a stall, but not very satisfactorily. One is usually enough in a box stall, especially if he is of any size. Bulls require plenty of exercise and sunshine in winter and should be pushed ahead as rapidly as possible after weaning.

Young heifers will thrive exceedingly well and require very little attention if allowed to run in a comfortable shed which opens to the south. Of course they will need a liberal grain ration, but as a rule will develop into stronger, hardier cows. Every individual in the herd, except the very smallest calves, should get outside for water, rough fodder and exercise every day during winter, with the exception of a few of the severest winter days.

Scours being a very common malady among the calves of every herd, precaution should be exercised in order to keep the disease out of the barn.

Regular feeding is an all important thing; and every feeder should have a definite plan or routine of work. Several small yards should be available in winter, and small pasture lots in summer, for calves. In summer the calves and young bulls are better inside during the day in a darkened barn, so that the flies will not torment them. Always keep plenty of water and salt in the fields in summer and the yards in winter.

The feet and horns should also receive attention, and at the right time. What little attention the calves' feet need can be done with a good blacksmith's knife or a pocket knife. The horns can be improved considerable in many cases while they are soft and small. For instance, if a horn tends to turn up or back too far, it can be directed forward or backward by trimming it with a knife on back or top. When cows', heifers' and bulls' feet cannot be trimmed without more or less trouble, the animal should be put in a stocks, which can be quite easily constructed by any farmer. Every breeder should have one of these stocks. Pregnant cows,

especially those heavy with calf, should not be put in stocks. If a cow aborts, she should be immediately separated from the rest of the herd, especially in case of contagious abortion. Disinfectants should be used freely and all discharges from the cow's womb destroyed.

In managing a herd one should consider his location and demands of his customers. That is, one will find that some buyers will want high class animals, while others will want only medium or cheap ones.

It is advisable to have a large per cent. of the calves dropped in the fall, because generally more attention can be given them and the bull calves will be of good size and age for disposing of the second fall or winter. All cows that prove to be non-breeders after a fair trial should be sent to market. While speculation is not advisable, yet one should not use his own breeding too freely. That is, one should avoid in-breeding if there is any tendency to reduce constitution or the size of the individual. Introduce new blood whenever you think it is going to benefit the herd, and always keep a good bull at the head of the herd.

It should always be the aim of every breeder to keep his herd in a condition worthy of inspection, and the animals for sale in the best possible bloom; rather approaching the show yard condition than the primitive or wild condition. If the calves from twelve to eighteen months of age have not been sold at private sale they should be sold at auction.

LECTURE XXX.

FEED, CARE AND MANAGEMENT OF A BEEF BULL.

Considerable food of a carbonaceous nature may be fed to a bull, providing he receives sufficient exercise and nitrogenous food. However, if one is to expect the best results from a bull, succulent and nitrogenous food must be provided.

A grain ration composed of oats, bran and oil meal is the most desirable; however, gluten meal and corn may also be fed very economically and without any bad effects. A variety of fodders, such as clover, alfalfa and sorghum fodder, will serve as roughage. Where roots and ensilage are available, less grain may be fed and the animals kept in a much thriftier condition. The amount to feed a bull is somewhat hard to get at, because there are so many variations. However, if a bull has much work to do, about 10 pounds of grain daily per 1,000 pounds live weight is a fair allowance.

In summer a good arrangement is to allow the bull free run in a good pasture which has good shade and water. In addition to this, if it is deemed advisable to keep the bull in high flesh, a small quantity of the above mentioned grain ration should be added.

In winter, as a grass substitute, roots or ensilage should be fed if possible, as they tend to keep the system cool and the digestive organs in a good healthy condition.

In summer when the flies are bad during the day, a bull should be kept in the barn in a darkened, yet well ventilated and bedded box-stall. During the night he should be turned out in pasture in order that he may graze and exercise himself.

In winter much care should be exercised in feeding a bull. That is, he should have his feed regular. Give him a chance at water at least twice a day, so that he will not have a tendency to drink too much at any one time. Do not feed large quantities of hay to an old bull and then allow him to drink large quantities of water, or you will derange his

digestive organs so that he will become despondent and sluggish in many cases. Always allow a bull plenty of exercise, because upon this factor depends, in a large measure, his usefulness and activity. His feed should rather be of a concentrated nature than bulky, because some bulls have a tendency to gorge themselves and become paunchy and slow, poor servers.

The feet of a bull demand more or less attention, especially if he is getting a liberal supply of grain. Feet should be trimmed so that the animal has always the proper use of himself either in walking or serving. Some bulls are as easily handled as a horse, and their feet can be trimmed without the slightest difficulty; however, this is rather the exception than the rule. The most expedient way is to put the animal in a stocks and raise it off its feet. Then by strapping the foot to be trimmed solid to a beam, so that the sole will be facing upward, the operation can be executed with a pincers and a chisel in a few minutes. Care should be taken to avoid cutting too deep or into the sensitive part of the foot, as this causes bleeding and lameness in many cases. Bulls' feet are often attacked with what is commonly known as foot rot, thrush, foul in foot, etc. Such diseases are more generally found among bulls that have been fitted for show than those that are simply kept in breeding condition. However, there are many bulls rendered unfit for service due to faulty feet which is often brought about through lack of care at the right time. If a bull becomes lame, due to cracks and foreign material between his toes, his foot should be cleaned out thoroughly and treated with creolin or any of the coal tar dips. Such treatment is simple, yet proves very efficient, providing it is applied at the very outset of a disease.

In handling or working around a bull always make it a point to have him tied up. Never depend on him, however quiet and gentle he may seem to be. If a bull is inclined to be vicious, as is often the case, do not abuse or fight with him, because this invariably makes the animal worse. Keep strangers away from a vicious bull as much as possible, so that he will be kept quiet at all times. If a bull is a slow server do not attempt to force him with a whip, etc., but rather seek to remedy his deficiency by changing his feed or dieting him. A bull is sometimes very clumsy in serving, and when such is the case one should not allow him to serve

large cows on the run. Never allow a bull to run in pasture constantly with the cows, as this, in short, is simply cruelty. In case abortion crops out in the herd, the bull should be thoroughly disinfected after each service. If a mature bull is carefully handled he should be able to leave 50 calves or more a year, and have them all come within a period of a few months. A bull may serve as many as three cows in one day, but it is not advisable to subject any animal to such heavy work. Even one service per day is enough, and many bulls will become sluggish if such is long continued.

LECTURE XXXI.

THE PRODUCTION OF BABY BEEF.

The production of baby beef is a feeding industry of comparatively recent origin. Several years ago the custom was to keep steers until they were four or five years of age before marketing them. There is little demand at present, however, for old, heavy cattle, and as a rule we find that feeders now market their cattle at from one to three years of age.

The production of baby beef may be divided into two classes: first, the high grade calf, forced from birth and finished for the market at an age of eleven to sixteen months; and second, the same kind of calves, but kept growing and gaining the first year and finished at twenty or twenty-two months of age. The former method is not so common as the latter, and is not so successfully managed by the average feeder.

In entering upon such a system one should have well-bred calves. If the animals are to be marketed at eleven or twelve months of age, they should be dropped in the fall, during October and November, and be allowed to suck the cows, if possible, for six or seven months. By having the calves come at this time they can be weaned in the spring and turned on good pasture. In addition to the grass they may be fed a grain ration composed of corn, oats, bran and oil meal. If they have access to clover pasture a large proportion of the ration may be corn; in fact, the oats, bran and oil meal may be omitted entirely the first month or two of the feeding period. They can be kept gaining nicely on a grain ration of shelled corn, or corn and cob meal, fed in conjunction with clover pasture. Later, or during the last two or three months, oats, bran and oil meal should be added to the grain ration. About half a pound per head daily of oil meal is sufficient at the beginning, and gradually increase this quantity until each is receiving two or three pounds. Many other feeds, such as gluten meal and dried blood, may be fed economically when the animals are intended for the

market at one year of age. Their rations should be of as concentrated a nature as they can handle profitably.

The other method is that of keeping the calves in a growing and gaining condition by utilizing the cheaper and rougher feeds of the farm and finishing them on concentrated feeds, fed in connection with grass or other nutritious roughage, at an age of twenty or twenty-two months. Silage can be utilized very profitably in this system. Range calves can be fed successfully in this manner. That is, one can buy the calves on the range at weaning time and have them shipped immediately to his feeding farm. Such calves by getting a liberal ration will retain their calf fat and keep in a sappy, thrifty condition during the first winter. The succeeding summer they can be turned out on good pasture and finished during the fall or for the Christmas market. While one might formulate a balanced ration, however, it should be borne in mind that no single ration, fed for an indefinite length of time, will give the best results. The most experienced feeders have found that animals relish an occasional change. This is especially true of young animals; however, such changes should be made very carefully, because violent changes are apt to derange the digestive organs.

Heifers may be used as well as steers in production of baby beef, providing they are put on market at an early date. While the production of this kind of beef is not adapted to feeders who have abundance of cheap pasture in summer and plenty of roughage, such as hay and fodder, in winter, however, such a system of feeding can be made very profitable on high priced land if a high class of animals is used and concentrated foods are available.

LECTURE XXXII.

POINTS TO BE OBSERVED IN THE BUYING AND SELECTING OF STEERS FOR THE FEED LOT.

Steers are put into the feed lot, fed and cared for with the hope of obtaining for them at selling time a price that will enable the feeder to realize a fair profit. After paying for his steers, their feed, and any other direct expense connected with them, he should still have left a margin that would pay him at least 10%, and better 20%, on his investment. It often happens that this profit is not forthcoming when everything is counted in on both sides of the account, and often, too often in fact, instead of a profit to the feeder there is a loss. This is the discouraging part of cattle feeding. When much time and labor have been spent in buying and bringing the cattle home, in gathering and storing the feed, in caring for and feeding them, there is not much encouragement when the feeder finds that instead of a gain, he has sustained a direct loss on all his operations.

The question naturally arises: Is there anything which the feeder can do to influence the amount of profit which will accrue to his labor? There is certainly something for him to do, and that is to exercise care and judgment in the buying and selecting of the steers he puts into his feed lots. No matter what skill is possessed by the feeder, unless the animals placed under his care have been bought right, and unless they have been carefully and wisely selected, his efforts will be fruitless so far as the matter of profit is concerned. Let us see first from what source or sources the profits in steer feeding may come, and then we shall consider the part which the buyer is responsible for.

Profit in steer feeding may come: first, from the conversion of cheap raw materials, such as roughage in the form of hay, corn stalks, and straw; grains, such as corn, oats, peas, bran; or concentrates, such as oil meal, gluten feed and blood meal, into high priced cuts of meat. In the second place by the addition of extra fat and flesh we

hope to increase the value of the whole carcass; i. e., we aim to convert the 1,000-lbs. steer into a 1,350-lbs. prime steer, and in doing this, make the whole carcass worth at least 1½ cents more per pound than when purchased for the feed lot. There are several other items which may enter in as profit to the steer feeder. A large amount of manure is secured and thus increased fertility. A home market is made for roughage and grains; and the manufactured product, the beef animal, can be more easily and economically transported to market. Then, too, there is employment for labor which would perhaps otherwise have to be left unemployed. The first two, however, are the important factors in determining profit, and these are on such a narrow margin that they must be carefully looked after.

The buyer going out to purchase steers to put into the feed lot must have before him an ideal which he seeks to place on the market, and this ideal should be the prime or choice bullock. He has in his mind's eye a low down, blocky, deep, thick set animal with straight top and underline, a wide spring of rib giving a wide back, a wide, deep loin, with good width between the hooks, a long, level rump, and deep, thick hindquarters, with low down twist and inside muscled to hock. This finished steer should possess a general refinement in his whole make-up. He should be smooth and fine about the head, which should be short and broad. The neck should be short, thick and evenly blended with the shoulders. The shoulders should be full and compact on top and the hooks and pins should be snugly hidden away. His legs should be short and fine, with no coarseness at the joints. The flesh should be on evenly on all parts. With all this refinement there should be no paunchiness. This goes under the head of general quality, but in addition to this the prime steer must possess what is termed "handling quality," which is indicated by a soft furry coat of hair, a mellow, pliable skin, and firm, mellow flesh. This is the prime steer which the feeder would seek to place upon the market in order to secure the highest price going, and in order that he may accomplish his desires the buyer must seek to obtain for him the raw material in the shape of feeders from which this sort can be made. He must secure such as will put on flesh rapidly and economically. In order that the

feeder steer may meet these demands there are certain attributes which he must possess. First, he must be a good feeder. We like a steer to be able to eat large quantities of food and at the same time make good use of that food in the way of laying on flesh. In the second place, he must possess a strong constitution and have vigorous, stylish, general appearance. In the third place he must possess the power of laying on flesh in the valuable parts—on the loin, rump, ribs, and rounds. In the fourth place, he must show signs of early maturity.

The feeder steer has been described already in a previous lecture on "Market Classes and Grades," but on account of its importance it will do no harm to repeat it in this lecture. A low down, blocky form, is always desirable. He should be deep in front and thick through the heart. A wide spring of rib giving a wide back on which to carry high priced meat. The rib should be round and deep, giving the steer a roomy middle. If there is one thing to avoid in a feeder steer it is that of a small, tucked-up abdomen. He must have sufficient room for large digestive organs. The loin should be wide and deeply laid on with muscles. The hooks should be wide apart, but should lack any undue prominence. A long, level rump, with heavily muscled, wide, thick hindquarters, and a low twist. A short, broad head, with large, mild, bright eye, large muzzle and mouth, a heavily muscled under jaw, a short, thick, smoothly blended neck, a big heart girth and roomy chest and low down hind flank, all go with a good vigorous feeder. With this form he should possess general refinement, which is indicated by a clean cut head, free from meatiness and puffiness. A fine flat horn, rather than one that is round and stubby; smoothly laid shoulders without either sharpness about the bones and joints of the legs. In addition to this he should be a superior "handler;" i. e., his skin should be loose, mellow and pliable to the touch, and he should be thickly clad with a soft, silky, furry coat of hair. He should have an abundance of natural flesh or muscle along the back and loin, about the hindquarters, over the shoulders and down the ribs, and this should be mellow to the touch.

A feeder of this sort should give the very best returns in a feed lot, so far as early maturity and economy of gain

are concerned, and when taken to the market, if finished, should find the top.

There is a leggy sort of steer possessing some general roughness which will make a fair feeder. He will do away with large quantities of feed and will always be up at the rack, but he will not make such economical gains, nor will he finish up at such an early age, and when he goes to market he cannot command the highest price because he is off on general quality. A steer of this kind is a loser all round.

Never select a long headed, long, slim necked, peaked shouldered, narrow backed, slab sided, thin quartered, cat hammed, harsh handling steer to put into a feed lot. Avoid steers that are weak in constitution. They will always be a source of annoyance by going off feed.

Choice feeders such as have been described above can come only from some one of the special beef breeds. It is not necessary that the dams should be registered. It is well enough to have them high grades. It is necessary, however, that the sire should be a pedigreed animal with good ancestry, and at the same time he himself should possess the good points which we demand in the feeder, together with that degree of masculinity which will insure prepotency.

Investigations have gone to show that beef bred feeders are by all odds the most economical to feed. They dress a higher percentage; deposit fat between the muscular tissue instead of laying it on internally; their meat is "marbled" and possesses a higher market value because of its juiciness and delicious flavors.

It is better to buy young steers that have been kept growing right along from birth and are in a good thrifty condition. It is a well known fact that young animals make more rapid and much more economical gains for the food fed than do older animals. At the Chicago Fat Stock Show in 1882 the cost of producing 100 pounds of gain was ascertained to be as follows:

1 to 12 months.	12 to 24 months.	24 to 36 months.
\$4.03.	\$7.98.	\$12.54.

Other investigations with larger numbers of animals have shown similar results.

Young steers, too, adapt themselves to new and changed conditions more readily than do older ones and lose less time

in acquiring an appetite for the new foods which are supplied in the feed lot.

Where one has a large amount of roughage to utilize, it might be necessary to buy an older, larger animal to place in the feed lot. It must be noted, however, that the day of the heavyweight four or five year old steer is past. The demand now is for the "handy weight" steer, weighing from 1,350 to 1,450 lbs. The quicker he can be produced the better it is for both the producer and the consumer. We have discussed at some length the kind of steer to buy, but we should know as well when and how to buy him. As to when we shall buy him will depend largely upon conditions. We usually buy when we are ready to handle them. The market, too, will have something to do with time of buying. The important matter is not so much when we buy as what we pay for our feeders. Much of the money lost in steer feeding has been lost because of injudicious buying. There was a time when we were sure of a good advance on the buying price when the selling time came, but we can no longer count on that. The steer feeder in order to insure himself against loss should count on at least 1½ cents advance on the buying price, and if feed stuffs are high, he should count on not less than 2 cents advance. In order to be sure of this advance, he must buy around 3 to 3¼. Last year (1902) beef was high and many feeders made good money feeding steers. This caused large numbers to rush into steer feeding during the winter of 1902-3. Many paid over 4 cents for their stock. Corn became high in price. Large numbers of animals placed on the market made beef low and the feeders could realize no gains. Many experienced serious losses. The man who would make a success of buying and feeding must read carefully the signs of the times. He should study well the local and market conditions, and if these are not favorable, he should stay out of the business until they are.

When buying, one should discriminate very seriously against stunted steers that have been starved when young things. These never do well and will be a source of constant annoyance in the feed lot as well as a profit stealer when the final balance is struck.

Care should also be exercised in seeing that the steers are weighed up right. If you buy steers that are weighed up full of water or other cheap material, it will take a deal of good feed to make good the loss you have allowed yourself in this part of the operation.

LECTURE XXXIII.

FEEDING STEERS IN THE DRY LOT.

While the results of many experiments and the experience of practical feeders conclusively prove that the most profitable gains can be made by feeding steers on grass, there are thousands of feeders who follow dry lot feeding from necessity or choice. There are many others who practice feeding on grass, but who also follow winter feeding, and this is necessarily dry lot feeding. It is, therefore, a matter of prime importance to every feeder to become thoroughly conversant with those methods which have proved to be of greatest value in producing maximum gains at a minimum cost.

In feeding steers in the dry lot certain general considerations demand attention. These are: size of lot, drainage of same, bedding, protection from winds, sheds, watering facilities, and arrangement of feed bunks.

The size of the lot, while variable, should be sufficient in size to permit a team to be driven in and out, so that the feeding may be done direct from the wagon. Extremely large lots are not desirable, as the cost of surfacing them is so great as to render it impracticable, and it is also a waste of land, and it cannot be justified on the plea that the distribution of manure will repay the use of the land, for the trampling of the soil during wet times in the spring more than offsets the manuring the land receives. A lot 6x8 rods, properly drained and surfaced, furnishes a far better place for a load of fattening cattle than a larger lot, and is ample for ordinary cases.

The matter of having lots that will remain free from mud, even in wet weather, is of prime importance, and it must be confessed a very difficult matter on the rich, black soils of Illinois and Iowa. In Illinois the only apparent solution seems to be the paving of feed yards; but this is an expensive matter, and we are not yet in possession of such data as will prove the profitableness of such a plan. In Iowa, however, it is possible to prepare and maintain excellent feed yards without paving.

Good underdrainage is the first consideration, and where the feed lots are located on a slope the tile should be laid along the upper side of the lots, so as to prevent the moisture from passing down from the higher land. The lot should then be graded up with plow and scraper until it is high in the center, with a fair slope to the sides; then haul gravel on the lot until it is fairly well surfaced. This will require the expenditure of some labor, but this will be practically all, as there are but few parts of Iowa where gravel cannot be obtained from gravel knolls or from stream beds. The damage done to feeding cattle through having to remain in a muddy feed lot may not be fully apparent to the novice, or to those whose methods are so slipshod that they are unable to tell definitely as to whether they are making a profit or loss during the muddy weather; but while we have as yet no definite data on this subject, experienced feeders are a unit in declaring that profitable gains cannot be made in muddy yards, and in a feeding experiment conducted by the Iowa Experiment Station in 1903, where one lot of cattle was kept in a fairly well drained yard, while another lot, equally well fed, was kept in an extremely muddy lot, those in the well drained lot made nearly double the gains that the others did; and as it is a recognized fact that the greatest gains can only be secured when cattle are most comfortable, no farther argument in favor of dry feed lots should be necessary. Bedding should be supplied in sufficient quantity to permit the cattle to lie down in comfort. Economy will usually be subserved by scattering the bedding on some one side of the lot, and only over a limited space.

Expensive stabling is not to be thought of under western conditions, and it is very doubtful whether the stall fed steer enjoys life as fully, or gains as rapidly, as the brother of the open feed lot. Protection from winds, however, should be given either by artificial groves on the north and west or by tight board fences. Inasmuch as groves cannot be supplied on short notice, the tight board fences are often resorted to, and with excellent success. These should be strong and substantial, and are best made by setting strong posts from 10 to 14 feet apart, nailing three 2x4 horizontally to them—at top, center and bottom—and then nailing inch boards, six feet long, perpendicularly to these. The top should be surmounted by regular fence capping, which can

be secured at a nominal cost, and which will strengthen the fence greatly.

The sheds should be extremely simple. The only requirement is that they shall protect the cattle from rain, sleet or wet snows, for the cold rarely becomes intense enough to make any provision for warmth necessary. For this reason, sheds that have a wind proof north wall, similar east and west ends, and a good roof, but that are entirely open on the south, are usually sufficient for all practical purposes, and the farmer's pocketbook will be far heavier than if expensive stables were built. Summed up in a nutshell the matter of fences and sheds is merely a matter of protection from wind and wet; the cold is usually no more than sufficient to give a fattening steer a good appetite.

Water must be available to the steers at all times, and dependence should never be placed on streams or ponds. In the winter these are frozen, and by the time the owner or hired man goes twice a day all winter to chop the ice and drive the cattle to the freezing water, where they never drink half what they ought to, patience will be a minus quantity, and the steers will be short many pounds of gain. In the spring, when freezing weather is past, the steers will lose a pound or two by expending energy in pulling their legs out of the mud. A tank in the feed lot so arranged that it cannot freeze, and supplied from a cistern situated on some height of ground, is the ideal arrangement, for this water will be comparatively warm. Where the lay of the land is such that a cistern cannot be arranged for, an elevated tank must take its place, and this can best be put up and arranged by some of the regular tank companies so as to be free from frost. The piping should be well protected, and should be not less than $4\frac{1}{2}$ feet under ground. For a tank in the feed lot, we have as yet seen no better arrangement than that now in use at the Iowa Experiment Station. These tanks are round bottomed, wooden tanks, from ten to twelve feet long, similar to the wagon tanks in use by many threshing companies. They are securely placed on a rock foundation. The piping enters at the center of the bottom and is controlled by a valve and a float. Around the tank a cheap, strong frame was built, and this was packed with sawdust. Hinged covers protect the top. The frame is made of two inch planks and the cover of

the same material. The hinged portion of the cover—two feet at each end of the tank—is of single thickness, but the balance of the cover is double planked. Where it is desired to water two lots of cattle, this tank can be set beneath the partition fence, and works admirably. These tanks were in use at the Iowa Station during the past year, and gave perfect satisfaction. Plenty of gravel and rock should always be placed around the tanks to prevent mud.

The feed bunks should be of convenient size and movable, so that they may be changed from place to place to equalize the tramping and to minimize the danger of making mud holes. The ordinary flat bottomed feed bunk, from 12 to 14 feet long, constructed of two-inch stuff, and strongly supported on 4x4 legs that are well braced with cross pieces, is the most generally used of any and is probably the most sensible arrangement yet devised. For roughage "sawhorse" bunks can be built, or, better still, a roughage pen can be built at one side of the feed lot, or between two lots. In the latter case, it is simply a small lot built between two lots, and forming part of the partition fence. The posts are set about 12 feet apart, and the fencing, which should be two-inch planks, is arranged so that the cattle can put their heads through to feed. The roughage, be it straw, hay or fodder, is piled up on the inside. Several loads may be thrown off in this feeding pen at once, and an attendant can move it up within reach of the cattle as seems necessary.

Comfort, without pampering, for the cattle, and convenience, without needless expense, for the feeder, are the essential features in the general management of feed lots for dry lot feeding.

LECTURE XXXIV.

FEEDING STEERS IN THE DRY LOT.—(Continued.)

Having taken up in the previous lecture the general points affecting dry lot feeding, we have next to deal with actual feeding considerations. Long and short feeds, feeding with and without hogs, getting cattle on feed, grains to use, roughage best adapted to fattening steers, light, medium and heavy rations, and the use of supplemental feeds, must all be considered.

Long feeds are to be preferred where the cattle being fed are comparatively young, the markets steady or rising slightly, and where feed is low or medium in price. Under such conditions the greatest possible gains are desired, and these can best be secured on the 120 or 150 day feeds.

Short fed cattle make most money to the feeder when grain is high in price, and when the margin between the buying and selling price of cattle is narrow. Under such conditions mature steers in thin condition can be crowded at a phenomenal rate for 50 or 90 days, and while the cost of gain will usually be as great or greater than in the case of the long fed cattle, the investment is turned sooner, with less risk at a time when markets are variable.

In feeding grain of any kind, more or less passes undigested through the steers, and this waste is increased when the cattle are on heavy feed.

Where good, thrifty shoats are allowed to run with the steers, this waste is reduced to a minimum, for the hogs will gather all waste that is to be found in the droppings. It often happens, however, that cholera or swine plague destroys the hogs, or renders them a very risky business proposition, and in such cases the problem is to make the steer utilize the feed so perfectly that little or no waste will be left in the droppings. This is done by grinding the grain fed, and the results of numerous experiments show that a saving of about 12% is effected by grinding. Where hogs are procurable, however, it is usually inadvisable to go to the

expense of grinding unless it be in the finishing period. At this time the steer's digestive apparatus seems to be more or less wearied, and the change from whole to ground grain will usually result in stimulating gains.

Getting cattle properly started on feed is important, and many novices make the error of undertaking to start the steers too rapidly. The result is that the animals go off feed, get to scouring, and are seriously set back. If the cattle are natives, no difficulty will be experienced in starting them on corn. Range steers, however, must acquire a taste for grain, and it will often require two weeks feeding to get them thoroughly in the notion of eating corn. During this time they should receive such roughness as is at hand—corn fodder, hay or straw—and should be given snapped corn. This is the best feed known with which to start cattle. As Professor Henry tersely puts it, "There is a freshness and palatability about an ear of corn wrapt in nature's covering which every steer recognizes and shows by the eagerness with which he consumes it." The feeding hours should be regular, and the attendants quiet. A rough, boisterous man will do untold damage to a bunch of steers. If the feed is to be a long one, the animals should receive but 4 or 5 pounds per head daily at first, with a gradual increase to about 10 pounds per head daily by the end of the first month. During the second month the feed can be gradually increased and the animals brought to full feed by the middle of the third month, and it will probably be advisable, where grinding is cheap, to shift them to ground corn by the beginning of the fourth month, even though the hogs are following. Where a short feed is the rule, the feed should be increased more rapidly; starting on 5 pounds per head daily, the increase should be so gauged that they will be receiving 14 or 15 pounds per head daily by the end of the first month. They should be on full feed, usually about 25 pounds, by the middle of the second month, and for the most rapid forcing the grain should be ground and mixed with cut hay or straw.

Changes in feed should always be made cautiously, and can best be accomplished by gradually reducing one feed, while increasing the other, and where cattle are on full feed, at least a week or ten days should elapse in making the change. At the start one feed per day is enough, but as the feed is increased two feeds are preferable.

Corn is the feed par excellence for fattening steers, and under prevailing conditions in the great central states it is the only staple feed used. In regions where corn is scarce or high in price, wheat, barley, oats and roots are used; and in some of the western states, sole dependence is sometimes placed on alfalfa, and with very good success. The question of feeding corn alone, or with other feeds, will be discussed in a later paragraph.

The roughage fed must be controlled chiefly by supplies on hand and prevailing prices. Good, bright clover hay is the ideal roughage to feed with corn; but it is difficult to secure, and high prices often prevent its use. Corn fodder, preferably cut before the leaves have dried up, can also be used, and even wheat and oat straw, used as roughage, have a feeding value that is surprising to many. Whatever the roughage be, the steers should receive all they want of it, but it should not be piled before them in such amounts that they cannot clean it up. Steers will not eat roughage they have breathed over for any length of time, and the aim should be to supply their needs once or twice a day.

The question of light, medium and heavy rations for fattening cattle has aroused much discussion since feeds have become high in price. The experiments conducted along this line by the Iowa Experiment Station in 1903 are the only available ones, and cannot be accepted as conclusive until further tests are made. They show, however, that the cost of gain was least on the light, and greatest on the heavy ration bunch; the medium ration bunch occupying a middle position. When total gains and selling prices are considered, however, the heavy ration proved slightly the best, as the greater gain in weight and the consequent higher selling price were sufficient to place this lot in the lead on returns; but the light ration bunch ranked next when the same factors were considered. Further experiments must be conducted along this line.

The use of supplemental feed stuffs from the packing houses, oil mills and glucose factories, has engaged the attention of feeders for several years past. The experiments conducted by the Iowa Experiment Station go to show that the cost of these supplemental stuffs is the chief point to be considered.

When corn is high and these various by-products are moderate in cost, they can profitably be used; but where the reverse is true, corn alone will prove most profitable. This question is too extended to be taken up in full here, and the student should write to the Director of the Iowa Experiment Station for full reports on this matter, which have been published in bulletin form.

In conclusion, the chief points to be observed in feeding steers in the dry lot are: comfort for the cattle, convenient feeding facilities and water supply, quietness and regularity in feeding, and a careful study of the comparative cost of the feeds which it is desired to use.

LECTURE XXXV.

FATTENING STEERS ON GRASS.

Throughout the corn belt the major portion of the cattle feeding has been done during the winter months. There are many reasons for doing so in preference to summer feeding. With the crib full of corn a man naturally seeks some way of disposing of the same. The farmer also has more time to care for the stock during the fall and winter months than during the summer. These things in the past seem to have settled the policy that during the fall and winter months was the most convenient time to make beef.

To the man who has tried both methods it is not necessary to argue the matter. He knows too well that a combination of blue grass pasture and corn is the most economical method yet known to the American agriculturist for the production of beef of the very highest quality. All of our feeding experiments verify the above statement.

Recent experiments conducted by the Iowa Experiment Station, also those by other experiment stations, show very clearly that a pound of gain on the beef animal can be produced in summer for less than two-thirds of the cost of producing the same during the fall and winter months on the same quality of cattle. In these tests the corn consumed was valued at 50c per bushel, and the pasture charged at the rate of \$1.15 per month per acre.

One of the most vital periods in the life of a steer that is to be finished on grass, is the changing from the dry feed lot to the pasture. Right here is where many men lose a month's feed, and in some instances give their cattle such a serious set-back that they never make satisfactory gains thereafter. Too much care and judgment cannot be exercised by the feeder at this time. He must accomplish the change without any loss or shrinkage in his cattle. In fact he should aim to maintain his former daily gains, and such a thing is possible.

In making this change no one set of instructions will apply to all conditions. The previous management of the

cattle must be carefully considered. Cattle which have been on full feed must be handled differently from those which have been on medium or light rations. The length of time the animals are to be fed—that is, whether they are intended for early summer, late summer, early fall, or winter market—must be considered. Cattle which have been on full feed for several months and intended to be marketed not later than the first of June, should not be changed from the dry lot to pasture. Such a change cannot usually be made without a loss to the owner. This is due to the fact that while they have been almost finished in the dry lot, yet they will sell as grass fed cattle. Further, they will not ship nearly so well as those from the dry lot, as the grass during the early months is very soft and washy, thus a heavy shrinkage must be expected from cattle fed on the same. These points should be carefully considered by the feeder.

When cattle are once placed upon full feed there should never be any let-up, but they should be fattened to a finish as soon as possible. Thus cattle which have been on full feed should continue to receive the same after being changed to the grass lot. In feeding cattle on grass, the best results will usually be obtained from those which have not received very much grain during the winter months. In this respect animals which have never received more than half a grain ration usually make much more satisfactory returns than those which have been on a full grain ration. This is due to the fact that animals will usually make about as heavy gains on a medium grain ration and grass as they will on a heavy grain ration. They will always make much more economical gains from the light or medium rations. The main and only advantage of the heavy ration is that it will usually furnish an earlier finish. Thus the feeder must use his judgment as to whether he will feed light or heavy rations and be guided by the length of the feeding period.

Making the change from dry roughage to grass is a critical point. There is much difference of opinion as to the best ways, each of which can be practiced with fair success. The first is to keep the cattle in the feed lots until the grass has made a good growth, then turn them on pasture for a few hours each afternoon when the grass is free from external moisture, the regular allowance of grain and roughage being supplied them in the feed lots; that is, they are fed and

watered as usual, and allowed to eat hay in the feed lots all forenoon. When returned to the feed lot they should have all the coarse fodder they will consume and their regular allowance of grain. By continuing this method from ten days to two weeks, gradually increasing the time in the pasture, gain can be made continuously in the great majority of cases.

The advantages of the above methods are mostly in favor of the pasture lot. It allows the grass to make a good growth early in the season, thus enabling it to withstand heavier grazing later on, and also periods of drought. The objections are that some cattle after once grazing upon fresh grass will not take kindly to the roughage supplied in the dry feed lot.

The other method of accomplishing this change, in many respects the best one to adopt, is to allow the cattle a run of the grass lot as it commences to grow in the spring. This is especially true when the pasture lots are convenient to the feed yards so that the cattle may have access to both without involving too much labor on the part of the feeder. Another point which will aid very much in making this change will be the presence of the old grass in the pasture lot. The wise feeder will not allow his pasture lots to be grazed too closely the previous fall. An abundance of dried grass in the spring of the year will aid the feeder very much in making a gradual change from the feed lot to the pasture lot, as then the tender blades, which are very watery, will be combined with some of the matured grass, thus affording a more substantial diet. Where the above mentioned conditions prevail, the cattle should be allowed the run of the pasture lot before the grass has made much growth. They should receive their regular allowance of grain and have fresh roughage supplied in their feed racks as long as they will partake of the same. This allows of a most gradual change. As the grass makes more growth they will get a little more of it each day, thus requiring that much less of the fodder in the feed lot. As previously stated, the presence of matured grass in the pasture lot will aid very much in bringing about this change.

Recent tests along this line conducted by the Iowa Experiment Station on the Cook farms at Odebolt, Iowa, have demonstrated that such a change is feasible. The cattle continued to eat their former roughage for several weeks and made better than two and a half pounds gain per steer per

day during the intervening period. A change of this kind does not allow the grass to get any start whatever, especially early in the season, thus more acreage is required to furnish abundant feed during periods of dry weather.

It is very doubtful as to whether it pays to feed young animals or animals which have not previously had much grain—much, if any—while the supply of grass is abundant. This is especially true of animals which are not intended for the early fall market. Tests made by the Iowa Experiment Station along this line, where two bunches of cattle of equal quality were allowed the run of equal areas of good blue grass pasture, one receiving grain in addition, and the other lot on grass alone, would lead us to believe that practically as heavy, and much more economical gains, can be secured from grass alone as from a ration of grain in addition to grass during those months when grass is plentiful. During the hot, dry months, a small ration of corn was found to be very helpful. This will be governed to a certain extent by the supply of grass. If the grass is short some grain can be fed to advantage. The preparation of corn for cattle on grass is an important point. When cattle are changed from dry feed to grass their mouths soon indicate a tenderness that makes the dry, hard corn difficult of mastication. This calls for preparation of some kind. Many advocate the grinding of the corn. In our experience shelled corn which has been soaked for about twelve hours has given the best satisfaction. The shelled corn which passes through the animal undigested is more likely to be utilized by the hogs which follow the cattle. Where there are no hogs to follow the cattle and corn is high in price it should always be ground, as this will save about twelve per cent. Thus the price of corn will determine the advisability of grinding the same.

Cattle on grass should be fed grain but once a day, and that always in the evening. The advantages of feeding in the evening are that the cattle being full of grass then will consume the soaked shelled corn more leisurely than when the stomach is empty. They soon lie down and rumination commences and is far more effective on the corn when the stomach is full of grass. Careful observation leads us to believe that less undigested corn is found in the droppings when the cattle are fed on full stomachs in the evening than when they are fed on empty stomachs in the morning.

An abundance of grass is one of the surest ways of securing good gains. Too many cattle feeders overcrowd their pastures, and by so doing are always scarce of grass. "Grass to the knees" is a good motto for the cattle feeder to frame in his own mind and to put into practice on his farm. Plenty of pure, fresh water should always be available. No effort should be made, however, to induce feeding cattle to consume large quantities of water, as it is not considered to be conducive to the most economical gains. Fattening cattle usually show a strong desire for salt, and this craving should be satisfied by a reasonable supply. The excessive use of salt leads to a heavy consumption of water, which is not consistent with heavy gains. Where shelter is provided, granular salt may be used, but if exposed to the weather rock salt only should be supplied.

Protection from the hot sun and flies should be provided. For this purpose a good grove will be a valuable adjunct. If natural shade of this kind is not available, it should be provided for otherwise. Some of the most successful Iowa feeders have large sheds and barns for this purpose. One very successful feeder houses his cattle during the day in hot weather and allows them the run of the grass lot at night. During periods of drought forage crops can be utilized to good advantage. Sweet corn is one of the best things for this purpose. Sorghum and field corn can also be made to serve a useful purpose. These crops, however, are largely water during the early stages, hence must be fed in large quantities to insure good returns.

The shipping of grass fed cattle is an important point, as grass cattle do not usually ship well. To ship such cattle is a hard task, but it must be done. Where convenient it is a good plan to place such cattle in a yard and feed them hay for a day or two, reducing the corn ration somewhat. The secret of shipping all classes of cattle is to place them on the cars full of feed but with as little moisture as possible. Cattle well bedded always ship better than those not thus provided.

LECTURE XXXVI.

PREPARATION OF CATTLE FOR MARKET.

In preparing cattle for shipping every precaution and the greatest care should be exercised by the feeder or shipper so that the animals will reach the market in prime condition.

If the steers are being finished on grass and grain, they should be taken off the pasture and put in a dry lot at least twenty-four hours, or better still forty-eight hours, before shipping, and fed only half their usual allowance of grain, with all the hay they will eat. In some cases it is advisable to feed no grain, thus getting the animals to eat considerable bulky food, such as hay. The whole secret, if there is such a thing, of shipping cattle successfully, is to get them full of dry food just previous to the time they are placed on the cars and market. That is, the less moisture the food contains in proportion to dry material, the better, because as a rule a steer that is largely filled with water has a tendency to scour, and thus show up gaunt and bad on the market. Some unscrupulous shippers have a custom of salting their cattle, so that they drink large amounts of water and fill up on the same. This is something that is usually very detrimental to the sale of the cattle. It is useless for the shipper to think he can fool the buyer by such a practice. By feeding a large quantity of salt one is apt to bring on a fevered condition in the animal's stomach or digestive organs, thus causing it to drink an unnatural amount of water, which in turn causes a looseness of the bowels and a surprising shrinkage.

When the cattle are taken off pasture they should be put in as dry a yard as possible, so that they may keep tolerably clean. Do not leave the ordering of the car until the last minute, but rather order it so that it can be properly bedded and a good supply of hay put in its racks. Straw, of course, makes the best kind of bedding one can use; however, the most essential thing is that of supplying plenty of whatever

is available. To simply half bed a car, in many cases, is like cutting the price of the cattle, because they become dirty and much of their finish and quality is apparently lost.

There is nothing better than good sweet hay for cattle before loading or in transit. Some shippers advise feeding a small quantity of grain, but as a rule grain, especially corn, has a tendency to fever the animals and cause them to drink too much water. Thus, all things considered, the less grain that is fed just previous to and during shipment the better. When the cattle are ready for shipment, they should be driven over the scales and the weights recorded. They then should be driven very carefully to the stock yards or station where they are to be shipped. If the weather is warm, they should be driven in the morning while it is cool. Quietness and gentleness should be in evidence in putting cattle on and off the cars. All hurry or violence should be dispensed with, as such usually causes heavy losses in weight.

As a rule about twenty good sized steers will fill a car; however, one should not rely on any given number, but rather go by the amount of space in the car. That is, always fill the car just as full as it will hold of cattle of a uniform size. By allowing the animals too much space they will push, fight and jam each other so that they will shrink considerably more than if they are crowded enough to keep them quiet. If the shipping takes place in mid-summer, when it is very warm, care must be taken to supply the animals with plenty of water on the car.

If the steers are on full feed in a dry lot the same precautions practically, as above mentioned, will suffice. However, less time or trouble will be required to get the animals in good shipping condition. The full feed ration of grain should be reduced to one-half, a couple of days before shipping.

Whatever distance one has to ship, he should make it a point to have the cattle arrive at the sale yards at 5 a. m., or at least never later than 8 a. m. By such procedure the animals can be fed and watered and thereby make a favorable impression on the buyer, as they will evidently be straightened up and appear fairly plump or full. In watering cattle in the yards do not allow them to suck and drink at a half or nearly empty trough, because they are certain to partially fill themselves with air instead of water, thus causing them to appear full, yet weigh light.

It is also important that the cattle be treated decently while in the care of the train crew. That is, one should not allow his cattle to be abused by rough switching, etc., on the road. In other words, always strive to reduce the excitement of the changes to a minimum, and above all things, do not run the cattle with a horse or dog, or allow boisterous men to abuse them while loading or unloading.

LECTURE XXXVII.

STABLING SUITABLE FOR BEEF CATTLE.

Live stock farming can be successfully followed without the aid of expensive stabling, but protection from the severe cold and wind must be provided.

One must first study the conditions of his locality so that he may arrive at the best and cheapest methods to be used in construction of a barn. He must also construct it so that it will be adapted to the country, feed and animals. For instance, in the eastern and north-eastern districts, where plenty of stone is available, it is usually expedient to build stone foundations or basement walls.

The custom in localities where plenty of stone can be obtained on the farm is that of building a side-hill or bank barn. That is, they select a bank or side hill in order to reduce the approach to the second floor to a minimum. Some build stone walls all around the basement, while others only use stone against the bank. When the bank wall is built of stone and the balance of the basement of wood, as a rule the stable is not as damp as when the walls are all stone. Brick may also serve the same purpose as the stone, but it is very expensive for the average farmer. Such barns should be well ventilated if the animals are expected to keep healthy. Never allow the ventilator ducts to open near the ceiling, as this has a tendency to draw off the warm air. It is always better to have the air come in and go out near the floor of the barn, so that an even temperature can be kept at all times and as much of the heat conserved as possible.

The above kind of barn is well adapted for conditions where large quantities of roots, ensilage and foods of a similar nature are fed. In such close, warm barns the food required to keep up the heat of the animal body is reduced to a minimum; and an abundance of feed can be stored in the upper part of the barn.

The construction of prairie or western stables, however, is something which we are more concerned with than those

of the east. In constructing a barn in the west one should take into consideration the number of animals he intends to house and the amount of shelter in the form of trees, he has at hand. In many of the prairie districts rock or brick is too expensive for the farmer to think of using them except for foundation purposes. If one is building a barn for pure bred stock, he should build it large enough to hold all his cows tied up; and there should be room for bulls and calves in box stalls. All young stock, such as heifers, are fully as well off in comfortable sheds and well sheltered yards. If the animals are to be fed largely on corn or food of a carbonaceous nature the stabling need not be made very close or warm. Where a large number are kept in one barn, it will be found warm enough if the walls are simply made of inch boards. Of course all space or cracks between the boards should be covered. A better and a more substantial wall, however, is obtained by placing common boards on the studing; then paper on top of them and finishing outside with drop siding. In such a barn one can feed considerable roots, ensilage or watery foods very satisfactorily. In constructing the basement everything should be arranged so that the greatest number can be housed and attended with the least labor possible. That is, one should have the feed room and all the mature animals near the center of the barn, so that the bulk of the feed will only have to be carried a short distance. It may seem unwise to keep the young animals, such as calves, in the outside box stalls; however, all things considered, it is the best system. That is, the calves can be put in stalls directly behind their mothers; the droppings from the cows can be readily cleaned out with a wheelbarrow every day and the box stalls at intervals of once or twice a week with the wagon. In tying up cows or matured animals a stanchion is not a fit tie. Some prefer to have a cow tied in a single stall, but such a method is better adapted to dairy purposes than any other. It is true when such a method of tying is employed there is less danger of cows tramping on each other's teats, etc. In order to economize space it is not advisable to tie cows separately, but instead it is far better to tie them in pairs by chains. Bulls of all ages should be kept in box stalls, which should have doors opening to the outside. Water should be available in the barn, so that the cattle may be watered inside on extremely cold days in winter.

In regard to floors that one should use in a barn, there is considerable difference of opinion. A plank floor will last from 3 to 5 years, or longer, providing it is kept dry or wet continually. If allowed to become wet one season and dry during the other, the life of a floor is usually very short. If one is desirous of obtaining a permanent floor, cement is undoubtedly the best. Some maintain that a cement floor is too cold and that it is dangerous for pregnant cows to walk on; this trouble, however, can largely if not altogether, be overcome by bedding properly; something which should be done by every stockman on any kind of a floor.

For feeding cattle inexpensive buildings will suffice in the majority of cases. Most of the meat in the west that is sent to market is produced by out-of-door feeding; however, it is the poorest sort of economy to feed too much grain to the wind or elements. Sheltered feed yards are a necessity if the largest profits are to be reaped. If one has a good grove around his buildings so that the penetrating winds will be checked, sheds will furnish comfortable enough quarters for cattle on full feed. The food of support required is much larger on a windy day for an unprotected animal than for one that is sheltered from the blasts, just as increased fuel is demanded for the stove with unchecked draft. Close stabling—such as tying up in a stable—has been found impracticable in the west. Cattle will do better where they have their freedom and reasonable shelter. If one is unable to build permanent substantial sheds which will keep animals comfortable, a simple and cheap shed or shelter can be obtained by stacking hay, straw or fodder, forming an L-shaped corner. Then by setting a few poles for a straw-thatched roof, the cold rains, sleets, snows and winds of our prairie states can be warded off. A man who furnishes his feeding animals with thorough protection from the wind and gives them tempered water to drink, needs not consult his pocketbook for costly buildings. The fundamental truth in feeding should always be borne in mind; self-preservation is the first law of nature. There is no use of pampering, as this only tends to enervate animals; nor is close housing advisable, as this has a tendency to weaken the system and bring on disease. There is loss in each extreme; thus the stockman should strive to find the happy medium.

LECTURE XXXIII.

REARING DAIRY CALVES.

It is with the dairy animals just as with the beef animal. If we are going to derive the greatest amount of gain from them, we must start them right when young things. The beef animal is trained from birth to put on flesh. The dairy animal should be trained from birth with a view to the production of milk. This must be our ideal—a cow that is capable of consuming and digesting large quantities of suitable food and capable also of exchanging that food into milk rather than into flesh and fat, except what is required to keep her body in a strong and healthy condition.

In order to get this kind of cow we must start with the calf and feed it right. Do not feed it foods that tend to fatten. Let it have its mother's whole milk for three or four days. The calf should always have its mother's first milk. For the next four weeks continue giving it warm sweet milk, a part of which may be skim milk at the start. At the end of two weeks skim milk may be substituted in whole for the whole milk. At this time, when the whole milk is taken away, it is a good thing to add a little oil meal to take the place of the nutrients which are lost by taking away the whole milk. Begin with about a tablespoonful a day, in the form of gruel or flaxseed jelly, and gradually increase this to two tablespoonfuls a day. Flaxseed jelly is made by boiling the seed, while the gruel is prepared by steeping the oil meal in water.

Do not overfeed your calf. When the calf is young, feed at least three times a day, having the milk warmed to blood heat.

Four to six quarts a day fed in three feeds should be enough for a calf up to eight weeks old, when two feeds are sufficient, and the quantity of milk can be increased as the calf grows older until 20 to 24 pounds is reached.

By this time the calf will begin to nibble at hay if it can get it. It is a good plan to have some nice early cut clover hay to put in its manger. If you feed new clover in

the summer, be sure to have it cut some time before and allow it to wilt before feeding. Ground oats, bran or shorts may be given it now. It can be easily taught to eat them, too. Take a little in your hand when you go to feed it milk, and when it has finished let it rub its nose in your hand. Some of the oats will stick to its nose. It will lick them off, and by repeating this a few times the calf will have acquired a liking for them, when they can be placed in its manger. This method of feeding may be continued until the calf is seven to eight months old. As has been stated at the outset, this method of feeding the dairy calf is not intended to produce fat, but it develops a strong, well muscled frame. If the calf has been furnished sufficient palatable coarse fodder, it will have developed, too, a large roomy abdomen and digestive organs, without which we can have no dairy animal. The greatest success has been achieved with calves dropped in the fall. In the winter time the farmer has more time to care for them, and when spring comes and with it the succulent, nutritious grass of the pastures, the young thing can be turned out and will make steady and rapid growth.

Above all things do not allow your dairy animals to acquire the habit of putting on fat. If you do so by feeding them fat producing foods, such as corn, timothy hay, etc., you will spoil what otherwise might have been an excellent dairy animal.

The calf should for the first few months be kept inside in clean, comfortable quarters, with plenty of light and pure air. Keep the young things healthy. In winter they should be protected from the cold, and in summer from the heat and flies. Never allow grain to be left over in the manger from one feeding time to another. Cleanliness should also be observed in the matter of feeding the calf from a clean pail. Do not ask the calf to drink from a sour, foul smelling pail, as this may give rise to serious digestive trouble. This method applies to both heifer and bull calves.

LECTURE XXXIX.

FEED, CARE AND MANAGEMENT OF THE DAIRY HEIFERS.

The young heifers are taken in from the pasture in the very pink of condition. They should not be fat, but they should be growthy and thrifty looking, with bright eyes and large nostrils. Their coats should be sleek and glossy. A large, roomy abdomen will indicate a large digestive tract in which to make good use of large quantities of roughage, such as corn stalks, hay, alfalfa and silage.

Provide good, comfortable quarters and feed good muscle and bone forming ration made up of clover hay, corn silage, roots, a little bran or ground oats, with some corn fodder and straw once in a while for a change. Bear in mind that the heifer, like the calf, must not acquire the habit of putting on fat; so beware of corn or other fat producing foods. Silage and roots will take the place of the succulent pasture grass and will tend to keep them in good health.

When to Breed Her.—The heifer should be bred at from 15 to 20 months, so that she will freshen (drop her calf) for the first time at from 2 to 2½ years of age. Let her begin her life duties at an early age. Giving birth to her first offspring is a trying time in the life of the young heifer. Comfort and kindness should not be spared her. Up to this time she should be handled and made entirely familiar with her attendant, the cattleman, whoever he may be. Even then she will be timid at this time. Place her in a comfortable box stall when she shows signs of parturition, so that you can be near to show her such attentions as she may require. A couple of days before parturition reduce her ration somewhat and give her a dose of salts as a drench. This will have a tendency to prevent milk fever and other troubles which might arise at this time.

After calving do not allow her to have any cold water for 24 hours. Give her a little tepid water to drink, and if

she need nourishment, make a thin gruel which she can drink. After this, she may be put on a light ration of hay, silage, roots, and grain (oats, bran, ground peas, a little oil meal or gluten feed), which may be gradually increased until at 3 or 4 weeks she may be on full ration.

Do not allow her calf to suck her more than two days at most. The quicker it is weaned, the better for both calf and cow. Sometimes a heifer wants her calf so badly that she will be inclined to hold up her milk unless it is present. This difficulty may be overcome by using a little kindness. Never whip her or abuse her in any way to make her give down her milk. Treat her kindly. It pays. You have the making or spoiling of what otherwise might be a first-class cow. Try the plan of having her calf near enough so she can lick it while you draw the milk from her. Repeat this a few times and pretty soon the calf can be removed altogether. It is not a good plan to feed a cow to get her to give down her milk. When the operation of milking is going on the cow and the man should be working in perfect harmony.

Keep her milking just as long as you can get a drop of milk from her at this first milking period. Feed her well on milk producing foods and make her milk 11 months. Don't let her dry up. She must form the habit of milking for a long time and of giving large quantities. Feed and management have much to do with her acquiring this habit. Do not allow her to be bred right away after dropping her first calf. This has been a severe trial to her and she should have time to recuperate. Breed her so that she will drop her second calf not less than 15 months from first freshening.

If, during her second period of lactation, she does not give upwards of 6,000 pounds of milk or make 250 pounds of butter, she should be disposed of, as she will not make a cow that will pay her way as a dairy cow.

A heifer's first calf, if a heifer, should not be kept for a dairy cow.

LECTURE XL.

THE WINTER CARE AND MANAGEMENT OF THE DAIRY HERD.

There was a time not so long ago when the dairy cow's work was done almost entirely in the summer. Her master thought it was asking too much of her to give milk during the cold months of winter and thought that a ten months' lactation period was too great a strain upon her nervous system.

During the winter months he allowed her to eat straw or corn stalks without any grain. She ran out of doors much of the time, taking shelter on the lee side of a stack or rail fence.

She was forced to travel perhaps a long distance to a spring or creek in order to satisfy her thirst. No grain was ever seen in her manger.

Times and conditions have changed and the dairyman has changed, and the dairy cow has become a veritable machine used for the purpose of converting plant food into rich milk. The dairy cow is now kept for profit. In many places she is kept milking almost the year round. She is a constant care, and to this care responds with an increased flow of milk containing a high percentage of butter fat.

Many follow the plan of having their dairy cows freshen in the fall or early winter. There is usually more available labor then to care for them. Dairy products, too, have a higher value then as a rule. The cow has to be fed, housed, and kept in good condition. If she is milking, the same labor with a little more feed will bring a profit to her owner. When she has milked five or six months and is beginning to let up a little on the flow, the spring is here and with it the fresh, green, succulent pasture grass, and being turned out on this the flow is increased and she is encouraged to go on, giving a good amount for four or five months, when she will begin to slack up to get ready for another lactation period.

The first thing to see to is that the dairy cow be provided with a stable where she will be warm and comfortable in every respect. Cleanliness should prevail in her quarters. Her attendant should be kind and gentle in all his dealings with her. An animal with such a high nervous temperament, and one from which so much is expected, should never receive the slightest unkindness. Her feed should consist of milk producing elements. The feeder must study the likes and dislikes of his several individual cows. He must study the individuality of each cow and suit his feeds to them. A good and suitable ration for the dairy cow is made up of clover hay, corn silage, roots, some cornstalks and straw for variety, with a grain mixture consisting of oats, barley, peas, a little oil meal or gluten feed. Science and practice working together have demonstrated that a ration consisting of 1 part protein to $5\frac{1}{2}$ to 6 parts carbohydrates, is most suitable for her when in milk. Feed her liberally with the cheaper, bulkier foods, making them palatable. Feed meal and other concentrated foods, according to the milk flow. Ten pounds of clover hay, 30 to 40 pounds roots, and 30 pounds silage, with 8 pounds grain mixture for every 30 pounds of milk ($2\frac{1}{2}$ gals.), has proven itself to be a good ration. The grain mixture may consist of 4 pounds bran, $2\frac{1}{2}$ pounds ground oats, $1\frac{1}{2}$ pounds oil meal or gluten meal per day. This ration may be increased so long as the cow responds and there are no signs of indigestion. Feed this ration morning and evening, and at noon give a small feed of coarse hay or straw.

Some follow the plan of cutting the hay and pulping the roots, where such are fed. These are mixed in the feed room by putting down a layer of cut hay, then a layer of roots, and then a layer of silage. This is allowed to stand for 12 hours before feeding. This makes the whole mass soft and palatable. One of the secrets of success in the dairy business is that of making the cow consume a great deal of coarse but nutritious fodder. It pays to cut up the roughage and the roots and also to grind the grain. By doing this you relieve the cow of a good deal of grinding and she remunerates you by a larger flow of milk. Study to give her a variety of food. Make it palatable, watch her manger, and see that nothing is left over from one meal to another. If a cow is inclined to put on too much fat, reduce the carbo-

hydrates. If she is inclined to grow thin, increase the carbohydrates. She should have access to clean, fresh water at least twice a day. Water for the dairy cow should not be ice cold. She should never receive a chill from any cause. If she does, serious trouble may be the result. Never allow her flow of milk to slacken from want of good, intelligent care. It is much easier to keep her right than it is to get her back to her flow again if she has once had a set-back. You cannot afford to let cows stand out in the wind around a trough and struggle with each other to get a place to drink.

Give them a little salt every day. About an ounce or an ounce and a half to a cow per day. They want it and should have it, especially when they are getting grain.

Never should there be any unusual noise in the dairy stable. The dairy cow demands quietness and gentleness. Noise and bluster around her are profit killers. You are the master, it is true, but you must acquiesce in this and cater to her demands. Think twice before you shout at her or hit her with a shovel. You may be able to beat her and you may be able to scare her, but if you do either you have yet to learn that you do not understand the dairy cow's make-up. Treat her kindly. Sacrifice a little in order to cater to her whims and she will more than repay you.

Give her a clean, soft bed of straw to lie on. Do not ask her to lie on hard boards or cold cement floor. She deserves better. Make her comfortable.

Everything should be quiet at milking time. She must be milked at the same time every day, and that by the same person, if possible. A cow giving 10 pounds will do with one milking a day. Others should be milked twice a day 12 hours apart. When cows are in the stable they should be brushed and curried often, to free the skin from excretions. The udder should always be wiped off carefully before starting to milk. Cows should be let out a little while each day in a sheltered barnyard, but not kept out long enough to become chilled.

LECTURE XLI.

SUMMER CARE AND MANAGEMENT OF THE DAIRY HERD.

It is not a good practice to turn cattle out to grass too early in the spring. The pastures are often soft and they will be much injured by being cut up by the cattle's feet. The young grass, too, is soft and watery. If the cows are kept off it until the middle or 20th of May, the grass then will have a good growth and will be able to shelter the ground so that it will protect itself against the drouth which comes in July and August. The grass will then be less watery and will be much more nutritious. When the warm weather comes let the cows have the run of the yard, but do not let them get a taste of the new grass, for if they do they will not take well to the dry hay and other preserved foods. When it is time to turn them on the grass, let them out only for an hour or so at first, gradually increasing the time until in three or four days they can be left out altogether.

Cows do not require any grain when the grass is good in the pastures. Have salt where they can have ready access to it at all times. Chunks of rock salt placed here and there in the pasture serves very well.

Provide an abundant supply of pure water. Do not allow your dairy cows to drink out of a dirty, stagnant pool. A well is better, and a clean tank or trough. See that the drinking troughs are kept free from filth.

The cow should not be asked to spend energy walking back and forth to a distant pasture. Bear in mind that her work is to manufacture milk for you, and it is your duty to provide the raw material and have it in a convenient place for her, if you expect her to give you a good return.

It is well to make provision for the hot, dry weather in July and August, when blue grass has gone to seed and the pastures become brown and seared. The dried up blue grass is nutritious, it is true, but the dairy cow must have succu-

lent food. Silage may have been stored for summer use. If so, now is the time to use it. You may have sowed oats and peas in the proportion of 1½ oats to 1 of peas for your dairy cows. Now is the time to cut it and draw it to the barn for them. Do not throw this feed over the fence to them. Put it in their mangers. Be sure that something has been provided for the dairy cows at this time of the year.

Then, too, the flies are bad in June and July, and if allowed to bother the cows will cause a material decrease in the flow of milk. You cannot afford to let this go unnoticed. A preparation made of fish oil and crude carbolic acid mixed in the proportion of a tablespoonful of carbolic acid to one quart of fish oil, if applied once a week to all parts of the cow except the udder, will prevent the flies bothering her.

Shade should be provided where the cows can get out of the heat in the middle of the day.

Forbid it that any dairyman should allow his cows to be chased with a dog. It will pay you to walk after them. The more hurry in this case the less milk. Even a boy on horseback will often drive the cows too fast. Be a friend of your cattle. Love begets love, even in your dairy cows.

Provide a shelter also against the cold winds and rains of October. Milk them as you did in the winter, always at the same time, quietly, gently, but speedily. When you have finished milking, do not sit and strip. It annoys the cow.

Keep in mind both summer and winter never to allow your dairy cow to have a set-back in the flow of milk.

LECTURE XLII.

FEEDS ADAPTED TO THE PRODUCTION OF MILK DURING THE WINTER MONTHS.

Clover hay nicely cured is the best roughage that can be offered the dairy cow. This feed is highly nitrogenous and contains a large amount of mineral matter. It is admirably suited to the production of milk. About 10 to 12 pounds per cow per day should be the allowance. If clean and well cured, it is better to feed it long, as in this form it is freer from dust than when cut.

In some sections, especially Canada, roots (mangels) are fed in large quantities to dairy cattle in winter. Corn silage has proven itself quite as valuable and can be more cheaply secured. It is simply the stalks, leaves and ears cut up into small half-inch lengths and stored away in an air-tight can called a silo. The corn should be fairly well matured before it is stored away.

Corn silage is highly carbonaceous, but because of its succulence is a very acceptable ingredient in the dairy cow's ration. With a little clover hay or alfalfa added, the ration can be easily balanced. About 30 to 40 pounds is fed daily. From this you can reckon that about 4 tons of silage should be stored away for the dairy cow to tide her through the winter months. She cannot subsist and do work on silage alone, but must be supplied with clover hay and other food-stuffs.

Corn stalks, if cut and cured properly, make a good substitute for timothy hay. Sometimes they are fed whole with ears attached. When fed this way there is always a little waste, as the cows will leave the coarser stalks after stripping them of the ears and tender leaves.

Another method is followed sometimes—that of running the stalks, leaves and ears through a cutter. When this cut stuff is fed, the cows leave nothing.

In the corn belt there is a great deal of what is known as corn stover. This is the dried stalks and leaves after the

corn has been husked. Much of this is dry and hard and not very palatable. The cows will make use of the leaves and bits of fine stalks, but this should be fed sparingly to dairy cows and should be supplemented with silage or roots and clover.

Timothy hay is a carbonaceous food. Because of its value as a horse feed it usually is too high priced to feed to dairy cows. It is not so well suited to milk production as clover hay or alfalfa.

Oat and barley straw are sometimes fed to dairy cows. They should be fed sparingly, too, as they are not milk producers. They should be introduced only for variety's sake.

Ground oats with their hulls make one of the finest feeds for the dairy cow. The hulls lighten up the feed and make it a very safe feed; besides it is highly nitrogenous and proves a good milk producer.

Oat hulls from oat meal factories would be valuable only to use in lightening up a heavy grain, such as corn or pease.

In the corn belt corn must of necessity form a part of the dairy cow's ration. Corn on the average is a highly carbonaceous feed. Four or five pounds per day may be fed, but this should be supplemented with wheat bran, and some oil cake or gluten meal. Corn, if fed alone, would tend to produce fat and not milk.

Barley is an excellent milk producing feed and in some places is fed very largely to dairy cows.

Where wheat bran can be purchased at a reasonable price nothing better could be obtained for milk production. Bran for a long time was considered of little value, but since the dairymen found out its value in their business the demand far exceeds the supply, and it is almost beyond the reach of the men who gave it its popularity. It is extremely rich in protein and mineral matter, and because of its light character is a very valuable complement to corn.

Brewer's grains, too, are rich in protein and are highly prized as feed for dairy animals. When situated near the source of supply these are obtained in a wet form. The cows like them when they are obtained fresh and sweet.

Gluten meal, gluten feed and other by-products of corn are rich in protein and are valuable additions to the grain ration for dairy cows.

New process and old process oil meals and cottonseed meal are among the most valuable of the concentrated nitrogenous feeding stuffs at the disposal of dairymen.

In the choice of feeds, if any are required, to supplement the home grown feeding stuffs, the market price together with the composition and palatability should be the guide.

LECTURE XLIII.

FEEDS ADAPTED TO THE PRODUCTION OF MILK DURING THE SUMMER MONTHS.

Dairy cattle can receive no better feed in summer than that which nature provides for them—grass.

Cattle up to their knees in Kentucky blue grass and clover should be working under ideal conditions. Nothing stimulates the flow of milk like the grass in June. Unhappily for the dairy cow and the dairy farmer these conditions will not last all summer. Something else must be provided.

Corn silage may be stored in a small silo and held over for summer feeding. This with a little grain proves a valuable substitute for the grass.

Corn may be planted near the barns where it will be handy to cut and draw to the stables. This, too, will help very materially to keep up the milk flow which might otherwise drop very low. It is a good thing to provide such a crop.

Another valuable summer feed is obtained by sowing peas and oats in the proportion of 1 bushel of peas to $1\frac{1}{2}$ of oats. This cut green in July and August is one of the best feeds to take the place of the pasture grass and will, if fed in time, raise the flow of milk. Several small sowings of this mixture should be made in order to insure a succession of cuttings.

Millet is sometimes used as a soiling crop, and if fed in small quantities, proves very satisfactory.

LECTURE XLIV.

CARE AND MANAGEMENT OF THE COW AT CALVING TIME.

Cows never do so well as when they are on grass. It is a good plan, if possible, to have the pregnant cow, when dry, out on grass. She should be in good bodily health and condition at calving time, and there is no better preparation for this than out on grass.

If a cow is confined during the latter stages of pregnancy, she should receive a ration of clover hay, roots, silage, corn stalks, a little ground oats, bran and oil cake, during the last month or so. Near the time of parturition the feed supply should be reduced and a couple of days previous to calving she should be given a dose of salts in the form of a drench. Kindness, too, is necessary at this time. Enclose her in a box stall. If it is a heifer's first time, rub the udder and teats at least twice a week for a month or six weeks previous to parturition. This will tend to make her quiet as well as give shapeliness to udder and teats.

After the calf has been delivered, give the cow a drink of tepid water. A little oat meal put in the water will help to nourish her. Do not allow her anything to eat for several hours. Begin her on a light ration and keep increasing until at the end of three or four weeks she can be put on full ration. If she is a full grown cow, you can breed her again the first or second heat, or at such time as it will suit your conditions.

Milk fever is one of the serious troubles which you must try to avoid. This is best done by keeping the cow's bowels in a laxative condition and by lessening the milk producing ration for a time before and after calving.

Allow the calf to take the colostrum (first milk) from its mother, and wean it in not more than two days.

LECTURE XLV.

FEED, CARE AND MANAGEMENT OF THE DAIRY BULL.

The bull as a calf may be reared in the barn along with the heifers, for a time. At an early age he should be separated from them and kept in a separate pen. His feed should be similar to theirs. When summer comes, have a yard or paddock with a strong fence, in which you can allow him to take exercise. Give him a ration of clover hay and oats, bran, and a little oil cake, with plenty of pure water. Give him protection from the hot sun and flies in summer. He should have a clean box stall when confined. Put a ring in his nose when still young, at say ten or twelve months old. This will tend to make him more tractable.

Dairy bulls with their highly nervous temperament, are easily made vicious. You never know what harm a vicious bull is going to do. The part you have to do in this matter is never to tease the young bull or allow him to be teased. To tease a bull is criminal. You do not know who is going to be the victim. Never rub him on the head. If you do, he will begin to play with his horns, and before you know it he has learned that he has horns, and then comes the danger.

The young bull should not be allowed to serve cows until at least 18 months old, and then only to a limited number. At 2 years old he may have 30 to 40 cows, and at 3 or over, if service is well distributed, he may have 100 cows.

When he is in service he should be well fed. A narrow ration of clover hay, silage, roots and a fairly heavy grain ration (8 pounds), such as we gave the dairy cow—oats, bran, peas, oil meal or gluten feed—a high protein ration.

Never let your bull run at large with the cows. It is dangerous in the first place, besides it is unfair to your neighbors. They may have a preference as to the bull they will use, but if their cows, when in heat, are near your bull,

he will break over ordinary fences and serve them. Keep him always so you will know exactly where he is.

Do not send a good bull to the shambles at 5 years old. If he is getting good heifer calves, his lease of useful life cannot be too long. Keep him as long as you can and then dispose of him to some one who needs a good bull. He should be useful for service until the age of 12 years, at least, if well cared for in his earlier life.

Keep this in mind, that you can never be too watchful of the dairy bull. No matter how kind you are to him, he will take advantage of you when you least expect it. It is in this way that so many prominent breeders have lost their lives. Have a strong stick with a snap in the end which you can snap into the ring in his nose. This will make it quite safe to handle him; but even this cannot always be depended upon to stop him.

LECTURE XLVI.

STABLING SUITABLE FOR DAIRY CATTLE.

In the proper care and management of the dairy cow, one of the most important points to be considered is suitable stabling. Other classes of stock are able to withstand more or less exposure to cold, but the dairy cow must have warm quarters. She is, in a large degree, an artificial animal, more delicate than the beef animal. This is especially true of those breeds which belong to the so-called special purpose dairy cattle; such as the Jersey, Guernsey, Holstein and Ayrshire. Any exposure to cold will seriously check the flow of milk. It will also increase the cost of production as the feed which should be used for milk production will have to be used to supply heat for the animal body.

In beef cattle the ration is of a fattening nature, which is closely associated with heat production. Such feed stuffs as corn and barley are useful for this purpose. The ration of the dairy cow is of a more nitrogenous nature, thus not so well adapted for heat production. This being the case it is very important to supply the necessary heat by artificial means in the way of warm stables. Beef cattle will do nicely in stables with a temperature ranging from 40° to 45° F. Dairy cattle should have warmer quarters; from 50° to 55° or 60° F. is about right.

The dairy cow is a hard worked animal and should do service for several years. Many cows are profitable at fifteen years of age. This being the case we can readily see the necessity of taking every precaution possible to protect the health of the animals. Since milk is used so largely as a food by the human race, it is very important that the animals which produce the same are in perfect health. This calls for plenty of sunshine and pure air in our dairy stables. The majority of our dairy cattle barns are sadly deficient in this respect. Too many are dark, dirty places with no means of

ventilation. Such stables are a source of contamination, as disease of some kind or other is sure to break out. Other stables are too small.

The stable should be large enough so that there will be 1000 cubic feet of space for each and every animal housed in the same. This calls for wider alleys and higher walls than are generally found. The walls should be at least eight feet high and are much better if they are ten. There should be an abundance of sunshine. High walls with plenty of large windows will furnish an abundance of light and sunshine. This is a point which must not be overlooked. Sunshine and microbes or germs (which are the cause of most diseases) are not found in the same place. A few minutes exposure to sun will kill a great many of the very worst disease producing germs. This being the case the dairyman should take advantage of the same and provide ample means for allowing sunshine in his stables.

The question of ventilation is one which is sadly underestimated by most dairymen. Plenty of pure air should be supplied. Each and every stable should be so arranged that there will be means of supplying fresh air, also a means for the escape of foul or impure air. In many good barns the fresh air is supplied by means of a sub-earth duct. This is so arranged that the air is brought underground for some distance, thus has the chill removed in the winter months. In the summer months the air is somewhat cooler, due to the same process. Ventilation tubes should be arranged with openings at both top and bottom of the walls.

The walls should be thoroughly whitewashed once a year. This will add much to the general appearance of the stables, also to the health of the animals. Some disinfectants should be added to the whitewash solution before it is put on the walls.

In some sections of the country bank barns are popular. This is a barn so built that part of it is partially under ground in a side hill. It affords many conveniences from a feeding standpoint. It also furnishes a large amount of room under one roof, which is no small item in these days of expensive roofing materials.

The objections to this plan of a barn are the difficulty of securing proper light and good drainage. Where one end or one side or an end and side of the stable is in a side hill

the light must all be secured from one side and end. Thus it is difficult to furnish ample sunlight. In the spring of the year such a stable is often very difficult to drain properly. Nothing is more detrimental to the health of the dairy cow than dampness. The basement barn is another kind which is popular in many districts. The advantages of this structure are much the same as those claimed for the bank barn, the main difference being that the bank barn is built partially underground while the other one is built above ground, thus much more easily lighted and drained.

Concerning the interior construction of the dairy barn, many methods of tying the animals are used. There are many advantages and disadvantages claimed for each system. Some are easy on the cow and hard on the man (the chain system of tying around the neck); others are easy for the man and not so comfortable for the cow (such as the stanchion system). The Bidwell stall, which fastens the cow in place by means of a chain behind the animal, is easy on both cow and man, but not so convenient at milking time. With the stanchion system it is much easier to keep the cow clean, which in the eyes of many men is a very important point.

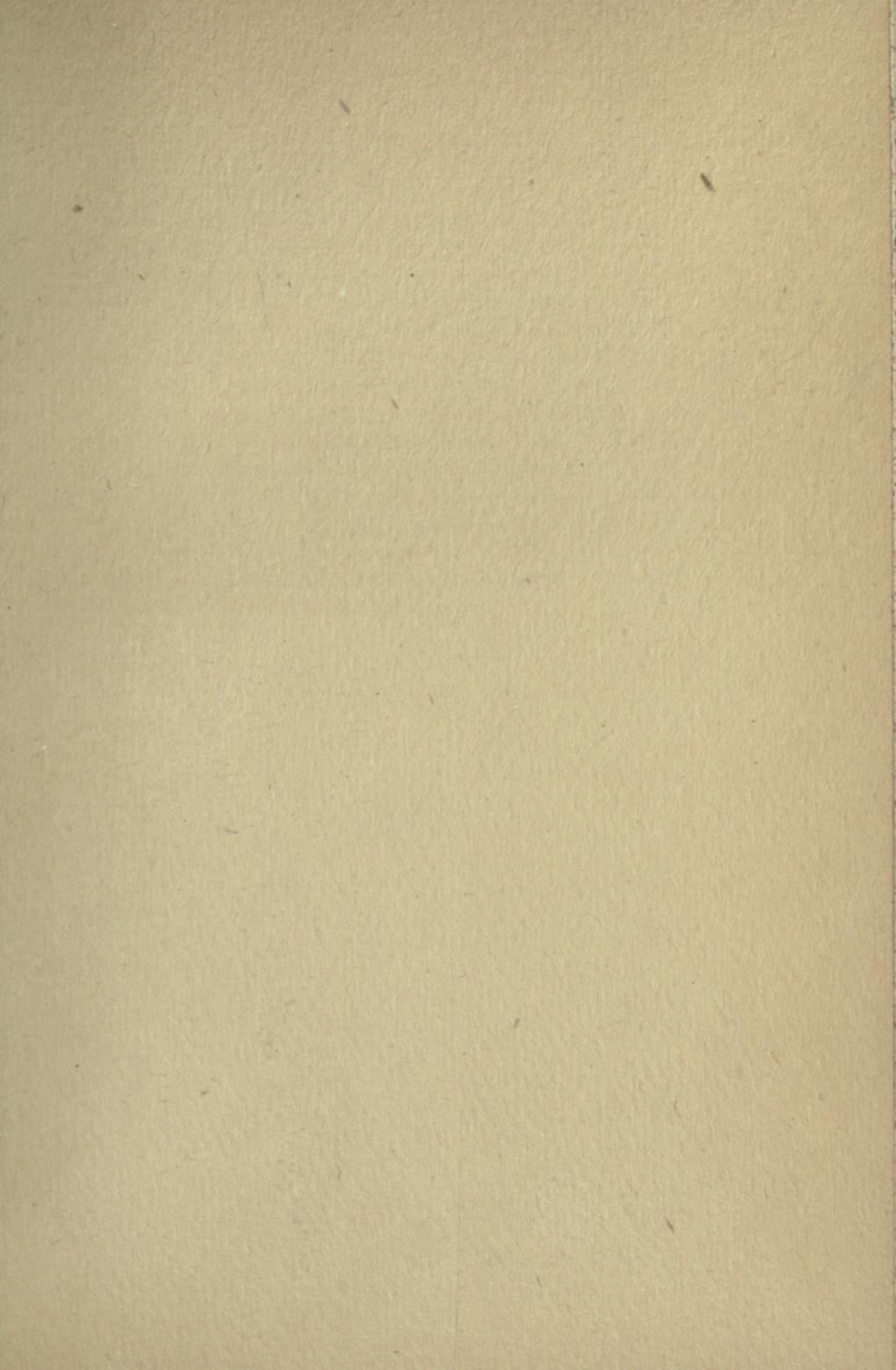
The stalls should be roomy and the alleys wide. The gutters behind the cow should be about eighteen inches wide with from six to eight inches drop behind the cow and from two to four inches drop from the alley way.

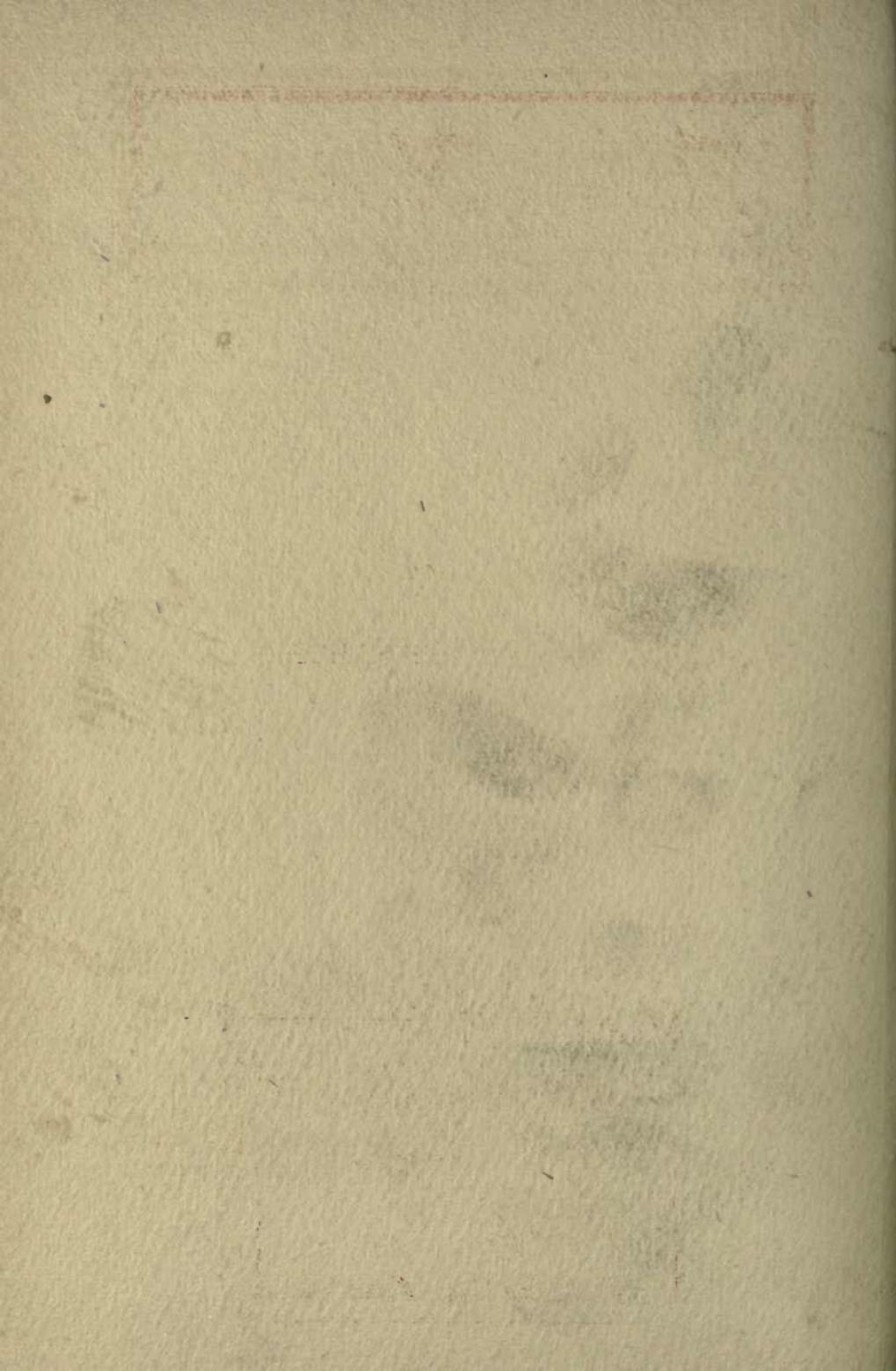
Every precaution should be taken to have every convenience possible arranged for, so as to make the feeding of the animals an easy task.

Concerning the materials used in the floors, various kinds are used with good results. Cement is easily kept clean, but rather hard on the cows and inclined to be slippery. Brick laid on edge is durable and not so slippery as cement. Plank is easy on the cow, but not so durable as the other kinds mentioned.

In recapitulation we would say that the stables should be well lighted, well ventilated, have plenty of fresh air, plenty of room, convenient for both man and beast and built in such a way and of such material as to warrant durability.

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PART I. NO. IV.

LECTURES

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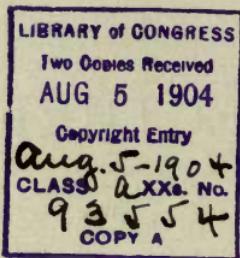
Feeding, Care and Management of Live Stock

BY

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LECTURE XLVII.

FEED, CARE AND MANAGEMENT OF THE BREEDING FLOCK, THE WINTER SEASON.

Sheep will eat and do well on almost any of the common grains and roughage that are grown on the average farm. The great trouble, however, is to get fodders in a palatable condition for them. If the flock enters winter quarters in good flesh, and have access to well cured fodders, such as clover and alfalfa hay, native and millet hay and roots, very little, if any, grain need be fed until near lambing time. On the other hand, if the flock is in thin condition when they enter their winter quarters, no time should be lost in getting them in better condition if a good crop of lambs is expected.

There is a wide variation in the rations which are fed throughout the country. For instance, the shepherds of the east think the roots are indispensable, while in the west many shepherds think they can winter their flocks fully as well without roots. No doubt too many roots or other foods of a similar nature are not advisable; however, the most practical shepherds find that a few roots judiciously fed in connection with nutritious foods, such as bran, oats and clover hay, make a splendid ration for ewes in lamb. A ration composed of equal parts oats, bran and corn, with a small quantity of oil meal, will give surprisingly good results. About one-half pound of the above mixture fed daily to sheep in conjunction with plenty well cured fodder will be sufficient to keep the flock in a thrifty condition. Clover and alfalfa hay are the best kinds of roughage; however, corn fodder may be fed in the corn belt section of the country very economically and satisfactorily. When corn fodder is fed it should be scattered in large lots, or better still, in sod fields. Sheaf oats also make a very desirable grain and fodder ration, if cut and cured while they are still a trifle green. When the grain is fed in this manner the weak and strong or

robust and greedy individuals get about equal shares of the ration.

Ewe lambs may be fed a ration similar to that of the breeding ewes, but, if possible, a greater variety should be given, as such is always relished by young things. The ram lambs and breeding rams may be fed a liberal supply of grain in conjunction with roughage, preferably of a nitrogenous rather than of a carbonaceous nature. Corn should form a small proportion of the grain ration, if other grains, such as oats, wheat and barley, are available, or can be obtained as cheap. Many other kinds of feed might be added to the above, and several variations might be necessary in order to comply with the conditions and feeds in some local districts.

Pure water should be supplied at all times; and salt should always be kept where the sheep have access to it. It is a great mistake to salt sheep only once a week, or at long intervals, because they are apt to eat too much, thus often causing heavy drinking, which sometimes brings on derangements of digestive system or scouring.

Although the flock has access to the above variety of grain and roughage, yet the success of the flock will depend almost wholly on the care they receive. Without the care of an intelligent shepherd a flock will return rather small profits. When the flock is brought into their winter quarters they should be divided or graded into several groups. That is, the breeding ewes should be separated from the lambs, rams and sheep which are intended for mutton, etc. The weak or old thin ones should also be separated from the young robust ones, so that they may receive better care and food. The rams can be kept in small lots of ample size to allow them plenty of exercise. Never allow rams to run with the pregnant ones.

Regular feeding is very essential, and sheep will often do better on a poor ration fed regularly twice a day than a good one fed in a haphazard way. Exercise is important, especially in care of breeding ewes. If ewes do not receive sufficient exercise during pregnancy the offspring will often come forth weak and puny. A ewe having insufficient exercise will usually experience more or less trouble in lambing. A good plan, and one which many of the flock masters use at present, in order that their flock may obtain plenty of exercise, is that of making the flock walk about half a mile daily for part of their roughage. If the flock is unable to obtain their exercise

in such a way as above mentioned, they should be carefully walked a short distance every day. To keep a breeding ewe penned up in a small place is simply nothing short of killing her with kindness.

Whatever kind of quarters be provided for sheep, they should be dry, both overhead and under foot. If the quarters are dry sheep will endure considerable cold without any inconvenience. Breeding ewes require about ten to fifteen square feet in a building, and about one and a half feet at a feeding rack. In building a barn one should also provide ample room overhead for enough hay to winter the flock. There should also be a room or office for the use of the shepherd, especially during the lambing season. Such a room should be equipped so that the shepherd can sleep and cook in it during the lambing season if he so desires. It is absolutely necessary to keep the sheds or barn where sheep are kept well bedded, because if the sheep are compelled to walk in a filthy, wet pen or muddy lot serious results are usually experienced. Foot rot is often brought on by allowing sheep to run in filthy places. Just how often one should clean out a sheep barn is a question that cannot be answered very satisfactorily. However, it is conceded by the most practical flock masters and shepherds that it is advisable to always clean the barn thoroughly before lambing time. It is also advisable to hurry or rush such work, because many undesirable and disagreeable odors usually accompany the operation. A disinfectant such as air-slacked lime should be used freely in the barn after the manure has been removed.

Ventilation of the sheep barn should receive careful consideration by the shepherd. To keep the sheep in as pure an atmosphere as possible and avoid draughts should be the aim of every shepherd. Draught should be avoided, especially when young lambs are in the barn, because such often brings on rheumatism, etc.

Sheep seldom need tagging in winter, except when they have been receiving a too generous allowance of succulent food. If any of the members of the flock become filthy, due to scouring, they should be thrown on their side and the dirty tags of wool removed from the stem with a shears or knife. Care should be taken not to trim too close in cold weather.

To keep the flock comfortable and quiet is an all important thing; strangers and boisterous men and boys should not be allowed to go plunging about among sheep. Sheep should

also be kept separate from the other animals on the farm. That is, sheep should not be allowed or obliged to run in the same field or lot as horses, cattle or swine, because under such conditions they cannot be kept quiet and comfortable. Dogging should be avoided, especially among ewes that are in lamb.

To manage the flock successfully one should take into consideration the barn accommodations, feed and help he has at hand. To make the business return the greatest profit the flock should be sorted or the culls removed or disposed of every year. The lambs should come at a time best suited to the barn accommodations and feed available. For instance, if one has comfortable barns and plenty of succulent food, such as roots or ensilage, it is advisable to have the lambs come in March, because they can be given sufficient attention and be ready to go ahead when turned on grass. They are also stronger and abler to guard off parasites. On the other hand, if the barn or sheds are not warm enough for young weak lambs, and no succulent food available for the ewes, lambs had better not come until there is abundance of grass in the fields.

All non-breeding ewes should be fattened and sent to market. Old ewes that have become poor feeders, and have a tendency to keep thin and delicate on good treatment, should also be sent to market. In order to keep up the standard of the flock and to improve them—as should be the aim of every flockmaster—plenty of feed of the right nature, comfortable buildings, intelligent care, and all other accessories conducive to the general health of the sheep should be furnished.

LECTURE XLVIII.

FEED, CARE AND MANAGEMENT OF A EWE AT LAMBING TIME.

If the lamb comes at a season when plenty of grass is available, a ewe will require no other food. On the other hand, if the lamb comes in the fall or early spring, considerable nutritious food must be fed the ewe immediately before and after lambing.

As lambing time approaches, a ewe weighing 150 pounds requires daily about one pound of such grain as bran and oats, three or four pounds of succulent food, and about the same weight of such dry fodder as clover or alfalfa hay. Other fodders, such as corn fodder, timothy and native hay, oat straw and pea straw will suffice, providing plenty of succulent and nitrogenous elements are fed in conjunction with them. Some succulent food should be fed to breeding ewes at all times; however, it is very easy to feed them too much just previous to lambing. When roots or ensilage are fed to breeding ewes in too liberal quantities, weak, large lambs are likely to be the outcome. Just before lambing, three pounds of any succulent food, such as turnips, mangel-wurzels, sugar beets, corn ensilage, will be found sufficient. A mixture of ten pounds corn meal, ten pounds bran, two pounds oil meal will make a very valuable ration for ewes after lambing.

After lambing, unlimited quantities of succulent foods may be fed in order that the flow of milk may be stimulated. However, it is always advisable to feed rich, stimulating rations to ewes rather light the first few days after lambing, because such foods have often a tendency to scour a ewe and her offspring.

A short time before lambing season—and this can be ascertained from the record kept by the shepherd—the most forward ewes should be separated from the rest of the flock. A good plan, and one which is used by some of the up-to-date

flock masters, is that of separating the ewes into four different lots, as follows:

1. A yard of ewes heavy in lamb.
2. A yard of ewes with single lamb.
3. A yard of ewes with twin lambs.
4. A yard of ewes with very young lambs.

The first indications of lambing are: filling of the udder, and later, restlessness, deep color and swollen condition of the vulva, droop on either side of backbone, lowering of belly, distracted look, and a clear discharge from vulva. When these conditions are noticed, the ewe should be brought into an enclosure and watched, if the weather is severe, and especially if it is disagreeable and raining. A cold rain is more detrimental to a new-born lamb than a lower and dryer temperature nearly at zero. If a ewe has been well managed previous to lambing, very little, if any, trouble will be experienced in bringing forth her offspring; but if she has been neglected, of course "bad luck" is apt to make its frequent visits. It is highly important that quietness prevail around the sheep barn during the lambing season. One of the worst things that can happen to a ewe is to be chased by a dog. This should be carefully guarded against by every shepherd.

Under the best of management and care some ewes of the flock have serious trouble in giving birth to their progeny. Unnecessary interference with a ewe in labor is unwise. It is much better to let nature take its course until it is evident that help is really needed. The birth of a lamb is always easy when the ewe is strong. A weak ewe, however, has always more trouble in giving birth to her offspring than one that has been duly prepared for the occasion by good care and feeding. The absence of shelter is usually a very costly instance of want of thrift on the part of the flock master. A lamb is a small thing; but it is generally the income from these small things that determine the profits in the sheep business. It is very essential that absence of all disturbances by other sheep be avoided, and close attention be given the ewe by the shepherd until the lamb is on its feet and sucking.

The foetus, if in the normal or natural position, should be found with the head resting upon the two forelegs, and in that case assistance is not usually required at parturition. Some of the abnormal presentations or positions commonly met with are as follows: One foreleg bent back; both fore-

legs bent back; head down between forelegs; head bent along one side; and sometimes the foetus seems determined to come stern first, with legs doubled back. In any of the above cases of presentation the ewe needs assistance in delivery. In most of them the lamb should be pushed back into the womb and straightened out so that it may come in the natural way. In case it is determined to come stern first with legs doubled up, which of course is the wrong and unnatural way to come, it should be pushed back and hind legs straightened out, and the lamb then removed, hind parts first. When a lamb's head is very large, sometimes by a little timely help from the shepherd the ewe may be spared from much pain and labor. That is, a few minutes' help at the right time from the shepherd will often save the ewe from a trying hour's trouble. For instance, if the lamb has a large head, the shepherd can materially assist her by placing his hand on the skin of the vulva and gently pushing it over the head of the lamb. After the head is free the forelegs should be straightened out; and then by taking both feet in one hand, the lamb may be pulled in a circular direction toward the ewe's udder. As soon as the lamb is born, some of the mucus about its legs rubbed on the ewe's nose will greatly arouse her maternal instincts, and often save or avoid much trouble later on. If the ewe is weak and exhausted, there is nothing better for her than a drink of warm oatmeal gruel three or four times a day. This can be given from a long-necked bottle, if she will not drink it otherwise. If the lamb is chilled a hot bath is the best thing for it, and then rub it by hand and wrap it in a flannel cloth. A teaspoonful of hot gin or whisky and water, a little sweetened, is the common treatment given by the Highland shepherd for the restoration of a weak or chilled lamb, and it is certainly effective.

If a ewe refuses to care for her lamb, as is often the case, especially with twins, she should be put into a small pen, in which she cannot get away from the lamb. There are many methods used by the shepherds in order to bring about the maternal instinct or reconciliation of the ewe. Some cut the tail off the lamb and rub the blood on the ewe's nose and on the back of the lamb. Others use the method of milking the ewe onto the back of the lamb, thus bringing about the desired result. Where the ewe has a dead lamb, and it is intended that she act as a foster-parent to some strange lamb, the dead lamb should be skinned while it is

still warm and its skin placed on the one which it is desired she should adopt.

Ewes sometimes retain their after-birth, although this is not as common among sheep as it is among the larger animals. The cause of this accident is frequently due to weakness of the ewe, and can often be overcome by giving the ewe a stimulant. Gorget or inflammation of the udder seldom occurs at lambing time, but yet may crop out by reason of exposure to cold, especially wet, cold spring rains, soon after or at birth of lamb. By treating an inflamed udder with some emollient, such as warm water almost hot, with a little alcohol in it, the ewe can soon be relieved. After bathing the udder should be rubbed gently by hand, and a little vaseline applied. This condition is usually brought on after lambing by feeding too much rich food, such as oil meal, etc. Again, ewes may become costive, which causes them to strain more or less. A dose of either castor or linseed oil usually stops a ewe from straining; and in case of a deranged system, due to inflammation of the udder, two drams of Epsom salts may be given, and the ration reduced to grass or hay for a short time.

LECTURE XLIX.

FEED, CARE AND MANAGEMENT OF THE LAMB FROM BIRTH UNTIL READY FOR MARKET.

No class of animals responds more readily to good care and treatment than the young lamb. It is very important that they be given the very best of care during the first few days, as they are then very tender. When a week or ten days old they will withstand a considerable amount of exposure.

At lambing time the ewe should have warm quarters if the weather is cold and unfavorable. If the lamb is weak and chilled, it must receive special care and stimulants to restore vigor. One of the very best methods of reviving the chilled lamb is to immerse it in hot water, then rub gently so as to start circulation of the blood. This is one of the most effective and at the same time simple methods of accomplishing the desired end. Sometimes whisky is given in small quantities to a chilled lamb with good results. Nourishment of some kind should be given as soon as possible. The mother's milk is the best, as the first milk of the dam or the colostrum is necessary to regulate the digestive system. If the lamb is not strong enough to suckle of its own accord, the mother should be turned on her side and some of her milk given to the lamb. Generally it will suckle without any further aid. It may be necessary to handle the mother in this way for a couple of days or until the lamb is strong enough to walk around and obtain the necessary nourishment itself. The mother's milk is all that is necessary for the first few weeks, except in some instances where a poor milker is trying to rear two lambs, then some cow's milk should be given.

When about ten days or two weeks old the tails should be docked and all ram lambs not intended for breeding purposes should be castrated.

The docking may be done with a sharp two-inch flat chisel.

This is one of the cleanest and most effective methods that we have ever practiced.

Where it is desirable to force the lambs for market, they should be taught to eat grain at an early age. For this purpose a lamb creep should be provided which may be made by partitioning off a small corner, leaving an entrance large enough for the lamb but too small for the mother to enter. In this should be small feed troughs or boxes in which a little cracked corn or oat meal, which may be obtained by screening the hulls out of ground oats, should be placed. This will be eaten readily by the youngsters and will aid very much in their development. This grain feeding can be done to advantage even when the grass is good. Lambs so fed will always thrive much better than those not fed any grain.

In the spring of the year—about ten days after the mothers have been shorn—the lambs should be dipped to free them from the ticks which left the mothers and came to the lambs. Any of the manufactured dips, such as Zenoleum and Chloro-Napholeum or Creolin, will give very good satisfaction.

They should be weaned from the mothers when from four and a half to five months old. They should then be given the run of a good pasture. Where rape can be had, it makes a most valuable adjunct at this season of the year. Some grain should be fed in addition. The lambs should be divided into two, and where pure bred stock are kept into three lots. All those intended for market purposes should be put in one lot, the ewe lambs intended for breeding purposes in another, and the ram lambs in a third. The grain rations will vary with the needs of the animals. Those which are to be fattened should receive a ration composed of corn with a small amount of either bran or oats in addition. Those intended for breeding purposes should be fed a ration conducive to growth, such as oats and bran. Some oil meal and wheat can oftentimes be fed to good advantage.

The market lambs should be fat and marketed when they will average about eighty pounds. Heavier lambs are discriminated against on all of our leading markets.

LECTURE L.

FEED, CARE AND MANAGEMENT OF THE EWE AT WEANING AND MATING TIME.

There is no more important subject to the shepherd than this, for upon the right work at this season depends the next year's crop of lambs. He who raises a strong, healthy lot of lambs, with a high percentage of twins and triplets, will be financially ahead of the man whose flock yields low returns at lambing season.

About the 1st of September—for Iowa conditions—the lambs and ewes should be separated and put in separate fields, preferably not adjoining. Under ordinary conditions the ewes will need no special attention at weaning time, but if pasture is very good and the ewes milking freely, it is best to turn them on scant pasture for a few days to avoid troubles arising from fever due to the sudden diversion of a large blood stream from the mammary glands to the body circulation. When the lambs have been taught to eat grain before weaning, and when pasturage is a trifle scant, the ewes will usually be so reduced in milk flow that no precautions are necessary, and the ewes may be turned at once on good pasture and pushed for gains, or, as old shepherds express it, "flushed." The reason of this is that it is an established principle of breeding that females will breed more readily, and will be surer to "catch," if they are pushed for gains at breeding season; and there is but little doubt that the percentage of lambs is considerably increased where ewes are so handled.

The matter of feeding to produce rapid, vigorous gains is also of interest. The feed should be succulent, yet strong. When pasture is abundant the ewes may be turned on this and fed some shelled corn and bran in proportions of about half and half. If pasture is limited, a field of rape, or rye and oats, should be provided, and there is no better feed for the ewes than a field of rye and oats, sown at the rate of two bushels rye and one bushel oats per acre—broadcast. This,

of course, will need to be sown by the last of July; it will then be fit for grazing by the 10th of September, and will furnish a fresh run of strong succulent pasture, which with a small ration of corn and bran will put the ewes to gaining rapidly and will put them in excellent breeding shape, in which they will be far more likely to produce twins than they otherwise would, and the percentage of ewes that fail to catch will be reduced to a minimum.

The ewes should have tags of wool cut away before the ram is turned on them; and a record should be kept of all ewes bred each week. This can be easily done by changing the mark on the ram each week, so that the ewes bred one week will be marked with black paint, the next week with red, etc.; and at the end of each week each ewe that has been bred should be caught and her tag number recorded.

In conclusion, it should be noted that the really essential thing is to have a fresh run of pasture on which to start the ewes to gaining rapidly; this, with the fact that the sudden diversion of blood into the system from the cessation of secretions in the mammary glands, will very quickly bring them into season, and if they are gaining the probabilities of a high percentage in lamb crop will be greatly increased.

LECTURE LI.

FEED, CARE AND MANAGEMENT OF THE RAM DURING THE BREEDING SEASON.

The ram is at least half the flock and often more because of his purer breeding, and it behooves the breeder to treat him with the respect his value justifies. To do good service in the breeding season he must be in good shape at the beginning of the same, and it will not be amiss to re-emphasize the necessity of this. The breed-ram should have as good quarters during the winter as any of the ewes; should be allowed plenty of exercise and should be kept in a strong, vigorous, fleshy condition on corn, bran and oats or feeds of a similar nature; and should be carried through the summer season in the same general manner. So cared for he will be strong and vigorous when the breeding season begins, will be "surer," and much more active. He should not, however, be so fat as to be sluggish.

When the breeding season is fairly on and the ewes have had ten days or two weeks of "flushing," it is time to think of breeding. Two general policies may be pursued. If the ram is a valuable one, and has many ewes to serve, he should not be allowed to run with the flock, but should be kept in during the day in a comfortable shed. At night, when the flock is brought to the barns, a well grown, vigorous ram lamb should have a band of canvas belted round his middle—so that he cannot possibly serve a ewe—and should be turned out in the ewe flock. He will quickly hunt out the ewes that are in heat, and the shepherd should be at hand to place them in a separate pen; frequently three or four ewes will be found to be in heat. After the lamb has had time to hunt the flock well over, he should be removed, and the breeding ram turned out with the ewes that are in heat. He should not be allowed more than one service to each ewe and the services should be at least thirty minutes apart, especially if several ewes are to be bred. A mature ram, in vigorous condition, if handled in the manner above described, should

serve eighty ewes, and may be allowed four or five every evening, and the same again in the morning—the “teaser” should be turned in again in the morning to sort out the ewes which are in heat. A young ram—yearling or lamb—should not be allowed so many in a season nor in a single night. A yearling should be able to care for forty-five ewes and a lamb about twenty-five, if carefully handled, and their energies conserved. A ram that is in high flesh should never be turned out on pasture with the ewes even though it be a small flock—the strain of repeated services and the excitement tend to impair his usefulness. A very simple and effective plan of marking the ewes that are bred is to smear the breast of the breeding ram with some paint; he will then mark each ewe he serves; and by changing the color of the paint each week it is possible for the flock master to determine just what week certain ewes were bred in.

The other policy, which saves labor, is that of allowing the rams to run with the ewes in pasture. Under this plan not more than thirty-five ewes should be allotted to each ram, and the same plan for marking the ewes should be adopted as outlined above.

The feeding of the breeding ram during the breeding season is extremely important, for led away by the excitement, he will rapidly lose flesh, vigor and masculinity unless carefully fed. He should receive an abundance of green pasturage, with plenty of room for exercise, and should receive an abundance of oats and bran, mixed in proportions of two parts oats to one bran by weight; besides this he should be given a little oil meal now and then, and a fair allowance of turnips or beets—but never mangels, as these nearly always cause urinary troubles, which may result in the death of the ram. Why this should be no one knows, but such is the result in practice.

The ram should be carefully watched during the breeding season and any disorder of the penis should be promptly attended to. Inflammation of the penis may be simple or cancerous. In the first, it is only necessary to give the ram a dose of Epsom salts (4 ounces), and to inject a solution of chlorate of potash into the sheath, which should first have been washed with some warm water containing some disinfectant as Chloro-Naphtholeum, Zenoleum, or Creolin. If the inflammation be cancerous, it will be necessary to turn the ram on his back, the penis withdrawn, and the diseased

spots touched with solution of nitrate of silver. This will destroy the fungus growths, after which the chlorate of potash treatment will effect a cure. Care should always be taken to shear away any tags of wool around the penis at the beginning of the breeding season.

In conclusion, the essential points in caring for a ram are: to give him the best of care at all seasons in order that he may be strong and vigorous; to conserve his energies by keeping him separate from the ewes, and by using a "teaser" to hunt out the ewes in heat; to feed him liberally on a strong grain ration, with plenty of pasture and room for exercise.

LECTURE LII.

PREPARATION AND FITTING OF SHEEP FOR SHOW RING.

In preparing or fitting sheep for show the thing of greatest importance is that suitable subjects be selected for the shepherd to fit. In order to make the best selection the breeder or flock master must be a competent judge. If a beginner is desirous of exhibiting and is somewhat in doubt as to what constitutes a good individual, he should not hesitate in procuring the ability or ideas of an experienced flock master. It matters little whether a breeder be a beginner or one who has been several years in the business; in both cases the services of an experienced shepherd should be secured. Always secure the very best service your business will support. It is necessary for every breeder to remember that he might as well try to take prizes without sheep as without the service of a good shepherd.

Much of the success of the breeder and shepherd in the show ring depends on their judgment, not only at the time of drafting to fit, but also in drafting the finished product for the arena. In selecting purebreds for show yard purposes there are several points worthy of consideration, viz.: constitution, form, and quality of fleece, skin and flesh. It is of great importance that an animal have constitution, because on this essential point much depends. Coarseness in a ewe or ram should not be confounded with constitution, because many large, coarse individuals are often weak constitutionally. Always avoid individuals that are flat ribbed or narrow and shallow in the chest, because such animals possess insufficient room for a strong, healthy pair of lungs. As a rule, a sheep low set, well sprung in the ribs and deep and wide in chest possesses plenty constitution.

At present fashion asserts itself more or less in sheep breeding, and in view of this one must become thoroughly conversant or acquainted with the qualities that merit, in the breed he is handling. In these days the right type must

be in evidence before one can win. The principal points to be looked for in the form of a ram are: a thick, short neck; a wide, deep body; short legs; straight, broad back; thick, fleshy loin; and a well muscled leg of mutton. The same general form will suffice for ewes; however, a feminine appearance must also be in evidence, as indicated, especially by a refined head and rather long and thinner neck than is usually seen in a ram. Just what constitutes a good leg of mutton is something which many fail to grasp. Although a sheep is not split up behind, this does not indicate that the animal has a perfect leg of mutton. A well formed twist or leg of mutton should not only be filled inside, but also outside, so that it will appear round and plump from every aspect. A sheep with well muscled legs will not only be better for the butcher's purpose, but will also be less liable to break down in the pasterns, something which is especially worthy of attention in breeding rams. Points that generally receive too little attention are the shoulders and spring of fore ribs. Too often one finds animals in the show ring that are poor in the crops and cut up in the flank. Animals deficient in the last mentioned points are usually poor doers, thus should never be selected with the belief that they will improve faster in the deficient point than in those that are more nearly perfect.

The fleece should always be carefully examined, and if any black spots be found in the wool on the body of the animal it should be rejected. A short, dense fleece is usually more preferable in the Down breeds than a long, coarse, open one.

The show skin, and in fact the skin of all sheep in a healthy condition, should be of a rich, brilliant, pink color. A pale colored skin is generally associated with a delicate constitution, disease, and animals that are either in a depleted or overdone condition; thus one should pay attention to this point, although it seems of minor importance while selecting.

The quality of the flesh an animal possesses is also worthy of close attention, especially in selecting sheep over a year old. If a sheep is well muscled or fleshed over all parts with fairly firm flesh, it will usually take kindly to feed and make satisfactory gains. Never buy animals that have been already fitted and are stale in their flesh, because they cannot, as a rule, be fitted again satisfactorily. It is always

advisable to use young animals each season; however, an animal of outstanding merit may occasionally be fitted several times. One should always select more than he intends to show, because under the best of management and care certain individuals will not take kindly to feed or, in fact, do any good. Although the best of selections have been made, such only serves as a sort of index to the success of the animals in the show ring. Selecting and feeding go hand in hand, thus failure in either brings disaster to the whole business or operation.

Successful feeding of show animals is an art of which very few can boast. It is not a difficult thing to fatten a sheep; however, it is usually difficult to be able to place an exhibit in the arena ripe enough and just in the right bloom. The majority who vie in the arena for honors too often fall into the ranks of those that underfeed or overfeed their animals. The mothers of lambs intended for show should receive attention, especially the first few days after parturition. Too much grain should not be fed to the ewe until the lamb is quite strong. Equal parts by weight of oats and bran and with a small quantity of oil cake will make a good ration for a milking ewe. About one pound of this mixture fed daily in conjunction with good clover hay and abundance of roots will be sufficient. When the lambs get large enough to eat they should have access to grain and hay. The grain ration may consist of oats and bran at first, and as the lambs become older a little oil meal may be added. In pushing lambs it is often advisable to feed them cow's milk from a bottle in order to enhance their growth. When such methods are employed the cow's milk should be given only in small quantities at first and while the lamb is still young so that there will be no danger of deranging the creature's delicate digestive system.

When lambs are weaned a good plan to follow is that of feeding a small grain ration in the morning, after which rape or some other succulent food may be given. During the day, or, in fact, all the time, they should have access to well cured clover hay. About five or six in the evening grain can be fed again; and they should be allowed to run in a rape pasture in the cool of the evening. In order to cultivate and keep a lamb's appetite keen, it is necessary to clean the trough and rack after each meal. Never allow feed to become stale in the feed boxes or racks.

Regularity in feeding should always be adhered to, so that the animal will not have to overtax its digestive system at any one time. Show lambs should be pushed from birth until they are placed in show ring. While grain is an indispensable adjunct for show sheep, however, one is safe in saying that more sheep are ruined every year and more fail as fitters by overfeeding of grain than from any other cause. Breeding sheep, especially ewes, should be fitted as much as possible on juicy, succulent food. Do not feed too much corn or food of a carbonaceous nature, or you will be liable to produce blubber, which is very undesirable. Always try and have some rape, cabbage, kale or turnips to feed, because such feed not only tends to keep animals healthy, but also produces the bloom that is so desirable in the show ring.

LECTURE LIII.

PREPARATION AND FITTING OF SHEEP FOR SHOW RING—(Continued).

In preparing sheep for exhibiting exercise should not be neglected, because the health, bloom and nature of the flesh the animal carries largely depends on this factor. They should be allowed to run in a yard once or twice every day, preferably in the morning and evening. In addition to running in a yard they should be taught to lead while young. A halter made of light medium sized rope will suffice. While breaking to lead, patience, gentleness and regularity should be the watchword of the shepherd.

The feet of sheep which are being fed heavily always need more or less attention. The shepherd should make a practice of examining the feet of his show animals at regular intervals, and if trimming is necessary it should be done without the slightest delay. In trimming always use a strong, sharp knife and pare the feet so that the sheep can stand firm and level on them. Trimming feet is a simple operation, but when neglected the feet often become foul. A foul foot can usually be cured if it is taken in time with a little bluestone (blue vitriol); but if left to run its course or neglected it brings on foot-rot, a disease which invariably bars its host from public appearance.

Some ewes when they become very fat are apt to scald themselves with their urine. Unless ewes troubled in this way are attended to immediately after the first indications are noticed they will become unsightly specimens wholly unfit for show yard purposes. This trouble can generally be overcome by washing out the foul parts and rubbing or treating them with vaseline or lard.

According to the rules of most shows sheep cannot be shorn before the 1st of April. Just how close shepherds adhere to these rules is a question that cannot be very satisfactorily answered; however, it is a fact that many of the winners in evidence at our shows every year seem to possess in a marked

degree the ability to produce wool. It is out of the question to think of making a shepherd shear his show sheep close. The method chiefly practiced by shepherds is that of stubble shearing. Stubble shearing is simply nothing short of fraud and dishonesty. It consists of taking a shears and shearing the back so that it appears level and at the same time leaving a good, long staple on the animal. The sides and belly are slightly trimmed. The sheep should always be washed immediately after they are shorn and trimmed while the fleece is still moist. Although the fleece of the sheep at this time is a trifle unsightly, yet with several careful trimmings during the summer a perfect and pleasing form is obtained by the time the show season opens. The long wooled sheep should not be trimmed, but rather left in the natural condition. In case of the middle wools or Downs trimming is essential. The simplest manner to perform this operation is to block out the sheep first; then take a pail of water, a brush and curry-comb and thoroughly dampen the fleece. Then with a keen cutting pair of shears at hand the straight lines, graceful curves and fancy touches of the shepherd can be produced. It is a simple process, but must be performed on every subject several times in order to get an animal in finished condition for the show ring.

Washing of show sheep is most commonly practiced among the long wooled breeds. Like many other operations in the sheep husbandry it has its advantages and disadvantages. When properly done washing is of great benefit to the show sheep because it cleans the skin and allows the pores to work freely, thus stimulating the flow of natural oil and growth of wool. Sheep should not be subjected to the washing operation until the weather is mild. Cold water with the chill off, or, better still, warm water, should be used, and a good quality of soap, preferably castile, should not be forgotten.

Whether one washes in a vat or any other kind of vessel, the essential thing in the operation is to remove every trace of soap from the skin and fleece, because if the slightest trace is left it is not only injurious to the fleece but also to the skin.

Dipping is often practiced, but as a rule such precautions should only be resorted to in order to guard off disease. It is not expedient to dip show sheep for ticks except they are badly infested. Whatever the sheep are dipped for they

should not be subjected to it later than six or seven weeks before the show season opens, because it matters little how the operation is performed it injures the fleece more or less, thus detracting from its beauty.

Coloring of the fleece is advocated by some very prominent authorities, while other up-to-date flock masters condemn it. Olive oil, yellow ocher and burned amber make a suitable mixture to use, but unless the shepherd is an expert at coloring and can experiment on one of the common members of the flock, it is advisable to dispense with the coloring feature. It is a fact that some sheep in the show ring are sometimes daubed with a greasy mixture until they are nothing short of filthy.

Show sheep should be blanketed so that the fleece may be kept clean, compact and smooth. Blanketing also serves for other purposes, such as keeping off flies and keeping the sheep warm. It is a good plan to keep the blankets on the sheep at the show until they are passed upon, so that visitors will not destroy the fleeces. Blankets may be made of various kinds of materials, such as duck and burlap. Duck makes the most serviceable blankets for show purposes; however, burlap or even bran sacks will suffice for home use.

During the summer or considerable time before the show season starts, every flock master should make application for catalogues and entry blanks of the shows at which he intends to exhibit. In making entries care should be exercised so that mistakes and confusion may be avoided the judging day. When the time to start for the show arrives it is expedient to ship plenty of the same rations as the sheep have been accustomed to, because usually it is impossible to obtain well cured clover hay, turnips and cabbage at reasonable price, if at all. In addition to feed one should equip himself with a trocar, blue vitriol, castor oil, shears, blankets and bedding for his own use. If the exhibit is small and you are the only exhibitor from your locality, it will not be advisable to hire a whole car, but instead it will be much cheaper to ship by weight or rather by the hundredweight.

After arriving at the exhibition grounds the sheep will often be very tired, especially if the journey has been a long one. If such is the case one should not worry though the animals refuse to eat or stand up. It is better to allow them to remain in the pens undisturbed than to entice them to eat while they are tired or exhausted. In order to avoid tiring

the animals too much it is often advisable to make arrangements to have them hauled from the station to the fair grounds. This is especially true if you wish to move them from the cars to the ground during the heat of the day. However, they may be moved conveniently a considerable distance on foot during the cool of the evening.

While the sheep are on the show circuit they should be regularly exercised morning and evening if the health of the animals is expected to be kept at its best.

When the judging day arrives the shepherd should have his sheep in good form and have them so educated that they will stand out bold and free. Do not allow a sheep to stand, as it were, in a heap, but rather aim to have them stand perfectly level on level ground. Never allow a sheep to stand with its head downhill, but rather reverse the position so that its front feet will be a trifle the highest.

The above methods will suffice for fitting of wethers; however, one may quite safely feed heavier grain rations to wethers than to rams or ewes.

If the show animals are retained in the flock for breeding purposes they should be reduced in fat immediately after the show season is past. In reducing sheep to breeding condition care should be taken to reduce the fat by degrees or very slowly, so that the constitution of the animal will not be impaired.

LECTURE LIV.

THE HOT-HOUSE LAMB.

The term "hot-house lamb" often leads to a misunderstanding, for the uninformed are liable to be led to believe that the successful raising of these lambs requires extremely artificial conditions. This is not true. The hot-house lamb is simply a lamb born in November or December, and fattened and sold during the first ten weeks of the year, at which time there is a strong fancy demand for choice fat lambs ranging from 45 pounds to 60 pounds in weight. They will bring prices ranging from \$8 to \$10 each, and the demand is always greater than the supply. The great cities furnish the market, and selling must be done through commission merchants, unless the producer has an intimate acquaintance with some of the large consumers. Commission charges are 5 per cent. The lambs are marketed, hog dressed, and are shipped by express or refrigerator freight.

The advantages of raising "hot-house" lambs are:

1. Practical immunity from parasites, which so seriously hamper the sheep industry in the United States. The parasites are far more fatal in lambs than in older sheep; but inasmuch as they almost invariably gain access to the lambs when the latter are feeding on pasture, this trouble is done away with, and losses from this source are nil.
2. Constant occupation at a profitable task for the farmer at an otherwise dull season. The work comes from November to March when regular farm work is slack.
3. A high price and maximum profits. Lambs only eight or ten weeks old bring as much money as those five or six months old ordinarily do. Choice lambs will realize the owner \$8 to \$10 per head, and as he has only had the care and feeding of them during their babyhood days—when they return more pounds gain according to pounds of food eaten than any other animals known—their cost, so far as feed is concerned, is at a minimum.

The raising of "hot-house" lambs, however, is not a task

for the careless and slovenly farmer. Certain peculiar conditions must be met, and due attention must be paid to details which make for profit or loss.

The first requisite is that the lambs shall come at the right season—in November or December. October lambs are somewhat too early and must be marketed about the Christmas holidays, for they will be too heavy to sell as fancy lambs if they are carried on till the middle of January. The really strong demand comes from the first of January till the middle of March. In order to have the lambs come in November or December, the ewes must be bred in June or July—time of pregnancy ranges from 151 to 154 days. Ordinary breeds of sheep will not breed at this season of the year, and the only sheep that can be depended upon to produce lambs in November or December are the Dorsets or their grades. The Dorset-Merino grade has proved eminently satisfactory, and the Dorset-Shropshire grade ewe is also an excellent ewe for this purpose, though scarcely so sure to breed at the right season as the former. The grade ewes are to be preferred to the purebreds for raising such lambs, as their cost is less and they are usually more vigorous mothers. The rams, however, should be purebred, as a grade sire lacks propotency and consequently fails to sire lambs of uniform merit.

The ewes should be sheared early, and kept on light feed from March until the latter part of May. They should be kept in only medium condition. In May they will, of course, be turned on pasture and should be kept gaining at a fair rate until they are bred. If pasture is not good they should receive grain in addition. The endeavor is to have the ewes at breeding time in good, vigorous condition—not fat, but gaining in flesh. The rams should be in similar condition. This gain in condition is known to shepherds as “flushing,” and is resorted to because long experience has shown that it increases the tendency of the animals to come in heat, and also renders conception much more certain.

In breeding the preferable plan is to keep the ram with the ewes only at night; but this necessitates considerable extra work, and breeders often find it more economical to turn two rams with the flock, letting them remain all the time.

After the ewes have all taken the ram, he should be removed from the flock. The ewes should have an abundance of good pasture, pure water from troughs or tanks, and shade.

These are the essentials; given these, the flock will come through the summer in fine shape, and the lambs will come strong and hearty.

The barn or shed in which the ewes and their little ones are to be cared for should be wind-proof, reasonably warm, and should have considerable glass on the south side. Good ventilation throughout the barn and separate quarters for the lambs should be provided for. A creep will prevent the ewes from passing into the lambs' portion of the barn. Sufficient bedding to keep the sheep clean should be furnished, but an excess is objectionable. Gypsum will keep down the ammonia from the fermenting manure. Water and salt should be furnished in the barn, and the ewes and lambs need not be allowed outdoors from the time they are put in until the lambs are all slaughtered and sold.

For feed there is nothing better for the ewes than good bright clover or alfalfa, with corn meal, wheat bran, and if prices permit, some oil meal or gluten feed. Cost is the determining factor in deciding on these supplemental foods, though due care must always be taken to secure only those protein carrying foods that are palatable, for sheep are the most particular about their food of all domestic animals. Carrots or Swede turnips are also very valuable as supplementary food for the ewes; but bright, fresh silage will answer practically the same purpose, and is much cheaper. The size and general thrift of the ewes should be the guide in feeding, and enough grain should be given to keep the ewes in a thrifty condition so that they will give an abundance of milk for the little fellows.

The lambs should be fed grain in troughs of their own. There is nothing better than corn meal and wheat bran, mixed in proportions of about 75 pounds corn and 25 pounds bran. This grain mixture with plenty of bright clover or alfalfa hay will make the lambs grow at a surprising rate; and if silage is available they should also receive some of this once a day, with some bran or gluten feed sprinkled over it. In feeding the lambs, they should be given all the grain they will clean up three times a day, and be supplied with bounteous hand. The troughs for both ewes and lambs should be thoroughly cleaned out before each feed.

Joseph E. Wing, in the "Winter Lamb," warns feeders to beware of silage when taken from near the bottom of silo, and states that the acid present in such silage is like rank

poison to young lambs. However this may be, it is certain that good silage is one of the most valuable feeds that can be secured for lambs or ewes.

If proper care in feeding is taken the lambs should weigh from 45 to 60 pounds in from eight to ten weeks, and should also be very fat. They should now be slaughtered, hog dressed, and prepared for market. This is more or less of a fancy operation, as a well dressed carcass will far outsell one that is poorly finished. In this connection, no better directions can be given than those by H. P. Miller, in the "Winter Lamb." He says:

"The preparation for market requires some skill, yet only such as almost any one can develop after carefully studying directions. We have greatly simplified our method of preparation, and the lambs apparently sell as well.

"It is very important to have them thoroughly bled out. To secure this we have found it advantageous to suspend the lamb by the hind feet in killing. Suspend a short singletree about six feet from the ground. Loop a small rope or strong twine about each hind leg and attach to the hooks of the singletree. With a sharp-pointed knife sever the artery and vein in the neck close above the head. Be sure to sever the artery. Bright red blood is the assurance. The venous blood is dark. Severing the head with a broadax would perhaps cause less suffering and insure a thorough bleeding. I remove the head with a knife as soon as the lamb quits struggling. Clip the wool from the brisket, and strip four or five inches wide upward to the udder or scrotum, also from between the hind legs as in tagging sheep. Now open the lamb from the tail to the brisket. Slit the skin up the inside of the hindquarters about four inches and loosen the skin from the underlying muscles for two inches on either side of the openings in the skin for the attachment of the caul fat. This should be removed from the stomachs before they are detached, and in very cold weather placed in warm water until ready to use. Next remove the stomach and intestines. In the early part of the season the liver, heart and lungs are not removed, but when the weather gets warmer they must be. Carefully spread the caul fat over all the exposed flesh. Good toothpicks should be provided for attaching it and holding it in place. Make small slits in it over the kidneys and pull them through. This part of the work is the one that requires skill to make the carcass look attractive. Now hang it in a cool place for twelve to twenty-four hours. In ex-

tremely cold weather twelve hours will be enough, but better make twenty-four the rule. Then neatly sew a square yard of clean muslin about each lamb so as to cover all exposed surface. We formerly wrapped each one in burlap and attached to a stretcher, but now place three in a light crate and tack the burlap over the top. We line the crate with heavy paper. Prepare them as shortly before shipping as possible. In warm weather ice may be put between the lambs, not in them. Send them as they are ready, three or six at a time. The market varies greatly, depending upon weather and the number arriving. It is useless to try to get them all in on a high market. Aim to slaughter regularly each week if you have lambs in condition, and keep your commission firm informed as to how many you will probably send and when.

"Attention to details is the secret of success."

LECTURE LV.

FATTENING SHEEP IN WINTER.

The fattening of sheep in winter furnishes a profitable industry to thousands of farmers, as well as to the large professional feeders, who fatten any class of stock when they consider market conditions right. Sheep, like beef cattle, afford a means of condensing the products of the farm into a concentrated market form; and fattening sheep are very easily handled.

The first step is to see that the sheep are free from scab, lice or ticks. Scab means ruin to profits, and lice and ticks seriously curtail the fattening tendency. The sheep should be carefully examined for these troubles, and if they are western sheep the safest plan is to dip them anyway, as scab may be present in limited degrees—perhaps only on one or two animals—yet it will spread through the flock like wildfire when they are fairly started on feed. The safest and cheapest plan is to dip; and this is taken up in detail in a later lesson.

When sheep are fed on a very large scale, as is frequently done in western Nebraska, or Minnesota, no sheds are provided, and the sheep are fed on the open fields, sometimes in bands of ten or fifteen thousand. Picket fences through which they can reach are provided, and hay is pushed up to the fence once or twice a day. Grain is fed in shallow troughs here and there in the lots. Under such general conditions the grain is usually shelled corn, fed with prairie hay; or under Minnesota conditions, wheat screenings and prairie hay furnish the feed.

The economy of such a plan of feed, and the eminently satisfactory results it has given, commands it to all feeders; but Iowa winters usually furnish cold, wet snows, chilling winds, and more or less rain toward spring. Sheep must be protected from this wet; hence for most parts of the state sheds which will protect the sheep from the north winds, and from wet snows or rains, are necessary. These sheds

need not be costly or elaborate; the south side may be left entirely open. The yard should be well drained, graded and surfaced to carry off superfluous water. Sheep love the dry and must have it if they are to do well. With sheds on the north, dry footing beneath, and yards on the southern slope, the sheep are under comfortable conditions and will do well. For feeding roughage the old plan of a picket fence is the best yet devised. It can be placed parallel to and about fifteen feet distant from the regular outside fence, and between these the hay and fodder can be thrown off in wholesale quantities, and then moved up next the picket fence, where the sheep can get it as needed.

Good clover hay is ideal roughage, and alfalfa is still better, when it can be secured. Where neither of these feeds is available, bright corn fodder is the next best feed, is greatly relished by sheep, and gives good results. It is useless to shred or cut fodder for fattening sheep (unless the refuse is desired for bedding), as they will not consume the rougher portions as cattle will under similar conditions. To feed the grain, flat-bottomed troughs, from 10 to 12 inches wide and 12 to 16 feet long, should be provided. Henry says that 100-pound sheep should be allowed 15 inches space at the trough, and 200-pound sheep 24 inches. Where the troughs set out in the open, where the sheep can get at them from both sides, less room than this will be needed.

For grain feed shelled corn is the great standard. Sheep masticate the food much more thoroughly than cattle do, and grinding is unnecessary. The sheep should be brought on feed very gradually, and as good a plan as any is to feed some bran for the first ten or fifteen days. If the feed is to be a short one, they should be receiving a pound per day per head by the end of the first twenty-five days, and by the end of forty or forty-five days should be receiving from one and one-half to two pounds per head daily; the exact amount will vary in the case of different bunches, some proving heavy, hearty feeders and others much less so. The aim is, however, to give them all they will consume after they are once up on full feed. Shelled corn, with some bran and clover hay, is as satisfactory a ration as can be secured for fattening sheep, and under ordinary conditions is as economical a ration as can be fed. When such supplemental feed stuffs as oil meal and gluten feed are low in price, they can be used to good advantage; and whenever emmer, cow peas or soy

beans can be secured at moderate prices they can be used, as they are greatly relished by sheep.

In the actual work of feeding, quietness should be observed. It is well not to feed too early in the winter time; daylight is plenty soon enough. The same attendants should do all the work, or at least as far as possible; and strangers or dogs should not be allowed in the lot, as they are very apt to frighten the sheep and cause them to lose flesh in running and jamming around.

Protection from sweeping winds, wet snow or rains, together with economical feeding arrangements, good judgment in buying feeds, and regular, careful feeding, to the limit, are the essentials which combine to make success certain.

LECTURE LVI.

FATTENING SHEEP IN SUMMER.

Many experiments and the testimony of many practical feeders have shown, conclusively, that cattle can be fed more economically in summer than in winter; and while the experiments along this line in sheep feeding are less numerous than in cattle feeding, they are quite as conclusive.

Experiments conducted in 1901, at the Iowa Experiment Station, in which 161 yearling wethers were fed, showed that the sheep made .406 pound gain per day on bluegrass pasture alone; that they made .46 pound gain per day on corn and bluegrass; on oats and bluegrass pasture .42 pound per day; on barley and bluegrass pasture .39 pound per day. Such gains as these are very large in feeding sheep, and show that very satisfactory and economical gains can be made on summer feeding; and furthermore, it was found that the most economical gains were made on bluegrass pasture alone. In another experiment made the same fall, in which 100 head of yearling wethers were fed in seven lots, the results showed that more economical gains could be made on corn and grass, or on grass alone, than on any usual combination of grains and clover hay. The gains on grass, however, were not as great as desired; this was due, however, to the fact that the grass was washy, due to its having been burnt over just prior to the time the sheep were placed on it.

The above experiments and the general knowledge of experienced feeders indicate that summer feeding is advisable whenever good pasture can be secured; and the results also show that where sheep have the run of abundant bluegrass pasture, that more economical results can be secured on grass alone than on grass and grain. This does not necessarily indicate, however, that grain should not be fed to sheep that are on pasture. This must be governed by local conditions, such as kind of pasture, abundance of same, and cost of grain that one desires to feed.

For yearlings or mature sheep bluegrass pasture is the

feed par excellence, but this caution must be borne in mind: Parasites that are extremely destructive to sheep are far more liable to find their way into sheep when they are grazing upon short, close grass—such as bluegrass is—than when they are running upon higher growing grasses, such as red clover and alfalfa. Besides this, these parasites never trouble sheep that are feeding on a pasture where sheep have not previously fed; hence it is that new pastures insure freedom from the parasites which are the bane of the sheep grower's existence. Bluegrass is the earliest and choicest feed we have, but if sheep have run on it for several years, there is danger from the parasites, even in the case of mature sheep; and it is almost certain death to lambs. Hence judgment must be used in allowing sheep to run on bluegrass pasture, and it must ever be remembered that one is taking considerable risk in allowing sheep on old pastures. When bluegrass has been decided upon, however, and where it is abundant and not too washy, no other feed need be given. If soft or somewhat scarce, some corn and bran should be fed with it. In starting the sheep on pasture in the spring, it is best to turn them on some pasture where the old grass makes up a large part of the feed; on such pasture the sheep will get a bite of old grass with the new, which will prevent scouring, which is very liable to occur if the sheep are turned on pasture that consists wholly of new grass. The pasture should be abundant and particular care should be taken not to overstock it during May and June, for if this is done, no feed will be procurable in July and August; and it cannot be too thoroughly emphasized that more feed can be secured from a pasture by grazing it moderately than by keeping it grazed close to the ground. Corn is the staple feed in the great central states, and gives the most satisfactory results of any grain fed in conjunction with bluegrass pasture. In starting the feed begin gradually—giving not more than one-third of a pound of shelled corn with about the same amount of bran to each animal for the first few days. The corn should be gradually increased and the bran decreased until at the end of ten or fifteen days the bran may be wholly discontinued, and the sheep should be receiving from two-thirds to three-fourths of a pound shelled corn per head per day. If the feeding period is to be a short one, the sheep may be brought to full feed, about two pounds shelled corn per day, within thirty days. But if the feed-

ing period is to be long, a little more time should be used in getting the sheep to full feed. The exact amount must be governed by the particular conditions. On long feeds, where pasture is plentiful, it will be most profitable to feed only about half what the animals would take. On short feeds and where pasture is somewhat limited, it is usually advisable to crowd the animals, giving them all they will eat up clean.

The fattening of lambs is a very profitable branch of sheep husbandry, and lambs are preferred to the older sheep. The favorite on the market is the handy weight lamb, aged about six months and weighing in the neighborhood of 100 pounds. They can be fed on pasture even more profitably than older sheep, for blue-grass, alfalfa or clover supply a high per cent. of protein, which the lambs need more than older sheep do. Bluegrass pasture, however, is dangerous to young lambs if sheep have grazed upon it during the preceding season, for stomach worms and other such parasites are more apt to be gathered up by the lambs when feeding on the short, sweet bluegrass than on any other pasture. In fattening lambs in summer, therefore, it is best to depend upon red clover, alfalfa and the more common forage crops; and wherever sufficient sheep are kept to warrant the employment of a regular shepherd the use of hurdles, whereby the lambs may be permitted to run ahead of the ewes, will prove very satisfactory, and will result in increased thrift among the lambs. In pasturing either clover or alfalfa the sheep should not be turned in until the clover or alfalfa is well grown, and then should be turned in when well filled up on other grass, and when the dew or wet is off; and after being so turned in should never be taken off, though a shed may be provided where the sheep may shade at midday. On such pasture with their mothers the lambs will make prodigious growth, and when weaning time comes they may be turned into another such field, or if clover or alfalfa be limited, they may be turned on rape, soy beans, or cow peas. Any of these may be sown in a cornfield at the last cultivation, or in oats or barley, and no better feed can be found.

By the time the youngsters are a month or six weeks old, the ewes should be given a little grain in long feed troughs, where the lambs may get a taste of the feed. As soon as they have developed a taste for grain a separate pen should be provided, with a "creep" through which the lambs may

pass. In this pen a feed trough should be placed, and here the lambs may be fed twice daily, beginning on shelled corn and bran, and gradually decreasing the bran till it forms not more than one-tenth of the ration by weight. When the lambs are weaned the grain ration should be increased until the youngsters are getting all they will eat up clean twice a day. Fed in this manner they will make rapid gains and will also be ripe and ready for slaughter by the time they weigh from 90 to 100 pounds.

In conclusion, we see that sheep may be fed more economically and profitably on grass and grain than in the dry lot; that very profitable gains can be secured on bluegrass pasture alone where such pasture is good; that lambs should not be allowed the run of bluegrass pasture if sheep have pastured on the same in preceding years; that alfalfa and red clover are the most satisfactory early pasture for lambs; that soy beans, cow peas or rape all make satisfactory late pastures; and that corn is, as a general rule, the most satisfactory grain feed that can be used in fattening sheep on pasture.

LECTURE LVII.

DIPPING SHEEP.

Sheep are dipped to free them from ticks and from scab. Ticks occur in practically all flocks. They may be very plentiful, in which case they do much damage; or they may be present to only a slight extent. In either case they are a detriment to the thrift of the sheep and should be gotten rid of.

Scab is caused by a very minute parasite which burrows into the skin, causes a scabby condition, and brings about a loss of much of the wool, great emaciation, and restlessness. Sheep so affected will do no good in the breeding flock or the feed lot. The disease is spread by contact, either with sheep that are affected, or with posts, fences, feed boxes, etc., where scabby sheep have rubbed. Scab is exceedingly difficult of radication, owing to the fact that the scab parasite, known to scientific men as *Psoroptes communis*, keeps under the protection of the dry scales or scabs, and these must be loosened or softened before the dipping solution can affect the parasite.

Sheep ticks are easily seen by any one who will take the trouble to examine affected sheep. The parasite that causes scab is not so easily seen, but it reveals its presence by small, scabby places here and there on the body, and by bare places where the wool has been torn out by rubbing. If some of the scales be removed and promptly transferred to a piece of black paper, the parasite may be seen as a very minute, light colored mite, crawling about. Scab is extremely virulent, spreading rapidly in a flock of sheep and precluding all possibility of profit in keeping an affected flock useless unless prompt steps are taken to dispose of the disease.

Treatment.

The only satisfactory method of dealing with ticks or scab is by dipping. This should be done at least once a year as a

precaution and to dispose of what few ticks are present, for it is indeed a rare thing to find a flock wholly free from ticks. Where the ticks are plentiful, two dippings per year are advisable. Where scab is found the promptest measures must be taken to stamp out the trouble. Two dippings should be given—ten days apart, and the dip should be applied warm—about 110 degrees F., unless a dip containing caustic, as lime, is used. The dips that are recommended by the Bureau of Animal Industry, Washington, D. C., are the lime and sulphur dip, tobacco and sulphur dip, and nicotine and sulphur. These dips are all of such a nature that they may be made up at home, and they are used very satisfactorily and effectively on a large scale. The extreme care necessary in making up these dips, however, and the injurious and often dangerous results brought about by improper preparation of these dips, renders them somewhat impracticable for the small farmer or flock owner. In addition to this is the further disadvantage of the trouble of preparing them, and the fact that the lime and sulphur dip always injures the wool fiber to some extent, especially if it is used at any time other than shortly after shearing. These dips, however, have the advantage of being cheaper than any of the proprietary dips, especially when used on a large scale. Inasmuch as they are somewhat impracticable for Iowa conditions, full directions for making them will not be given here. Those who desire to use them should write to their congressman for the Fourteenth Annual Report of the Bureau of Animal Industry, which discusses these dips in full.

There are numerous proprietary dips on the market, some of which are quite effective when used according to directions, and many which are not. All have the disadvantage of higher cost than the home-made dips, but the best injure the wool much less than the lime and sulphur dip. In fact, some are rather beneficial than otherwise in effect on the wool. Those which appear to give the best satisfaction to flock masters, so far as can be learned, are Zenoleum, Chloro-Naphtholeum, Cooper's Sheep Dip, Little's Sheep Dip, and Car-sul Dip.

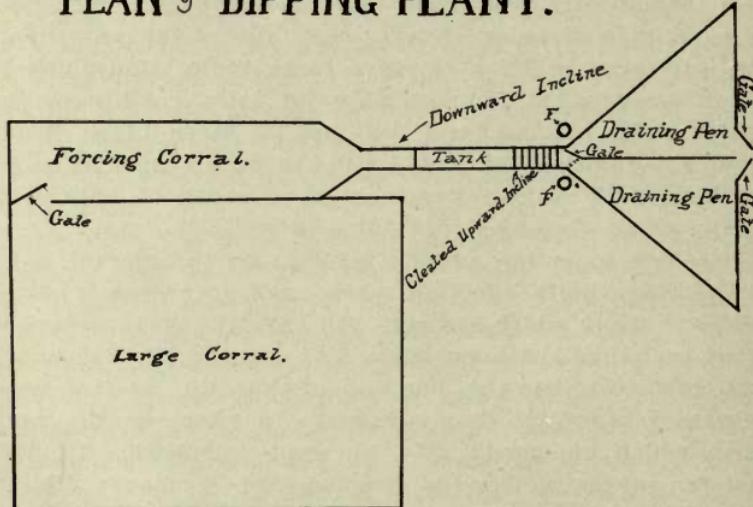
The first two are carbolized dips, based on coal tar by-products. The third and fourth are arsenical dips, and the last is a coal tar dip with sulphur. All appear to be reasonably effective, but must be used hot (110 degrees F.) in order to soften the scab sufficiently to penetrate to the para-

sites beneath. Any proprietary dip should be used strictly according to directions. This is especially true in the case of the poisonous dips. For ticks these dips need not be hot.

To accomplish satisfactory results it is necessary to have a regular dipping tank. These can be made of wood, but the galvanized tanks are cheaper and better. Galvanized steel tanks 4 feet deep, 10 feet long on top, 5 feet long on bottom, 20 inches wide on top and 15 inches wide at the bottom, weighing from 160 to 225 pounds—the standard size for such tanks—can be purchased most cheaply from the firms that sell the proprietary dips, as they sell the tanks at very low cost to introduce their dips. The cost will vary from \$8.50 to \$16.00, depending upon the grade of tank purchased. A very good one can be bought for \$12.50.

The tank should be set in the ground and small yards arranged so as to facilitate the passage of the animals to the tank. The accompanying sketch shows a very convenient arrangement:

PLAN of DIPPING PLANT.



By having two draining pens the dipping can go on continuously; one pen filled, the gate from the center partition is simply swung around, diverting the sheep into the other pen. The floor of the draining pens should be so arranged as to divert the drainage into barrels stationed at F. Here

the liquid can settle and then it may be drawn off with a siphon, thereby preventing manure, etc., from passing from the draining pens into the tank.

The same general principles laid down for sheep dipping will apply to hogs, and the proprietary dips are used most extensively. Lice are the parasites fought and there is no difficulty in controlling them.

As to frequency of dipping, sheep should be dipped twice per year—lambs and all. Hogs should be dipped whenever it appears necessary, and it will usually be found profitable to dip two or three times a season even though lice may not appear to be present.

LECTURE LVIII.

FORAGE CROPS FOR SHEEP.

The question of forage crops for sheep is one of the most important to the sheep raiser in the central west, because of the internal parasites which make life a burden to the flock master.

The different crops used for forage purposes may be classed as early or spring crops, mid-summer forage plants, and fall forage.

Winter wheat and rye, where they can be grown, are two of the most valuable early feeds. They may be pastured when grown for the grain, but it is best to have a small plot expressly for pasture purposes. Red clover and alfalfa both furnish valuable early pasture, usually (in Iowa) becoming available in the early part of May, and they are also good in summer or in fall if mowed or kept grazed down. It is best to have a limited area of these for the sheep to run on and to graze this down before allowing more range to feed on. In this way waste is reduced to a minimum—a very important matter when the pastures are yet undeveloped. This can be arranged by providing hurdles, which will be discussed later.

Of the spring sown crops which become available by the last of June or the first of July, rape and sorghum are two of the most valuable. Both do best on fairly rich soil, which should be well prepared. Sorghum can best be sown broadcast, from 80 to 100 pounds per acre, according to the nature of the soil; rape should be sown broadcast at from 3 to 4 pounds per acre. The heavier sowing gives a larger yield, but it is scarcely so valuable from a food standpoint as the lighter seeding. If sown in drills 24 inches apart, from 1 to $1\frac{1}{2}$ pounds per acre is sufficient. Both rape and sorghum may be sown at any time from May 1 until August. July sowing, however, is better for rape than sorghum. Rape or sorghum sown in May will do to turn on by the last of June or first of July. If sown about the middle of June in a

favorable season it will be ready to pasture in thirty days. Both crops, however, possess more feeding value as they approach maturity. Rape can very often be sown to good advantage with oats. At the Iowa station (1889) rape so sown—one pound rape and six pecks of oats per acre—gave a yield of eighteen tons per acre besides sixty bushels of oats per acre. The rape interfered but slightly in harvesting the oats, and afterwards came on and made the above excellent yield.

Besides rape and sorghum, two of the most valuable forage crops we have for sheep are legumes that can be spring or summer sown to good advantage. These are cow peas and soja beans. They may be sown alone or in corn, and furnish the very choicest of feed. Best results are usually obtained by sowing in drills, twenty-four inches apart, and cultivating. The peas or beans should be dropped from three to four inches apart in the drills. If sown broadcast, from three pecks to one bushel of seed should be used per acre on rich soil. Neither soy beans nor cow peas mature with certainty in this state, and seed must usually be obtained from a distance. If sown alone they should be sown in May—as soon as the ground warms up well. If sown in corn it will necessarily be at the last cultivating, and the cow peas are preferable to the soy beans for this purpose. In early corn, which is laid by in June, the peas will make a vigorous growth and will be in good shape to turn lambs on in the latter part of August.

The foregoing list gives a succession of forage crops, all desirable for sheep pasturage, from early in May until well into the frost season in the fall, and sheep carried on such pasture will remain free from stomach worms, liver flukes and other intestinal parasites which infest only pastures that are grazed for two or more consecutive years.

Other crops, such as oats and peas, sweet corn, etc., may also be grown, but the ones mentioned are all crops that have proved their worth, and no farmer need hesitate to sow them.

In growing any forage crop, the most gains from a minimum amount of land is secured when hurdles are used. These are made of ordinary fencing material, sixteen feet long. Each panel has three boards, held together by three or four uprights. Two of these are attached by hinges to a third in such a way that the three will fold together. The result

is forty-eight feet of fencing in a light, handy form, and when a number of these are hooked together and braced with light, inexpensive braces, a fence that is cheap and very easily moved is secured. With these hurdles a certain portion of the forage crop may be fenced off and the fence set forward every few days when the sheep have cleaned up what they have access to. The advantage of this plan in economizing the feed is apparent. The disadvantage is that it requires some labor to move the hurdles from time to time. Each man must decide for himself as to the advisability of hurdling, as local conditions, such as scarcity of feed, cost of labor, etc., must be the controlling factors.

The essential point about forage crops for sheep is that they give practical immunity from parasites, which cause most of the loss in sheep growing. In addition, they are sure to produce plenty of pasture, even in seasons when blue-grass pasture becomes brown and scant.

LECTURE LIX.

ECONOMICAL METHOD OF STARTING A FLOCK.

In the central west sheep are kept for three purposes: as mutton producers, as wool producers, and as weed destroyers. These are the three sources of income from the flock of sheep. As weed destroyers they have no equal, as they will eat readily over 575 out of the 600 different kinds of weeds which grow in this country. The horse eats about eighty, while cattle eat but fifty or sixty. For this purpose alone sheep are useful and no farmer can afford to be without a small flock.

From a mutton and wool producing standpoint they are also valuable. This being the case, we should pay attention to mutton form and the growth of wool in selecting animals for foundation stock. A man's liking for any business is more or less controlled by the financial returns from the same. This is especially true of the sheep breeding business. If good judgment is used at the beginning no class of farm animals will return as great profits on the investment as will sheep. In starting the flock some advise the purchase of purebred animals, such as a bunch of ewe lambs. This means a heavy outlay of money at the beginning with not much income during the first year. A ewe should not drop her first lamb before she is two years old, thus the only source of income from the ewe lamb is her wool clip, which should pay for her keep.

For the man who has no sheep a much more economical and profitable method of starting the flock would be to purchase the so-called old ewes which have been discarded from the flocks of sheep men. Many people consider a ewe to be old and undesirable when she attains the age of five years. Such a ewe, if a good breeder, will not appear so nice to the eye of the visitor as the two or three-year-old ewe. Still, if her udder is good, there is no reason why she should not be profitable from a breeding standpoint until she is eight or ten years old. She is just the kind of an animal for the

beginner in the sheep business to handle. During the month of September and the early part of October each year there are thousands of just such ewes sent to our markets, where they are a drug on the market. A ewe which has reared a good lamb or perhaps two lambs is always rather thin in flesh. This being the case, the butcher does not want her, except at a very low price. They can usually be purchased at from \$1.50 to \$3.00 per head at any of our leading live stock markets. In selecting such ewes get those which show good breeding and have good fleeces. Have them dipped before leaving the yards, and better still, after they arrive home as a safeguard against scab, vermin and other troubles.

Having secured a flock of old ewes for a small amount of money, you can now afford to spend some money in the purchase of a good sire. He cannot be too good from a mutton and wool producing standpoint. It is not necessary that he have all the fancy points of his breed, such as color markings, wooling of the head and legs, and other fancy points. It is very important, however, that he does have a good mutton form, a good, heavy fleece of wool, and a strong constitution, as indicated by width and depth of chest. He must be right in every respect, because he is more than half the flock.

The ewes should be well fed during mating season, also during the winter months. The next fall some culling out should be done. Those ewes which are oldest and least prolific should be separated from the rest of the flock and fattened for the market, to be sold in December or January; not September, when the market is always overstocked with such animals. A number of the best ewe lambs should be selected to replace the old ewes which have been discarded, in this way selecting the foundation for the future breeding flock. If this method is followed up, in a few years all of the old ewes will be replaced by younger ones of better type and breeding. At the same time the flock will pay larger dividends on the capital invested than any other class of stock on the farm.

By getting a new and better sire every two years an excellent flock can be built up from a very small outlay of money. More attention should be paid to breed type in the selection of the sire from year to year, as by so doing the type of the entire flock will be very much improved. If after a few years' experience with the flock you wish to establish

a purebred flock, a few choice purebred ewes may be added to the original flock. Then by proper care and selection the purebreds may be increased from year to year and the grades discarded.

The majority of men, however, will make more money by handling a flock of good, high grade sheep, the offspring of which are sold for market purposes, than by engaging in the purebred business. Every man should keep a purebred sire, but few men are qualified to make a success of handling purebred stock.

LECTURE LX.

SHEDS OR HOUSES SUITABLE FOR SHEEP.

Sheep, unlike many other kinds of stock, do not require elaborate buildings. There is no need of an expensive structure, but ample provision must be made for the comfort of the animals. In this connection, however, the severity of the winter must be considered. In those sections of the country where the winters are long and severe more water and more expensive sheep barns are needed than in the milder climate. Plenty of room should be provided, as sheep do not do well in cramped quarters. The fleece of the sheep serves as means of protection in time of cold. One thing, however, which must not be overlooked is the fact that sheep must have dry quarters. They will not thrive in damp quarters. They must be kept dry under foot and overhead if the best of results are expected. Sheep in the natural state always seek high ground, where it is dry and clear.

In dry climates and especially where the lambs are not dropped early in the season, sheep may be kept in almost any kind of a structure that will be dry under foot; provide shelter from draughts and storms. In many such instances a shed made from poles covered with straw or native hay, fixed in such a way as to prevent draughts and dampness due to dripping, has served an admirable purpose for the beginner in the sheep business.

In some instances the basement of a barn is used for sheep, but as a general rule such a place is not dry enough, especially in the spring of the year, thus is oftentimes very unhealthy.

Where the sheep barn is built as a separate building it should be high enough to provide ample room for the storage of a considerable amount of hay and straw overhead. This will add very much to the convenience of the same and reduce very materially the amount of labor required in caring for the flock. The barn should be narrow and long rather

than wide. In shape it should be L shaped and built so as to provide protection from the north and the west, as it is from these directions that most of our severe winds come. A barn of this construction should not be more than twenty-five or thirty feet wide. There should be an alley along the north and west sides about four or five feet wide for feeding purposes. In fact, many good barns are not more than twenty feet wide with a four-foot alley, leaving about sixteen feet clear for the sheep. This arrangement of a barn divides up very nicely. No stationary partitions are needed, as the feed racks, which should be sixteen feet long, will serve two purposes. They can be put in crosswise, thus making a real good partition. This method of dividing the barn proves to be very convenient in the spring of the year or at any other time where it is desirable to remove the manure. The feed racks may then be taken out, thus leaving the building one open space. In making the feed racks it is best to construct them for the double purpose of feeding both roughage and grain or other fine feed. This can be easily done by having the racks about two feet or twenty-eight inches wide at the bottom. Then have two boards about eight inches wide each nailed together in the shape of a wide angled V. The angle should be of at least 135 degrees. These boards should then be placed on the center of the bottom of the rack so as to form a slope on either side towards the outer edge. This will be found very helpful in keeping the grain or other fine feed in the outer edge of the bottom of the rack. That part of the rack which is to hold the rough feed, such as hay, straw or corn fodder, should be built on the center of the V shaped ridge and project upwards to the height of about three feet. They should slant gradually upwards so as to be about two feet wide at top. Vertical slats about four inches wide and three inches apart should be nailed on the sides. This affords a very good means of supplying the roughness to the animals at their own will and at the same time protecting their fleeces from chaff and other foreign matter. The bottom of the feed racks should be about eight inches from the ground. The side boards on the lower part of the grain trough should not be more than four inches in height. This makes a very good combination feed rack, and is both economical from the standpoint of exposure and labor.

In each and every sheep barn there should be one or two

warm rooms, which will be found very convenient and useful at lambing time. These should be so arranged as to allow of further division. A small pan is especially desirable and necessary in the case of young ewes which do not take kindly to their lambs. A feed room should also be provided especially in a barn of any size. It will save much labor at feeding time, as in such a room all of the various kinds of grains or other feed stuffs used may be stored. In a small barn such a room is not so necessary.

Plenty of sunlight and ample yard room are very necessary for the health of the flock. This calls for a large number of windows on the east, south and west sides of the sheep barn. The yards should be located on the south and east sides of the barn. All doors leading to and from the pens should be low and of good width. A high step and a narrow door make a dangerous and costly combination to the breeding flock of ewes. Ventilation is necessary for the health of the flock, but draughts must be guarded against, as the sheep can withstand less exposure of this kind than any other farm animals.

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Animal Husbandry
—*Series*—

Part I.

Kennedy.

*Correspondence
Agricultural
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Sioux City, Iowa

ANIMAL HUSBANDRY SERIES.

PART I. NO. V.

LECTURES

ON

Feeding, Care and Management of Live Stock

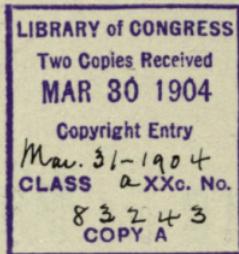
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LECTURE LXI.

FEED, CARE AND MANAGEMENT OF BROOD MARE.

The proper care and management of the brood mare is one of the most vital points to be considered in the production of horses, so much of the success or failure is due to this part of the work. A careful study of the methods practiced on the most successful horse farms reveals that although there may be some minor points of difference, there are certain well defined rules which must be adhered to if the best results are to be expected.

It is universally recognized that nothing but mature mares should be used if good, strong colts are to be reared. Another point is the importance of exercise. This seems to be one of the most essential features in the estimation of most successful breeders. This may be accomplished by allowing the mares to remain out of doors most of the day during the winter season and all of the time when the weather is mild and favorable. In those sections of the country where the winters are not too severe and the ground is not covered with snow, grazing for part of their ration serves an excellent means of securing the much needed exercise. Where some care is used in the fall of the year in not allowing the pastures to be too closely grazed, thus leaving an abundance of grass, it will provide much feed of the very best kind during the winter months. Grass, cured in this way, is better than hay, as it contains just as much nourishment and in addition has a most favorable influence on the digestive system. Where such grass cannot be had some corn fodder should be scattered over the pasture some distance from the buildings to encourage and secure the desired exercise.

The above method is especially desirable on farms where horse breeding is practiced on such an extensive scale as to make it impossible to secure exercise in any other way. On most farms such a method is not necessary, as the same end may be secured by means of light work. The belief held

by some that work is injurious to the brood mare is wrong. Light, regular work is one of the very best things for such an animal. Heavy, irregular work, especially during the latter part of pregnancy, must be avoided, else serious results may be the result. All good horse breeders recommend light work wherever it is at all practicable.

In the largest and best established horse breeding districts of France the majority of the horses are produced by small farmers who do all their work with their brood mares. The colts are sold when about twelve months old to the dealers, who mature and sell them for breeding purposes to other countries. In this way they claim to be able to produce the very highest type of horses. The mothers always have sufficient exercise, thus, as a result, strong, healthy foals are secured, which always make much better horses than those reared from dams which have been irregularly exercised and overfed.

In most sections of the country spring foals are reared. The fall foal seems to be the exception, thus in our treatment of the feed and care of the dam it will be for those which rear spring foals unless otherwise mentioned. Where fall foals are reared it is very difficult to feed the mother so as to have a liberal supply of milk. Another disadvantage in rearing fall foals is the increased trouble during the winter months, caused by teething.

Where spring foals are to be reared the mother should be liberally fed during the winter months. The ration should be of such a nature as to keep the system in a good, cool, healthy condition. This calls for more or less nitrogenous feed stuffs, such as some bright, pure clover or alfalfa hay for part of the roughness, and oats and bran for the grain part of the ration. A strictly corn or other carbonaceous or heat producing diet must be avoided. Where too much corn is fed the mother usually becomes very fleshy and plethoric. As a result, at foaling time the mother will be more or less troubled with inflammation and the colt will be weak and have little or no use of its limbs.

Feed of a succulent nature should be supplied in some form. Where roots can be had they rank first. Corn silage when fed in limited quantities also gives good results, but it must be fed with care else the same difficulties will be experienced as when too much corn is fed. Where the foal is dropped before the grass season has arrived, other feed

stuffs of a succulent nature must be provided. For roughness either alfalfa or clover hay will answer a good purpose, as they are both conducive to milk production. For concentrates, crushed oats and bran are good. A mash of some kind should be fed every evening. This can be made by using bran and crushed oats, equal parts by weight, and steaming for about half an hour or one hour. In some instances skim milk has been added to the mash with good results. The main object should be to supply an abundance of food adapted to milk production. Great care must also be exercised to feed the mother very regularly and on the same kind of feed stuffs, so as to avoid any bowel trouble in the foal.

When the grass season arrives nothing is better than plenty of good, fresh grass. It is one of the very best aids to healthy and abundant nutrition for both mare and foal.

When mares are worked while suckling it is better that the foal should be left in the stable and that the mare be taken to the foal for its nourishment at least three times during the day. Ample time should be given for her to cool off thoroughly before the foal has access to her, as otherwise a gorge of the overheated milk may produce serious disturbance in the digestive organs of the foal. Some farmers, however, find little inconvenience from permitting the foals, especially when quite young, to accompany the dams to the field and follow them while at their work. This gives them an opportunity to empty the udder of the mare as often as it may be deemed advisable, and eliminates all danger from over-gorging that occurs when the mare and foal are separated. Generally a mare which is liberally fed will supply a sufficient amount of nourishment for the foal during the first few months of its existence. It sometimes happens that the milk of the mother is not sufficient to promote the proper growth and development of the foal. In some instances, too, the mother may die, thus the colt will have to be reared by other means than nature's way. When the colt requires additional food or has to be reared by hand, cows' milk will be found to be the best possible adjunct or substitute for the milk of the dam. The cow's milk should be sweetened a little at first, as the milk of the mare is sweeter than that of the cow. The colt can soon be taught to drink milk. Care must be taken, however, to prevent overfeeding, as this is the greatest danger in the hand rearing of colts.

A half pint is sufficient at first, but it should be fed at least six times per day. Gradually increase the amount as the colt grows older. Some oats and grass should also be given. When the colt is about two months old, skim milk should be substituted for the fresh milk. Some oil meal or flaxseed meal to the amount of about one pint per day should be fed in conjunction to prevent constipation. It will also be very helpful in developing the frame of the colt. Either whole or skim milk can be profitably fed to any colt which is thin in flesh, as such an animal will not otherwise do well during the first winter.

It is always advisable to teach the colt to eat grain before weaning. This will make the weaning period a much less severe one on the colt. The best age to wean the colt is at about five or six months, depending on the condition of the dam and the colt. Generally speaking, a colt should never be allowed to suckle longer than six months. In fact, five months seems to be sufficient.

There are various methods of weaning the colt. One very commonly practiced and one which gives good results is to tie the colt in an adjoining stall from the dam with the partition low or so open that they can see each other, thus preventing unnecessary fretting and worrying on the part of both animals. The ration of the mare should be reduced and of such a nature as to be non-productive of milk. A pound of Epsom salts fed in the grain will have a beneficial effect upon the system. When the mare's udder becomes so full as to cause her uneasiness, a part of the milk should be drawn off, but she should not be milked dry. This should be done by hand, as such milk is not good for the colt. It will also be found much easier to dry off the mare when the colt is not allowed to suckle. After weaning, the mare and the colt should be kept apart. The colt may be fed skim milk after weaning to good advantage. Care must be taken, however, where the colt is fed by hand, to avoid the common practice of making too much of a pet of the colt and by so doing spoil it in after years.

LECTURE LXII.

FEED, CARE AND MANAGEMENT OF COLT FROM WEANING TIME UNTIL READY FOR WORK.

The usefulness and value of a horse is largely determined by the feed, care and management the colt receives from weaning time until ready for work. The greatest of care and the best of judgment should be exercised in the selection of the feed stuffs, and the administration of the same; also in the management of the youngster. A very common mistake is made in trying to mature a young animal too soon. By so doing, the proper development of both bone and muscle is very often checked. In growing the young animal the aim should be to secure uniform and proper development of all the parts. This is especially true of the bone and the muscle. The young animal should never be in high flesh, just in good growing condition.

After weaning skimmed milk may be given to the colt, especially if it is not in good condition to enter the winter. Clean, sound oats, ground or unground, constitute the best of all grain foods for the colt. It is better as a general rule to have the oats ground at first. During the winter months a ration of three parts ground oats and one part corn meal will give very good results. A little oil meal can also be added to the ration to good advantage. Do not feed too sparingly of the above ration. More colts are ruined by underfeeding and lack of exercise than by overfeeding when combined with an abundance of exercise. It is very easy to ruin a colt by too liberal grain feeding if it is not given plenty of exercise.

The ration must be such as to produce bone and muscle, and that is why oats and oil meal are so valuable. A sole corn ration does not contain enough protein and ash for the best results. For roughness nothing is better than alfalfa, clover, or oat hay. Dusty clover hay should never be fed, as it is likely to cause wind trouble. Some corn fodder, prairie or timothy hay can always be fed to advan-

tage during the first winter. Corn silage, when fed in conjunction with other feed stuffs which are rich in nitrogenous matter, will be very helpful. Some roots, especially carrots, are an excellent adjunct to the colt's ration during the winter months. During the first winter the colt should be kept in a box stall during the night and allowed plenty of out of door exercise during the day, especially when the weather is fine.

Too much stress cannot be laid upon the importance of open air exercise as being absolutely essential to a healthy, symmetrical development of bone, muscle, and the vital organs. Practical breeders have for a long time recognized the value of allowing the liberally fed colt to rough it to a considerable extent, knowing that he always developed into a much hardier horse. Many a good colt by too high feeding and close confinement has grown up into an unsound "weedy" horse. The horse is different from most animals in that its future usefulness in no small measure is determined by its hardiness and endurance. These necessary requisites cannot be secured without plenty of bone and muscle forming food, plenty of fresh air, and exercise. The long haired, coarse boned colt invariably grows into the high priced horse. On the other hand the sleek coated, fat bodied colt very seldom develops into anything that is valuable and creditable as a mature animal.

Liberal feeding is necessary, and especially in those feed stuffs which are rich in bone and muscle producing material. This, combined with an abundance of exercise, are two of the very most important essentials in the care and management of the colt.

During the summer months, while the pastures are good, nothing in the way of additional feed will be necessary. They should be supplied with salt at all times and have free access to pure water at all times. During the hot weather and fly season, some kind of protection must be provided. A grove of trees or a shed or some other structure will serve an excellent purpose.

During periods of drought when the supply of grass is scant, some additional feed should be fed. Forage crops may be made to answer an excellent purpose, especially when green oats, barley, clover, alfalfa, or sweet corn can be supplied. A light ration of grain will usually be found the best supplement in this connection. Oats stand at the very top for this purpose.

During the second winter the colt should receive much the same treatment and feed as during the first winter. More bulky feed can be fed to good advantage. The grain ration should be liberal and composed largely of those feed stuffs which are conducive to growth and bone production.

Draft colts of good size should be broken to work. Light work will be more beneficial than harmful for such animals. During the spring and summer they may also do some light work. They can be used to good advantage, where carefully handled, to rest the brood mare from time to time. In this way they can be made to earn their keep. Light work is always beneficial for a colt of this age, providing they are carefully handled.

There are a great many little things which must receive careful attention in the management of the colt. The prevention of lice is a most vital point. Many colts are very seriously checked in their development, due to the presence of lice. The indications of lice are rubbing against stall, manger, fence, or some other obstacle, thinness in the colt, when a colt ceases to do well, hair falling off or being rubbed off. There are several methods of treating a colt troubled with lice. They must be liberally fed on corn, oats, bran, and hay. There are several kinds of powder recommended to kill lice. Many of them are very good and will give immediate relief. One of the best and surest remedies is an application of gasoline put on a whisk broom or brush and thoroughly rubbed through the hair on all parts of the body, especially the neck, withers and back. Kerosene and soft soap emulsion or Persian insect powder applied in the same manner are also good. No colt will thrive and make good growth while troubled with lice.

The teeth should also be given proper care, especially at teething time. Loose teeth should be removed.

Grooming is another point which will prove helpful. It is especially valuable in case of colts which have not ample opportunity for exercise. It is also very important that the colt should be properly halter broken, as outlined in the lecture on this subject.

The feet should also be properly cared for. They must not be allowed to grow out too long, or become uneven in shape. Many otherwise good colts are ruined by allowing the inside of hoof or outside to become much larger than the corresponding side. Crooked legs are the result.

LECTURE LXIII.

FEED, CARE AND MANAGEMENT OF WORK HORSES.

The feed, care and management of the work horse is a very important subject. It concerns a very large number of peoples. One man will take a horse thin in flesh, work it hard and have the horse gain in flesh on very much less feed than it had before. Another man will take a horse in the height of condition of flesh and fit for work, and in a short time the horse is seen to be dull and losing flesh, notwithstanding that it had all the grain and hay it could consume. This fact is of great significance and opens up a field for investigation. It shows that it is not so much the amount of feed given, as it is the properly balanced ration and the regularity with which the feeding is done, together with the manner of the handling. All of these points are worthy of most careful consideration.

The average work horse is a hard animal to properly care for on account of the irregularity of his work. During certain seasons of the year he is taxed to his utmost by real hard work. At other times work of a medium nature is demanded, and at certain times he has little or nothing to do, in fact may be idle. This is especially true of the farm work horse. These different changes and demands require special care and feed for the maintenance of good health, flesh and endurance. A horse at real hard work must be more liberally fed, and fed on a ration differing in composition and preparation from the animal that is at light work or idle. Thus we can readily see the necessity of making a very careful study of the animal and its needs at all times.

A careful study of feeding tests and rations reveals the fact that a horse at real hard work requires a ration of a nitrogenous nature to supply the demand upon the system. Such a horse must also be fed more grain and less roughage than the horse at lighter work. While the grinding of grain and the cutting or chaffing of the roughage is not advisable in feeding horses under ordinary conditions, it may oftentimes

be very beneficial in the case of animals at real hard work. The ration may be composed of various kinds of grain, such as corn, oats, wheat, barley, shorts, bran, molasses, beans, oil meal, gluten feed, and a variety of other feed stuffs. Too much corn should not be fed, as it is claimed to burn out the system in a short period of time. In many places where horses are worked very hard the ration is largely oats and shorts, with some wheat, barley, or corn added. For roughness timothy, clover and mixed hay are used. In some instances millet, sorghum and oat hay are used quite extensively. Firms owning large numbers of horses which are worked very hard usually grind all the grain, cut the roughage, then moisten it and mix the grain in and feed both at the same time. This method seems to save the horse some labor. Various methods are followed regarding the number of times the animals are fed. Some feed five and six times per day. Generally the animals are fed but three times per day. The watering is usually done before feeding and no water is given for at least two hours after feeding. This method seems to favor more complete digestion of feed.

Horses at medium work do not require such liberal feeding. Neither do they require so much nitrogenous feed, thus cheaper feeds may be used to good advantage. There is no necessity for grinding the grain or cutting the roughness fed, as they have plenty of time to do this work themselves. They may be fed more corn and barley, which are usually much cheaper feeds than oats, shorts, and other nitrogenous feed stuffs. For roughness, timothy, clover, mixed hay, sorghum, millet, oat hay and small quantities of the various kinds of straws may be used to good advantage. Where straw is used to any extent more of the grain must be fed. Regarding the quantity it will depend on the size of the horse and the amount of labor required. Horses at medium work should receive about one pound of grain and one pound of hay for every one hundred pounds live weight of the animal. This may have to be modified to some extent with different horses. Some horses, on account of their conformation, require less feed than others. Horses which are idle part of the time should be fed and handled with much care. They must be maintained as economically as possible while not at work. They do not require very much nitrogenous food. They should always be fed a sufficient amount of feed to keep them in real good flesh. Where

horses are doing little or no work, the ration may be cheapened in several ways. In some instances the grain ration is almost solely withheld and the same kind and amount of roughage is fed as when at work. In other instances part of the grain is fed in conjunction with straw or some other cheap kind of roughage. This in many ways is the better method, due to the fact that the grain part of the ration seems to furnish more bottom and fettle in the animal, thus it will be in much better form for work when such is needed. It is a fatal mistake to starve a horse while idle and then suddenly increase his grain ration when the work season arrives. The increase should be made several weeks in advance, and better still, to feed some grain all the time.

Idle horses should not be allowed to remain in the stable, but should be given exercise. Where light work cannot be had, they should be allowed the run of an open lot. They will then be in a much better condition to withstand work when the time arrives.

There are certain general points which apply to all classes of horses. For instance, during the winter season some succulent feed should be supplied to keep the digestive system in good condition. Roots, especially carrots, serve an excellent purpose. Bran mash is also good. Steamed or boiled grain to which has been added a little flaxseed is one of the very best regulators that can be fed. It should be supplied about twice per week.

The feet must also receive attention. They should be kept trimmed from time to time. Horses which are at hard work on pavements should have their feet packed so as to soften the hoof and eliminate any fever or inflammation. This is done by using steamed bran or shorts which is packed in the bottom of the hoof at least twice per week, and in some cases every night. It is very beneficial to the feet. Grooming should never be neglected, as it keeps the skin and hair in good condition, thus causes much better circulation of the blood; consequently better health.

The teeth should be examined at least twice a year. Any sharp projections on the grinders should be removed by means of a rasp made for this purpose. Many horses suffer a great deal due to sharp projections on the teeth. The removal of the same by means of a file or rasp is called "floating." Many horses which are thin and otherwise out of condition are thus troubled. The front teeth sometimes

become too long and slanting, thus need attention. Water should always be given before feeding and none should be given for at least two hours after feeding. The hay or roughage should be fed first, then the grain part of the ration. The harness should always be properly fitted to the horse. Large collars or too small collars should never be used. During warm weather the harness, and especially the collars, should be kept very clean. They should be scraped and washed every evening to prevent sore shoulders. This is an important point, especially with young horses.

LECTURE LXIV.

FEED, CARE AND MANAGEMENT OF THE DRIVING AND SADDLE HORSES.

The driving or saddle horse is used almost solely for pleasure purposes. This fact makes the care and management of this class of animals very difficult to control. It is very seldom that animals of this class receive regular exercise. When the weather is fine and the roads are good, they are usually worked hard. On the other hand, when the weather is unfavorable they are oftentimes idle a great deal of the time. Another point which makes their care difficult is the fact that their labor is usually performed during a couple of hours of the day, and generally of a severe nature during this short period of time. All of these things are unnatural, thus very hard on the animal. Animals to withstand such treatment must receive peculiar feed and care. In many instances it is very hard to exercise such an animal when they are not needed for pleasure purposes. This is especially true in cities and towns, where they are confined to the stable most of the year. The feet need special care, also.

Whenever it is possible such an animal should have a roomy box stall which has a ground floor. This will be helpful in supplying some exercise and the ground floor will be much easier on the feet and legs. This is a most important point. If this stall can open into an open lot, so much the better. The horse should then be allowed a few hours out in the open lot every day when the weather is at all favorable. This will be very helpful and will have very strong tendency to increase and lengthen his period of usefulness. No horse can be confined to a small stall in the stable for any length of time and retain its vigor and soundness. Imprisonment of this kind will ruin any animal.

Where an exercising lot can be had, it should be long and rather narrow, so as to prevent the horse from running in a circle, which so often results in a slip or a fall, which

may prove to be very injurious to the animal. With a long lot the animal will have a chance to extend itself, and when near the end of the lot will stop with its feet under it, which is not so liable to injure it as if running in a circle. This is an important feature of the exercising lot.

The ration of the driving horse should be different from that of the average work horse. This is due in a large measure to the peculiar demands of such an animal. They should be fed much less roughage in proportion to their size than horses at ordinary work. The roughage should also be of a different nature. The driving or saddle horse must have plenty of endurance, thus must be fed roughage which will not in any way cause looseness of the digestive system, or "washiness," as it is generally known. In this respect timothy hay seems to be the very best kind of roughness for the driving horse. Mixed hay does fairly well where animals have very light work. Clover hay, when dusty, is very liable to cause wind trouble. When good pure clover hay is fed, it is too loosening, thus animals fed on this kind of a ration are soft and "washy." Millet may be fed in very small quantities. Good pure oat or barley straw may oftentimes be used in small quantities.

For grain nothing is equal to good clean heavy oats. Other feed stuffs may be equal as heat and flesh producers, but they do not possess the stimulating qualities which are found in oats. This is supposed to be due to a specific albuminoid which is found only in the oat grain. It gives the horse his fire and snap which is so desirable in the saddle or driving animal. Oats should form the major part of the ration. Some other feed stuffs can usually be added to the oat ration and by so doing reduce the cost of the grain ration. Some bran, shorts, corn, gluten feed, barley, wheat and a great variety of other feed stuffs might be mentioned in this connection. Oats should always constitute at least one-half and better still two-thirds of the ration fed. For instance, a ration of three parts oats, two parts corn and one part of either bran, shorts or gluten feed will give good results. Regarding the amount of roughness and grain to be fed, it will vary some, depending on the amount of labor to be performed. It is not best to feed over ten or twelve pounds of hay and from twelve to fifteen pounds of grain to a horse which has regular work.

For horses which have light work about the same amount of roughness and from six to ten pounds of grain. This will have to be regulated by the amount of labor performed. It is not necessary to cut the fodder or grind the grain for horses which have good teeth and plenty of time to feed. Steamed feed or a mash of some kind should be fed at least twice a week.

Roots, during the winter season, and some green feed during the summer months, should be supplied. They will have a favorable influence on the health of the animal.

Another important point is the watering of this class of animals. They should always be watered before being fed grain and should not receive any for at least two hours after feeding. It is not best to give driving horses a large quantity of water at one time especially just preceding a drive, as it is very apt to affect the digestive system and may cause the animal to scour. The horse which is required to make a long drive should receive water every two hours, especially during hot weather. Little and often is a good rule to adopt in this connection. Water will never injure a horse, no matter how warm the animal may be, providing it is given in small quantities and slowly.

Salt should be supplied at all times. It should not be added to the grain ration. A better method is to have it in a separate box. Either rock salt or the common salt may be used.

The teeth should always be examined at least twice a year. Any sharp projections on the outer edges of the molars should be removed by means of a rasp or file for this purpose. The incisors or front teeth should be kept short and even. This will aid very much in the proper mastication of the feed. Many thin horses consume plenty of feed, but on account of poor teeth cannot utilize the proper amount of the same.

The appearance of the saddle or driving horse depends in a considerable measure on the condition of the skin, hair, tail, and mane. A well groomed horse always looks well. This is really one of the most important points in the management of this class of animals. Too much care and attention cannot be given to the matter of grooming. The skin should be soft, the hair fine, soft and short. The mane and tail fluffy, ears free from long hair, and the legs to the knees and hocks clipped in such a manner as to present the

appearance of always being free from long hair. The hoofs should be kept clean, well oiled, and polished occasionally.

These things add as much to the appearance of the horse as neat, well pressed clothes, clean linen, neatly blackened shoes to the appearance of the well groomed man.

During cold weather a large, warm blanket will aid very much in keeping the hair short and soft. When the weather is warm a light cover should also be used to keep the hair nice and at the same time it serves as a means of protection in fly season. The curry comb should not be used except to clean the brush from time to time. The brush alone should be used to clean the hair. The mane and tail should be combed out well with a comb for this purpose, not a curry comb, as it will cut the hair. A piece of soft flannel should be used to put on the finishing touches. Some prefer a chamois skin for this purpose.

It is very important that the attendant should be careful in all the little details. Kindness in every detail should prevail, as the temperament and disposition of the animal add very much to its value.

LECTURE LXV.

FEED, CARE AND MANAGEMENT OF THE STALLION.

The proper feeding, care and management of the stallion is a most vital point. Perhaps more mistakes are made in this connection than in any other kind of horse management.

One of the most frequent mistakes made by inexperienced persons, and even by many who think that they know all about this subject, is the endeavor to keep the stallion in fine show condition all the time, and especially at the opening of the breeding season. To this end drugs and nostrums are oftentimes used. The horse is kept carefully housed and closely blanketed; he is loaded with fat; his muscles become soft and flabby for want of exercise, and although he may come at the beginning of the season apparently in the pink of show yard condition, he is not nearly so well fitted for service in the stud as he would have been had this fitting been entirely eliminated.

One of the very first principles in the preparation of the stallion is that a healthy horse does not require any medicine whatever to put him in condition for the stud. The whole secret of successful preparation lies in a few words. Let him be well and regularly fed on healthy, nutritious food, with plenty of exercise every day to keep his muscles firm and hard, with plenty of grooming so that his coat may present a fine appearance. The skin should be kept thoroughly clean by occasional washing and frequent brushing and grooming. The mane and tail should be kept clean and thoroughly brushed out. If very dirty, use soap in the cleaning process; and when this is properly attended to there will be but little danger of having fine tail or mane ruined by rubbing.

The ration should be mainly good, sound oats, as nothing is better. It may be varied somewhat from time to time by an occasional ration of corn or barley for variety sake. A change of diet at times seems to have a favorable influence on the health of the animal. Wheat bran is a most

valuable adjunct, thus should always form a part of the grain ration. It is one of the cheapest, safest and best regulators for the bowels, and it is also especially rich in protein and ash, two important constituents from a nutrition standpoint. For roughness, good, pure hay, timothy, timothy and clover, or bright clover, or good, pure corn fodder, all answer an excellent purpose. It should be clean and free from mould and should not be fed in large quantities. Some roots, especially carrots, can be fed to good advantage twice or three times per week. The quantity of feed will be governed by the animal and the amount of exercise given. The number of times to feed also varies. Some good horsemen recommend three and others four times per day. In either case no more should be given than will be promptly eaten up clean. Just feed what the horse will eat up clean with relish. This, with plenty of exercise, will usually keep the horse in good condition.

Water should always be given before feeding, and none for a couple of hours afterwards. The stomach of the horse is small (holding about sixteen quarts) and a pailful or more of cold water will arrest the action of digestion, instead of aiding it, thus the advisability of always watering before feeding. The stallion should be watered often, and given but a little at a time. Salt should be kept before him at all times. Either rock or granular salt may be used.

The question of exercise is a most important one. The amount of exercise to be given will vary somewhat with the condition and habit of the horse. If he be in thin flesh and it is desired to fatten him up, the exercise should be lighter than it otherwise would be. On the other hand, if he becomes too fat, this may be remedied by increasing the amount of exercise. The walk is the natural gait of the draft horse and he should not be driven or led at a faster gait.

For roadster, coach, or running horses, a moderate "jog" will not hurt them, but prove beneficial. The light horse will also require much more exercise than the draft horse. It is very difficult to have this exercising done properly. Most grooms and stable hands are too lazy to do this work in a right manner. The stallion should not be walked or jogged long enough to become tired, but they should have enough of it daily to keep the muscles firm, the appetite good, and to prevent the laying on of an undue amount of fat. Most

draft horses should have the equivalent of five or six miles walk each day, while light horses require from seven to eight to keep them in right condition. In many instances where it is impossible to have the horses walked each day, an open lot is used to provide exercise. This is not so good but it is much more economical of labor, thus the reason for practicing the same. The exercising lot should be long and rather narrow, so as to prevent the stallion from running in a circle, which so often causes him to slip and fall or otherwise injure himself. With the long lot he will have ample opportunity of extending himself and at the same time little or no chance of accident. The fence around such a lot should be tight for one-half its height (about four feet) and slat fencing above so that the stallion may see all that is going on on the outside, thus eliminating fretting and worry on his part.

The main point in the stable management is to feed, groom and exercise so as to keep the horse in the very highest possible pitch of strength and vigor. A healthy horse needs nothing but good food, pure air, plenty of exercise, with due attention to cleanliness and regularity in feeding and watering. Some horsemen confine their horses to stalls in which they are tied, but the large majority use box stalls. A box stall twelve feet wide by eighteen or twenty feet long with a ground floor serves an excellent purpose. There should be a manger or rack for hay; in some instances a box well fitted in the corner is used for grain, while many prefer that the feed boxes should be entirely detached from the stall to be removed as soon as the horse is done eating. The hay being fed on the floor in one corner of the stall, thus leaving nothing in the way of projections such as boxes, racks, mangers, sharp angles, etc., upon which a spirited horse might injure himself. If, in addition to these precautions, the sides of the stalls be lined all around—doors and all—with stout boards, standing out at the bottom about eighteen inches from the wall, and sloping upwards and toward the wall for a height of three and a half feet, you will have a stall in which it will be next to impossible for a horse to injure his tail or mane by rubbing. In such a stall the stallion should be loose and the owner may rest assured that the liability to injury is reduced to a minimum.

The stallion's feet require careful attention. They should be cleaned out every day with a foot hook to prevent foul

matter from collecting about the frog of the feet and causing "thrush" and other foot troubles.

The breeding stallion, during service season, requires special attention for the best results. The regulation of the service of the stallion is a feature that is not thoroughly understood or practiced by many horsemen. Some stallions which are very strong and vigorous can do a much heavier season's work than others. This should be carefully regulated with all horses, as the first two weeks' use is the hardest. Many horses are ruined for the entire season by too heavy use during the first week of the breeding season. The number of services should be limited to about two the first week and four the second week. After this one a day or two one day and one the next with strong, mature horses. This will depend to a considerable extent on the rations fed, the health of the animal, and the previous management so far as exercise is concerned.

LECTURE LXVI.

BREAKING AND FITTING HORSES FOR MARKET.

This is one of the most important things to be considered in connection with the horse industry. More men fail to reach the top in the horse business, due to lack of intelligence in the breaking and preparation of horses for the market, than from any other cause. This subject is of peculiar interest, due to the fact that so many men are concerned in the production of horses. The proper breaking of a colt determines to a considerable extent the future usefulness of the horse, and no man who has ever dealt in horses and experienced difficulty in their management will deny that there is room for a great deal of improvement over our present methods of doing this work. From time to time we see illustrations of improper breaking. We see people who have driven horses for two or three years which have never been taught the lesson of how to back. A horse is not thoroughly broken until it is taught each and every one of the things which it may be called upon to do at any time. In addition to the losses resulting from improper breaking, millions of dollars are lost to the farmers of this country every year by selling horses that have not been properly prepared for sale. It is a comparatively easy matter to fit horses for sale. It can be done without taking them from their regular work. Still, where heavy gains are to be made, the less work a horse does and the quieter he is kept, the quicker he will put on flesh.

In breaking a colt the first thing to be considered is the nature of the animal. The disposition of no two horses is exactly alike. As a rule there is a great difference in the disposition of the native horse and those from the western states, especially from the ranges. The native horse is much easier broken than the western horse, though the latter, when properly broken, is a very reliable animal. There is also a great difference in draft and light horses, especially those which are bred for trotting and running purposes.

The draft horse requires much less preparatory handling than the trotting or running bred horse.

After making a careful study of the disposition of a colt the next thing to do is to halter it. To do this properly the person in charge must possess a great deal of patience. The colt should be properly secured in a box stall or a small shed, preferably one with a ground floor, so as to eliminate all danger from slipping. Take a halter with a rope about fifteen feet long attached to it. Pet the colt and treat him kindly so as to win his confidence, and he will soon learn that you are not going to hurt him, thus making it usually very easy to put on the halter without any trouble. If the colt is at all nervous and likely to pull on the halter it is best to break him of this at the beginning. Take the loose end of the rope and pass it through a hole in the manger or around a post and back between the fore legs, placing it around the girth and tying it there. The colt is now tied by both the head and the body. Step back from him and let him fight it out, and it will usually not take him very long to learn that he is conquered. When tied in this way there is no danger of injury, as is oftentimes the case when tied by the head only. As soon as he learns to stand quietly and has given up pulling on the halter, pet him and give him to understand that you are his friend.

It is well to leave him tied for some time before trying to teach him to lead. Teaching a colt to lead by the halter is a very important part of his education. Here is where a great many men fail. A horse that is well broken to lead is more attractive, easier to handle, and will command a higher price in the market than one that is not properly broken. In training to lead always teach the colt to walk beside you and never allow him to follow along behind, as is often the case. This can be done very readily by taking a whip in the left hand and touching him up a little from behind as you walk along. A few lessons of this kind will teach him that the proper place for him is beside you, and he will not want to be any other place.

After being well trained to walk beside you, encourage him to trot. This can also be done with the gentle use of the whip. It is well at the beginning to have the lead shank in the mouth of the colt, so that he will not get away from you should he become frightened. In leading, keep his head

well up, so as to make him look attractive and stylish. Also keep his head as straight ahead of him as possible.

Do not make the lessons too long or tiresome, as short lessons, given often, are the best. A colt which is well broken to the halter will always show to good advantage. After he is thoroughly halter broken, the next step is to get him used to the biting harness. This consists of an open bridle with a check, surcingle, crupper and side lines, which go from the surcingle to the bit to prevent him from turning his head to either side. Put this on him and check him up—not too high at first, but raising his head a little each day until the desired height is obtained—which will make him look most attractive. For this lesson let him have a yard in which he may go about at his own will. After he has become well accustomed to the bit and check, put on long lines instead of the short side lines and teach him to drive, start and stop at the word; also to back. This is a very important part of the breaking. It is very easy to teach a colt to back if you have plenty of patience. Most men are in too much of a hurry to do this properly. Encourage him to back, step by step, by steadily pulling on the lines and at the same time telling him to back. As soon as he makes a step backwards slacken on the lines and say "Whoa." Repeat this until he will back when told and as often as you tell him. If proper care and kindness are combined it will not take long to accomplish this part of his education.

The next step in the colt's education is to hitch him in harness. This may be done either single or double. In many respects it is preferable to break him single at first. The advantages of breaking him double over single at first are that when he is hitched with a reliable horse he will not shy so readily at strange obstacles. The only reason we recommend breaking him single at first is that his education up to this point has been alone—not with other horses. In breaking him single he should be hitched to some kind of a breaking cart. There are many good breaking carts on the market which are not very expensive. The cart must be strong and durable. These are points which must be given careful consideration. Many a good colt is ruined by first hitching him to some worn out or dilapidated cart or vehicle of some kind. A man who has not a breaking cart may accomplish the desired end in another way. He can make a breaking cart by using two wheels of a light wagon with an

axle, to which he may attach two poles to act as shafts. These poles or shafts should be long enough so that should the colt kick he will not in any way hit the cross bar or get his feet over the same. A seat should be placed on the cart and then it is ready for use. While this may not look so nice as a regular breaking cart, it oftentimes answers a very good purpose and will save the breaking of a good buggy or other vehicle which is not intended to be used for breaking colts.

An open bridle is best, for when broken with an open bridle the colt will usually go all right with the blinders. Always start a colt with an easy bit, for a severe bit that will irritate the mouth will oftentimes make him misbehave when otherwise he will go all right.

When first hitching a colt always use a harness with a breeching, so that he will get used to it along with the other harness. Before hitching a colt in the cart it is best to put a set of hopples on him. These can easily be made by taking a set of straps, which should be strong and large enough to pass around the fetlock. These straps should have rings in them. To the rings attach a rope about twelve feet long. Pass the rope from each one of these straps up through the girth and back to the seat. This will be found to be very helpful in case anything should go wrong and the colt should become unmanageable so far as reining him by the bit is concerned. Should anything happen just pull up on the rope and you will bring him down on his knees, and thus prevent him running. He should not be pulled up too severely, as sometimes by so doing you may bruise or skin his legs. This will also be found to be very helpful in teaching the colt to stand, as he will soon discover that you have a power over him which makes it impossible for him to get away.

When hitching the colt for the first time be as careful as possible not to frighten him in any way, as much of the success depends upon the first time he is driven. As soon as the colt is gotten into the shafts and everything is securely fastened, get on the seat and start him off as quietly as possible. Should he attempt to run or do anything out of place, a gentle pull on the hopples will soon convince him that he is under your control. Keep him at a moderate speed, stopping occasionally. Also teach him to walk. Be sure and do not give him too long a lesson the first time. Many people make a great mistake in this respect. Two

hours will be sufficient for the first lesson. Kind treatment and considerate driving will accomplish a great deal in a short period of time. The colt should receive his lessons each day until thoroughly accustomed to driving. Should he show any inclination to shy, do not use the whip after he has passed the same, as it always does more harm than good. Some people object to leading a colt past a strange obstacle. This is something which oftentimes can be done to advantage. It is not good policy, however, to always lead an animal by anything which in any way appears to scare it. Sooner or later the animal must learn to pass by such obstacles of its own accord. It is much better policy to lead a colt past something of that kind than to try to whip him by it. In getting a colt accustomed to electric cars, steam cars and other such obstacles, do not take him too close the first time. Gradually drive him a little closer each time, until he finally learns that it will not in any way harm him, thus he will stand real close without any fear.

Should the colt get his tail over the line, do not pull on the line. By so doing you will teach him to grip it, thus cause much trouble. Just slacken the line and usually you can get it free without any trouble.

In teaching the colt to back when hitched, do it in much the same manner as when driving with the lines. Be careful, however, not to expect him to back too quickly.

After the colt has been driven and you wish to unhitch him, never do up the lines first, then the tugs and last the holdbacks. Always do up the tugs first, then the holdbacks, and lastly, the lines. Then should he start to run you will always have something to catch and prevent him. In hitching him double the same care and precaution is necessary. It is best to hitch him with some well broken horse that is a good walker and a free driver. Never hitch him with a lazy horse that has to be whipped up all the time. Hitching a colt with a lazy horse which requires the constant use of the whip, will nine times out of ten ruin it.

If colts are of good size, and especially those belonging to the draft class, they may do some light work very soon after being broken. In fact they will learn just as fast, and can be taught to do a great many things while doing light work. Light horses or colts which are bred for trotting or coach purposes can oftentimes be made to do a certain amount of light work without any injury. In teaching the

colt to draw a load, be sure and have it light at the beginning. Gradually increase the weight from time to time as he is able to handle it. Encourage him in his work, start him easy and he will usually get along nicely. Balkiness in horses is nine times out of ten caused by injudicious handling at this stage. Many men will load a colt down with far more than he can handle and then, if he does not start right, will whip him and abuse him. When this once happens it is very seldom that a colt will ever develop into a horse of much value. In teaching a colt to draw at first it is very important that he is always placed where he has good footing. Otherwise he may become discouraged and be made to balk. After having him nicely started the main object should be to keep him going and not to undo anything that has already been accomplished.

In the preparation of horses for the market, breaking, while very important, is only part of the work. Everything should be done to make the animal attractive to the eye of the purchaser. No man can expect to receive the full value for his horses which he has raised and broken unless he fits them in such condition as to meet the requirements of the market. The market demands horses of mature age, and it matters not whether they are trotting bred, coach or draft, they must be in good flesh to bring their full value on the market. Farmers, as a general rule, fail to recognize this last fact, and millions of dollars are lost to the farmers of this country annually, due to this one neglect. A horse is not recognized on the market as being a mature animal until he is five years old.

In fitting horses for sale it is very important that they be in good condition. Draft horses may oftentimes be fattened and will usually make much larger gains when they are confined to the stalls than when worked or given exercise. Light horses which are intended for driving purposes cannot be fattened in this way, but should be given a regular amount of exercise every day, and this can best be accomplished by moderate driving. The stables should be comfortable, the stalls kept well bedded, and horses so arranged in the stalls as to best attract the eye of visitors or buyers who may happen to visit the farm.

As previously stated, driving horses should be given a liberal amount of exercise, and this can just as well be accomplished by doing a moderate day's work, but under no

circumstance should they be over worked or over driven. Many men who are preparing horses for market make the fatal mistake of allowing their animals to remain in the stalls for a week or ten days, then take them out to exercise and drive them for a few hours as fast as the animal can go, and by so doing remove all the flesh which they have put on in the previous eight or ten days.

Another point which we must consider is the grooming. This is a very important part of the preparation. A horse with a sleek and glossy coat is much more attractive than one with long, dry hair. They should always receive a good cleaning at least once a day. The feet and legs should also be given proper attention. The manes and tails should be kept well brushed, so as to give them a neat and attractive appearance. Do not use a curry comb on the mane or tail, as it has a tendency to cut the hair, thus give it a rough appearance. A singer can usually be used to good advantage to do away with the long hairs under the body and around the throat. In light horses a great improvement can be made by clipping the legs as far as the knees in front and as far as the hocks behind. This requires to be neatly done and well tapered off at the knee and hock, so as to look as smooth as possible. The hair in the ear should also be clipped out and the mane pulled. The feet should be properly trimmed and kept well leveled. A few hours put on a horse in preparing him in this way will add much to his appearance and may add \$50 or \$100 to his selling price.

When the horse is nearly ready for sale give him an occasional lesson on the halter. Teach him to trot up well with a graceful carriage, to stand with his head erect so as to present a good appearance when the buyer inspects him. In this respect it is always better in standing a horse to stand him with his front feet a little higher than his hind feet. If you wish to drive him in harness and present him in this way for sale, be sure and have the harness well cleaned and polished, as it will add many dollars to the value of the animal. Have the harness properly adjusted and fitted to the horse. Any deviation from this depreciates the value of the animal. In showing a horse in harness, teach him to drive up; also to stand with his head well up.

LECTURE LXVII.

FATTENING HORSES FOR MARKET.

One of the most important points to be considered in the preparation of horses for the market is to have them properly fattened. This applies to all classes of horses, but it more especially applies to the draft horse. Usually carriage horses and other types of horses intended for driving purposes carry a sufficient amount of flesh. They should be fat enough to give them a smooth appearance. The draft horse, however, is a different animal. He must be unusually fat to sell to advantage. Nine-tenths of our draft horses which are sold weighing from 1600 to 1700 pounds, should be made to weigh from 1800 to 2000 pounds. The draft horse market is a peculiar one, as weight is one of the most important factors in determining the price. Usually every 100 pounds in a draft horse after he weighs 1600 to 1800 pounds is worth twenty-five cents a pound; every pound from 1800 to 2100 pounds is worth about fifty cents a pound; thus the importance of having the horse real fat.

In the preparation of the driving horse it is very important that he be given regular exercise. With the draft horse this is not so important. In fact most successful fitters omit exercise altogether, claiming that they can get much heavier gains by keeping the animals in a quiet place. Many men prefer tying them in stalls where they may have a ground floor and a rather dark stable. These conditions seem to be conducive to the putting on of flesh.

In the preparation of driving horses for market the feeding of the same should be somewhat different from that practiced in the fattening of the draft horse. It is always best to water before feeding in any class of horses, and never after feeding until two or three hours have elapsed. Salt should be kept within reach of the animals at all times. In feeding the driving horse do not make the common mistake of feeding too much. About three-fourths pound hay per day for every one hundred pounds weight of the animal is

sufficient. That is, a horse weighing 1200 does not require more than nine pounds of hay daily. The hay should be pure and free from dust. For grain a mixture of oats, corn and bran, fed in the proportion of about fifty pounds corn, fifty pounds oats and twenty-five pounds bran, makes a very good mixture. Feed about one pound per day for every 100 pounds weight of the animal. In some instances, however, it may be necessary to feed somewhat more.

Boiled or steamed feed, fed two or three times a week, will be found to be very helpful in keeping the animal in good health; also in giving a sleek coat of hair. A little oil meal or flaxseed added to the feed before being steamed will also be found to be very beneficial in this respect. Some carrots or potatoes may also be fed to good advantage. The method of feeding above referred to is especially desirable and applicable to the fitting of light horses. They must be given regular exercise.

The horse most commonly grown upon the farm and the one which is so often neglected when it comes to preparing him for market, is the draft horse. He should be fattened in a somewhat different way. As previously stated, pounds of flesh are an important factor in determining his market value. This being the case it is very necessary to have him make heavy gains. One of the first points to be considered in fattening a horse is to attend to his teeth. Many horses fail to make good gains, due to the fact that their teeth are not in proper condition. The preparation of the teeth is known as the floating of the teeth. It is best to get a veterinarian to do this, as he has the proper instruments, and where there are many to do it can be done more rapidly. Floating the teeth is a point which a great many people overlook and is in many instances the real cause of a horse being out of condition. When a horse has a number of sharp projections on his teeth the gums become raw and sore, so that he does not masticate his food thoroughly, consequently indigestion often results and the horse runs down in his condition. In examining a lot of horses recently it was found that a large number of them had sharp projections on the under edge of the grinders. Their mouths were in such a condition that a person would wonder how they could eat at all. But after the teeth had been floated down quite a marked change was noticed.

As previously stated, one of the most important points to be considered in fattening draft horses for market is to secure heavy gains. In this connection fattening of the draft horse is commonly termed stall feeding horses for market. It is done in very much the same way as with cattle. In one of the large horse feeding establishments of the West the following method is practiced: The horses are purchased, their teeth are floated and they are all put in the barn and fed gradually, as great care must be taken for a few days to avoid colic. It seems most preferable to feed them grain about five times per day, due to the fact that the stomach of a horse, being proportionately smaller than the stomach of a cow, he needs his feed in smaller quantities and often. The hay is placed in racks so that they may have access to it at all times. They are given all the water they will drink twice a day. The following method is followed in feeding the grain: Corn is given at 5 o'clock in the morning; water at 7; the hay racks filled at 9 o'clock, when they are also given oats and bran, the proportion being two-thirds bran and one-third oats. Then at 12 o'clock they are fed corn again; at 3 in the afternoon oats and bran, and the hay racks are refilled; at 4 they are given a second watering; and at 6 the last feed of corn is given. The proportion for each horse when upon full feed is as follows: Corn, from ten to fourteen ears at each feed; oats and bran, about three quarts per feed, making in all from thirty to forty ears of corn and six quarts of oats and bran per horse per day. The horses are not given any exercise. It seems impossible to give them all sufficient exercise, thus they are not given any from the time they are put in the barn until a few days before they are to be shipped. As a substitute for exercise, in order to keep the blood in good order, thus preventing stock legs, Glauber salts is used. This is found to be quite satisfactory and will in most cases prevent this trouble. It is mixed with the oats and bran, as in this way the horses eat them quite readily. These salts are fed about twice per week. They can be purchased very cheaply from the druggist when bought in considerable quantities. They are not so strong as the Epsom salts and they have a desirable and cooling effect upon the blood. The same firm also feeds oil meal. They claim that it aids greatly in putting on flesh; also that it gives the skin a soft, mellow touch. The mangers and feed boxes should be cleaned out twice a

day, and the cobs and all other refuse thrown out behind the horses and taken out with the manure. The horses should be given sufficient time to rest their stomachs, and this can be done by giving the first feed at 5 o'clock in the morning and the last between 6 and 7 at night. Horses fed as described above usually make good gains. In some instances horses fed in this manner have made a gain of five and one-half pounds a day for a period of fifty to one hundred days. One horse gained 550 pounds in 100 days. In many instances from one dozen to twenty horses have made an average daily gain of three and one-third pounds per day for a period of ninety days.

One of the largest horse feeding establishments in the state of Illinois, a firm which has fed hundreds of horses annually, feed much along the same line as outlined above. They made a business of buying in horses in the half-fed condition from farmers and feeding them from one to three months in preparation for the market. The length of the feeding period would depend upon the condition of the animal when purchased and the prospective outcome of the same. Large framed, coarse boned animals were always fed much longer than the fine, pony built horses. The former class would make heavier gains and required more flesh to give them finish and to make them attractive to the eye of the purchaser.

Many people have doubted the wisdom of forcing the horses in this way. They claim that the animals will not wear as long after being subjected to such fattening processes. This may be so, and no doubt it is in no small degree. Still, we must cater to the demands of the market. We must give our purchasers what they want. In draft horses they demand fat, thus if we hope to get the highest value for our animals we must sell them in high flesh.

LECTURE LXVIII.

STABLING SUITABLE FOR HORSES.

Shelter of some kind must be provided for the horse, especially for the work horse. In this respect they differ from the other kinds of stock, as nearly all the other classes of stock in some country or portion of country are maintained without shelter. In cold climates stables are necessary for the horse as a means of protection and from the standpoint of convenience. In warmer climates they are more often provided and used as a means of convenience. This is due to the fact that the horse is used for labor purposes, thus must oftentimes be had on very short notice. This of necessity causes the owner to make some provision of a place of some kind where the horse can always be found. Out of this necessary provision has grown the many elaborate stables of the present day.

In general, stables should be so constructed as to meet the needs of the occasion to the very best advantage for the smallest expense possible. They must be so constructed as to protect the animals from the cold blasts of winter, also to supply plenty of fresh air during the summer months. They must be convenient and durable. They must be well lighted and have proper facilities for ventilation. These are points which must always be considered in planning the stable.

Most men make the mistake of building too small a structure, and as a result reduce the size of the stalls, the alleys, the feed rooms and harness rooms, to such an extent that they are always inconvenient. The horse stable should be convenient. It is used every day in the year and every provision possible should be made to have feed rooms convenient, the stalls wide enough, the alleys wide enough, so that either horse or man can pass behind the other animals with safety. The harness room should be near as possible so as to eliminate all unnecessary walking on the part of the attendant. Ample provision must also be made

for plenty of light, as nothing will add more to the appearance of the stable and the health of the animals than plenty of sunshine.

The stalls should be of sufficient length and width to answer the needs of the animals. Single stalls are preferable to double stalls on account of the greater safety and freedom which they afford the animals. This is especially true in the case of a man who is constantly purchasing new animals. Some of the stalls should be larger than others so as to make ample provision for larger animals. Box stalls should always be provided. They are very convenient for brood mares, foals, or horses which are in any way injured. No stable is complete without at least two large, well-lighted box stalls. They also make a very safe place to put a vicious horse in during the night, thus preventing his harming the other animals in the stable should he by accident become freed from his own stall.

The mangers should not be too high from the ground and should be provided tight bottoms. Boxes should be arranged in one end of the manger for the purpose of feeding grain. The floors may be brick, cement, wood or ground. The brick floors are durable, but hard on the animal unless very heavily bedded. The cement floors are much the same as the brick, with the exception that they are not so durable where horses have sharp calkins on their shoes. The sharp calkins have a tendency to chip the cement and in time make holes in the same. The wooden floors are not durable and are also filthy, due to the fact that they retain too much moisture. The ground floor is the only kind which is not hard on the feet of the horse. They are objectionable in some instances, due to the fact that they are easily "pawed" by horses which have such a tendency.

In recapitulation we would emphasize the importance of securing the greatest amount of convenience, comfort, light, and durability for the least possible expenditure of money.

LECTURE LXIX.

FEED, CARE AND MANAGEMENT OF BROOD SOWS.

One of the most common mistakes made in connection with brood sows is the use of the immature animals for breeding purposes. In the Central West, and in fact in most sections of the country, from one-half to two-thirds of the sows which are kept for breeding purposes are under one year of age. This simply makes the breeding business more or less complex in its nature. That is, we have no assurance of the value of these young animals for breeding purposes. A sow which has once been bred and reared a good litter of pigs can usually be counted upon to do likewise afterwards. The evil results which follow the breeding from immature sows are: 1. Reduced size of litters. 2. A weakened constitution. 3. A general refinement in the animal and lack of size. These are all points which each and every breeder of hogs must consider very carefully. As a general rule, the only safe kind of a sow to keep for breeding purposes is a mature animal which has already proven her worth as a breeder. Brood sows should be fed differently from those animals intended for fattening purposes. Corn, while an excellent feed for fattening hogs, should be used in very moderate amounts for breeding animals. It should not form more than one-third of the ration. This is due to the fact that corn is a fat and heat producing feed. The ration of the brood sow should be of a nitrogenous nature, so as to have a cooling effect upon the system. Sows which have an abundance of exercise can withstand more corn feeding than those that are confined to the pens. A ration of shorts and oats, or some gluten feed, or any other feed stuff which is fairly rich in nitrogen, will give good results. Probably one of the best rations will be a mixture of one part corn, one part shorts, and one part oats. In some instances bran is used, instead of shorts, for feeding of brood sows, especially where mature animals are kept for breeding pur-

poses. Oil meal, while used to a considerable extent for breeding stock and for fattening hogs, must be fed with great care to the brood sow, especially near farrowing time. It has been known to cause abortion when fed in considerable quantities shortly before farrowing time. During the summer months, the brood sow should have the run of a blue grass, clover or alfalfa pasture. If none of these are available, some forage crop, such as rye, oats and barley; peas, oats and barley; sorghum, cow peas, sweet corn or rape should be supplied. It is also very important that the brood sow be fed succulent food during the winter season. In this respect some corn ensilage or roots answer a very good purpose. These keep the digestive system in good order. It is further believed that some clover or alfalfa hay which has been finely cut and steamed serves a good purpose. In some instances the use of leaves of alfalfa or clover as a part of the ration is recommended. One important feature which should not be overlooked is the necessity of plenty of exercise. Many men make a fatal mistake by confining their brood sows to a small pen and feeding them heavily on feeds of a fattening nature. Where such a course is followed, evil results are almost sure to come at farrowing time. The sow will usually be so fat and her system heated to such a degree that milk fever or inflammation of the udder is almost sure to occur. The number of litters per year which a sow should rear will depend upon the conditions. If you wish to market your pigs twice a year at the age of six or seven months, it will be found much more profitable to rear two litters per year than one. This is especially true in those sections of the country where the bacon hog is produced. Where mature sows are used for breeding purposes, two litters per year can be reared to advantage. It must be borne in mind that where two litters per year are reared it is a very hard drain on the system of the sow. Young and immature animals cannot withstand such a drain on the system. Where mature hogs are used and they are well bred, two litters per year can be reared without much difficulty.

For a short time before farrowing it is not best to feed very much grain feed. Thin slops are much better than any other kind of a ration. This is due to the fact that it is very necessary to keep the digestive system cool and to feed feeds which are very easily digested. A couple of days pre-

vious to farrowing from four to eight ounces of Epsom salts should be fed in the feed. This will prove beneficial in cooling the system and thus prevent milk fever or inflammation of the udder. After farrowing, the pigs should be left with the mother. The mother should be fed on feeds conducive to the production of milk. After farrowing, the sow should have a light ration in the form of a mash composed of wheat bran and shorts or their equivalent, gradually increasing up to the tenth day, when the sow can be put on full ration, and ground corn and oats in equal parts can be added to the ration already mentioned. The sow should be fed, too, according to the size of the litter. Other rations suited to the same purpose are skim-milk and shorts; skim-milk, shorts and corn; skim-milk, shorts and oats; skim-milk, shorts and barley. Where two litters per year are to be reared the young pigs should not remain on the mother more than four or five weeks. Where they are taught to use other feed at an early age, they will do just as well in a separate pen after four or five weeks of age, as they will on the mother. At weaning it is best to remove all pigs at once. If the udder is inclined to be full and has a tendency to cake, it should be milked out by hand. The practice of allowing a few of the pigs to remain on the dam for a few days longer is often very injurious to the mother. This is due to the fact that each and every pig has its own teat, thus will not drain all the others. In addition to the points which have been mentioned above good general care and management should be given to the dam. She should always be well fed and fed on feeds conducive to health.

LECTURE LXX.

FEED AND CARE OF YOUNG PIGS FROM BIRTH UNTIL READY FOR FATTENING.

The brood sow should be placed in a comfortable pen a few days before farrowing. If the weather is inclined to be cool, this is especially desirable, while on the other hand if the weather is warm sometimes she may be allowed to run in a pasture lot. For a young brood sow, however, or even for any age of a sow, it is safer to have her in a small pen which has been especially prepared for farrowing purposes. She should be accustomed to this pen, so that it will not be strange or different to her. A fender which can be made from a 2x6 or 8-inch scantling should be placed along the wall about seven or eight inches from the floor. This affords a means of protection by preventing the mother from lying on the young, for in such a way she cannot get within six or seven inches of the wall and they will not be crushed but will have an opportunity to escape without any injury. This point will often save the lives of several of the little pigs. If the weather is cold, it is best that the bed should be warmed properly and properly dried. For bedding, cut straw or chaff is preferable to long straw. Long straw makes it hard for the little fellows to get around, thus more or less liability of their being crushed by the mother. Cut straw also takes up the moisture much more readily than does the long straw. If any of the little pigs are chilled at farrowing time they should be removed from the pen and taken to a warm place until they have recovered. It is not a good policy, however, to keep the little ones away from the mother too much of the time. By so doing, and especially with a young mother, there is some danger of her not owning her young. Provision should be made so that the little fellows may have an opportunity to secure some feed in addition to that provided by the mother as soon as they are old enough to use the same. A little trough in which some whole milk is supplied will prove very attractive

to the pigs. The whole milk may be gradually changed, however, to a skim-milk ration, but the skim-milk must be sweet to prevent scours or bowel trouble. As soon as they take to the skim-milk a little shorts may be added to the same. In this way the young pigs may get a great deal of their ration required for maintenance by the time they are four or five weeks of age, thus making the weaning period an easy one. This is especially beneficial where two litters per year are to be reared. It is then very desirable to have the young pigs weaned at an early age, say four or five weeks. After weaning, the same ration as that which was fed before weaning may be fed to advantage. Nothing seems to give better results for the young pigs at first than a ration of milk and shorts mixed in the proportion of one part of shorts to three or four parts of skim-milk. Feed them at least three times a day. Better results may be obtained if they are fed four times a day for the first month. During the spring and summer season they should be allowed the run of a good blue grass, red clover, or alfalfa pasture. Nothing seems to give better results than blue grass or alfalfa in the growth and development of young pigs. If blue grass, red clover or alfalfa cannot be supplied, some forage crop such as that mentioned in the previous lecture should be provided. As they get older a ration of shorts may be fed with some corn added to the ration. Corn is not so conducive to growth but is an excellent feed for fattening purposes. Some oil meal added to the corn ration will also prove good in that it will have a favorable influence on the digestive system of the animal. Sweet corn may be fed in conjunction with grain ration during the fall months. It seems to answer an excellent purpose. Squashes, mangels or some other kinds of root crops may also be used to advantage. Where these are fed it is better to have them cooked or steamed and mixed with the grain ration.

One thing which must always be kept in mind is the importance of having clean dry quarters for young pigs. Filthy quarters are very injurious to the health of these little fellows and prevent their proper growth and development. The pens should be so arranged that there will be an abundance of sunshine.

Where two litters per year are to be reared, the fall litter should come early enough in the season so as to have made considerable growth before the cold weather arrives.

In this respect they should farrow at least by the 1st of September. These farrows should be given proper care and attention until the 1st of December and then placed in warm dry quarters and well fed, and should make good gains during the cold weather. If, on the other hand, they come late in the fall and are exposed to the cold weather and improperly fed and housed, poor gains will be realized.

During the winter season it is especially desirable to feed some steamed or cooked food. This seems to keep the system in good shape. Pigs which are being fed on steamed or cooked food must have warm comfortable quarters and must not be exposed to extreme cold at any time, else inflammation may occur. Hogs which are confined to warm quarters part of the time and then exposed to real cold for a few minutes are very susceptible to inflammation and other such troubles. In some instances where young pigs are suckling the mother, especially if the mother is a real heavy milker and they are confined to small quarters, trouble may be experienced through "thumps." This trouble may be prevented by giving them more exercise. If it is during the winter season, while the sun is shining bright, they should be allowed out in front of the pen for an hour or so each day. Plenty of fresh air and exercise will always be found a good preventive for "thumps."

LECTURE LXXI.

FEED, CARE AND SELECTION OF STOCK INTENDED FOR BREEDING PURPOSES.

In selecting stock for breeding purposes there are several points which must be given due attention. One of the first and most important is good breeding. Another point which we must consider is conformation—that is, that in addition to good breeding, the pigs to be selected should possess the desirable conformation or form which is demanded of the class to which they belong. Another point to be observed in the selection of stock intended for breeding purposes is that they be from mature stock, strong in constitution and of good size. It is a very poor policy to select breeding animals from immature sires or dams, or from sows of weakened constitutions or lacking in size.

By good breeding we mean stock descended from animals which have for generations possessed the desirable qualities which go to make up a real good market hog. Nothing but pure bred sires should be used. The dams should also be pure bred. Where grade sires are used, breeding is more or less a lottery. Another point which should be considered in selecting stock for breeding purposes is to select from those strains or families which are noted for their prolificacy. This is a point in which a great many of our breeds, and especially families of certain breeds, are very deficient. In conformation the young pig should have indication of developing in the desired form; that is, it should have length of body, depth of body, smoothness of shoulders, width of back, loin and hindquarters, should stand squarely on its legs, should have indications of having bone and should have the characteristics of the breed to which it belongs. It must indicate constitution by having good depth and width of chest. It must also have a good coat of hair—that is, a thick, straight coat. Thin-haired pigs are not desirable, as thin hair usually goes with a weak constitution and lack of size.

After having selected the type of a hog desirable, it is all important that this animal be given good feed, care and attention. It must be fed on a ration conducive to the development of bone and muscle. Breeding hogs differ very much from fat hogs. They are expected to be kept until they are several years old, therefore must possess good bone and must also have good muscle. This calls for a ration rich in nitrogenous matter. It also calls for a ration rich in ash matter. This being the case, corn being a ration which is deficient in nitrogen and ash, should form but a small portion of the ration for young and growing animals. Feeds rich in protein, such as shorts, oats, gluten feed, oil meal, alfalfa, red clover, rape, skim-milk, etc., should constitute the major portion of the ration fed. Corn, however, while deficient in protein and ash, may be fed in a limited amount, especially when properly combined with the other feed stuffs.

These young pigs must be liberally fed, as it is all important that they obtain a good growth at an early age. They should be separated from those intended for fattening purposes before they are three months old. They require more exercise and more nitrogenous feed stuffs than those which are intended for fattening purposes. The boars should be separated from the sows and given different care and treatment. The sows should be forced rapidly and should not be bred before they are at least eight months old. The boars should also be fed liberally and should not be used for breeding purposes until they are at least eight months old. The boar should not be used very heavily the first year and not more than ten or twelve sows should be served by him during his first season. This is an important matter, one which a great many breeders fail to give proper attention. The young boar especially, and the young sow, too, should be given a liberal amount of exercise. This is a very important feature.

LECTURE LXXII.

FATTENING HOGS FOR MARKET.

The age at which hogs should be fattened will depend more or less upon the market demands and the locality. In some countries and in different sections of the same country we find that there are differences in the market demands. As a general rule in this country the fat or lard hog has been the most popular. When such is the case it is better to market hogs at the weight of from 300 to 400 pounds. These seem to meet with the most popular favor of the buyers. In other sections of the country and in other markets where the bacon type of hog is preferred over the fat or lard hog, they must be marketed at an earlier age. The best weight for the bacon hog is between 160 and 220 pounds. They do not require to be nearly as fat as the fat or lard hog; still, on the other hand, a bacon hog is by no means a thin animal. They should have a covering of about one inch of fat over the back. They should be deep sided and long sided, and must be firm in quality. Where the bacon hog is desired, as a general rule it will be found most profitable to have the hogs fattened and finished for market at about five and one-half or six months of age. Where the fat or lard hog is desired, the most profitable age to market the same in order to meet the requirements of the market would be about eight to ten months. Hogs of this age should weigh in the neighborhood of 300 to 350 pounds. As a general rule, however, it may be stated that the greatest and most economical gains, especially the most economical gains, are made on the younger animals. This is one point in favor of the bacon hog.

The season of the year at which the fattening should be done will depend upon various conditions. In some instances, in fact in a great many cases, hogs are fattened during the fall and early winter months. In other instances they are fattened during the spring and early summer months. Generally speaking, the most economical gains can

be made during the early fall or spring months. The weather is then not too cold nor too warm—in fact, about right for the best gains. In real cold weather a considerable amount of the feed is used for the production of heat to supply the heat required for the maintenance of the animal body. In real warm weather, on the other hand, a considerable amount of feed may be wasted. Where two litters per year are to be reared it will be found best to fatten the first bunch and market them during the months of September and October. The second litter should be fattened and ready for market some time during the latter part of March or the month of April. These are things which each and every feeder must, to a certain extent, control himself.

Concerning the various kinds of feeds which are to be used in the fattening of hogs, in this connection we must consider the feed stuffs which are available, those which are home grown and most easily grown, those which are most palatable for the animals, and, lastly, those which are most economical. All of these factors must be considered in selecting the ration. There are a great many different kinds of rations, comprised of different combinations of feed stuffs, which give very good results. One important factor seems to be that variety be supplied. A combination of feed stuffs always gives better results than any single feed stuff when fed alone.

In the western states corn must be the basis, and form a large proportion of any grain ration fed. This is due to the fact that corn is the staple grain grown in this country. Taking it one year with another it is the most economical feed which the farmer has at hand for swine feeding purposes. Corn, however, is not a well balanced feed for young and growing hogs, thus should be fed in conjunction with some other feed stuffs which are rich in those compounds such as protein and ash, in which corn is deficient. Corn is a strictly fattening food. For hogs which are a year or a year and one-half old, and which are to be fattened in a short time, perhaps a ration of corn will prove as economical and give as heavy returns for the feed consumed as any other feed stuff or combination of feed stuffs that can be used.

Hogs, however, as a general rule are not kept until a year or one and one-half years old before marketing, but are marketed at from six to ten months of age, thus should be

fed on some feed stuff which is not only adapted to the production of fat, but conducive to growth as well. In this respect a ration of corn and tankage, fed in the proportion of four or five parts corn meal to one part tankage; or a ration of corn meal and gluten feed, equal parts by weight, or a ration of corn and shorts, equal parts by weight; or a ration of one part corn, one part barley and one part shorts by weight, or a ration of two parts corn and one part of either wheat or shorts by weight, when fed in conjunction with skim-milk, will give excellent results. These feeds are especially adapted to fall or winter feeding. During the summer months the most economical gains can usually be secured by fattening hogs on some kind of pasture or forage supplied in some other way. For instance, corn when fed to hogs which have a run of good clover pasture, alfalfa pasture, blue grass pasture, soy beans, rape, cow pea pasture, and a mixture of peas, oats and barley which had been sown early in the season, will give very good results. The forage crops mentioned are all rich in protein and seem to have a favorable influence on the health of the animals.

No one feed stuff is best under all conditions. Each and every man must be governed largely in this respect by the feed stuffs available, and those which are most economical.

Preparation of Feed Stuffs.

In the preparation of feed stuffs no definite rule can be recommended which will answer all conditions. Different kinds of feed stuffs and different ages of the animals will have an influence in this respect. During the fall and winter months, especially if the weather is somewhat cold, steaming or cooking feed may be an advantage in that it supplies the same in a warm condition. It may also increase the palatability of the same. During the spring and summer months there is no advantage derived from steaming or cooking except from a palatability standpoint. In some instances feed stuffs which are inclined to be musty may be made very much more palatable by steaming them. Soaking has much the same influence that steaming or cooking has, and seems to be much more economical in spring or summer feeding.

Feed stuffs which have a hard hull, such as barley, should be ground, or if not ground, should be soaked for

twelve hours or steamed before feeding. Where alfalfa or clover hay is added to the ration during the fall or winter months it should be cut up very fine, steamed and added to the ration. Hogs which are being fattened, especially if they are being forced for a quick finish, should have some kind of a condiment. This will aid digestion and give tone to the system. In this respect, sulphur to the amount of one teaspoonful every two or three weeks has sometimes been found to be very beneficial. Probably one of the most common and at the same time beneficial preparations in this respect is prepared from charcoal, wood ashes and certain other adjuncts which are considered to be beneficial to the health of the hogs which are being fattened. The following mixture has been recommended: Six bushels of corn cob charcoal that has been well crushed, or three bushels of common charcoal, with one bushel of ashes, eight pounds of salt, and two quarts of air slacked lime. Dissolve one and one-half pounds of copperas in hot water, sprinkle it over the mass and thoroughly mix. Put this into self feeding boxes or somewhere where it will be protected from the weather, and let the pigs partake of the same at will.

It is very important that the hogs be kept in comfortable quarters, well bedded and clean. They should be fed all that they will eat up clean within a half hour or so after feeding. It is a bad mistake to feed more than they will clean up in the course of twenty minutes or half an hour. It is much better to underfeed a little than to overfeed, especially during warm weather. Any feed which is left over during warm weather soon ferments, and thus becomes undesirable. The feed floors and troughs should be kept very clean. In fact, most good swine feeders sweep off their floors and feed troughs every morning and evening.

LECTURE LXXIII.

PREPARATION AND FITTING SWINE FOR SHOW PURPOSES.

The successful fitting and preparation of swine for the show rings is a business in itself. It is something which a man must study carefully for himself; and to a large measure obtain his knowledge by experience in the show ring and in the preparation of the stock for the same. There are so many little details which must be observed closely, the neglect of which may mean failure. Perhaps no other line of live stock management is so important, and especially so hard to master, as the proper preparation and fitting of animals for exhibition purposes. The first consideration, however, is to use good judgment in selecting animals which have some outcome to them. It is the height of folly to think of making a show animal out of an animal which is not bred right. This is the first and most important essential. Nothing but strong, vigorous, healthy animals should be selected in the hope of making prize winners. They must possess good form; must have the desired form of either the fat or the bacon hog, depending upon which class they belong to in this connection. For instance, with the bacon hog it would be useless to select short, chubby youngsters with the hope of making show animals out of them. On the other hand, in the fat hog class, we must not select too short and chubby animals if we hope to be successful. Still, there is such a thing as selecting too long and rangy an animal as to make a good fat hog for show purposes. The medium length should govern. Perhaps in no other instance is breed type so important as in those animals intended for exhibition purposes. It is really the first and foremost requisite. There are various breeds of fat hogs as designated by those points which characterize the breed type of the animal in question. This being the case, no animal which is at all deficient from a breed type standpoint should be selected for

exhibition purposes. It would simply mean time, money and labor thrown away.

Constitution is a very important point. A hog which has a good constitution will withstand a great deal more exposure and will make better gains than one which is poor in constitution. Furthermore, in all our show rings, any weakness in this respect is discriminated against most severely. The question of bone is an important one. In many instances it is the deciding point in the show ring. A hog must have plenty of bone, and that bone must be of good quality. A large, coarse, porous bone is not desirable. We must have size of bone, combined with quality. The feet and legs are also very important. A hog which does not stand well on its feet and legs can never make a show animal. Crooked legs, long pastern, knock knees, and all other deviations from the correct form should be discriminated against. Quality throughout as indicated by the refinement of the head, the ears, the shoulders and the bone, is a very important feature.

The coat of hair must not be overlooked, as a swirly coat will be very much discriminated against. Curliness or coarseness of coat is also very undesirable. On the other hand, a thin haired, fine haired hog is always discriminated against. A good coat should be medium in length, straight and very thick, and should be of the desired color of the breed in question.

Having all these points, the next thing to be considered is the feed which will produce proper and uniform development. It is very important that the hog intended for show purposes should have a ration which is properly balanced. That is, one which will supply plenty of muscle, building material, and an abundance of bone. In this respect nothing seems to serve a much better purpose than shorts combined with oats, or shorts and barley, and shorts with a small amount of corn. The best ration, however, is a ration of skim-milk and shorts, with perhaps a little corn or barley added. Sometimes as much as 10% oil meal is added to the grain ration. It seems to have a favorable influence upon the health of the animals, and also adds quality in finish to the same. During the summer months a good clover or alfalfa pasture, or, in fact, any forage crop which is rich in protein, makes an excellent adjunct to the grain ration.

Hogs intended for show purposes should have abundance of exercise. Many good show hogs are ruined by being confined in too small a pen or yard. In such instances they go lame, lose the power of their limbs, and other things which would be very objectionable from a show ring standpoint.

If the hogs are not coming on quite as fast as you would like them and have not quite as much finish as you would like, feed some whole milk, as whole milk is the best feed available for fitting a hog for show purposes. The only objection to the use of the same is that it is rather costly. Next to whole milk, skim-milk and oil meal probably stand second.

Before going out on a show circuit it is well to wash the hogs with a good brush, soap and luke-warm water. This will clean the scurf out of the skin and present the skin and hair in much better condition than it otherwise would be. Washing, practiced at least once or twice a week before commencing the fair circuit would be found to be very helpful. The feet should be trimmed and kept short. This will aid very much in keeping the hog on his feet. If the toes are long and allowed to grow out, the tendency will be for the animal to go down on its pasterns.

Be very careful of the ears of show animals. Do not nip them or put in labels which will in any way interfere with the shape of the ear. This is especially true in those breeds which have fine ears and which are of a drooping nature.

Another important point to be considered is the training of the hogs at home to show well. No man should take a hog out to an exposition or fair who has not spent some time in training him to show at home. A hog which is a little inclined to be weak in the back can usually be held up fairly well by walking him around and keeping the head down. The general tendency is, however, for a hog which has never been shown to get his head up and back down when it is taken into the ring with strange animals.

In the show business every little point counts, and each and every man who hopes to be successful will be very much benefited by studying all the little details. It is the giving of attention to details that counts and the man who masters this part is the man who will be successful in show yard contests.

LECTURE LXXIV.

FORAGE CROPS FOR SWINE.

Forage crops of some kind are very commonly used in connection with the production of pork. Various kinds have been used in this country and some kinds are especially suited to one locality, some to another. One of the main things to be considered in planting forage crops is to get a variety so that there will be plenty of feed throughout the entire season. Many men make the mistake of confining themselves to some one crop, thus have an abundance of the same at certain seasons of the year while at other seasons of the year they have little or no green feed for their hogs.

The use of green feed of some kind either during the summer or winter months has proven to be very beneficial to the health of the animals. This is especially true in the case of breeding animals and young stock intended for breeding purposes. It seems to be necessary to supply forage of some kind to animals intended for breeding purposes. Forage crops also serve another purpose. They are very valuable in balancing the ration. This is especially true in sections of the country where corn is the staple grain crop grown. Corn, while rich in carbonaceous matter and very valuable from a fattening standpoint, does not contain enough protein and ash for the proper development of bone and muscle. Most of our forage crops, especially those belonging to the legume family, are very rich in protein and ash, thus make an excellent adjunct to the corn ration. Alfalfa, clover, soy beans, cow peas, and the Canadian field pea are all very valuable in this respect.

As previously mentioned, it is very important to supply a variety of forage crops in order that there may be an abundance of green feed at any and all seasons of the year. Some men who are very successful in the swine breeding business use rye, which has been sown the previous fall, to supply the earliest green feed in the spring of the year. When rye is sown in the month of September it furnishes an excellent

pasture very early in the season. It can be used for a month or two. It is especially palatable and very much relished by the animals while it is young and tender. After it has obtained some height the straw becomes rank and unpalatable. It should either then be allowed to ripen, or be plowed under and replaced by some other crop which will furnish green feed later in the season. After that blue grass pasture, red clover or alfalfa will furnish the next crop for the spring months. Blue grass pasture does very nicely at any season of the year providing there is enough of it. Most men make a mistake by pasturing hogs on the blue grass pasture lot by having too many hogs for the amount of pasture. It is rich in protein and mineral matter, thus makes an excellent feed to add to the corn ration. Red clover, where it can be had, makes one of the most acceptable forage crops that can be grown in this country. It is very rich in protein and ash matter, thus an ideal food to feed in conjunction with corn or barley for the proper development of the young animal. In the spring of the year it does very nicely, but it cannot be pastured continuously, as during the months of July and August it becomes very coarse and fibrous, thus unpalatable to the animals. If after it has been pastured a month or so the hogs are taken off the same, and then stubble is cut fairly close to the ground, a second crop will grow up and make a fairly good pasture later on in the season. In this way some swine men are able to get a couple and in some instances three crops of red clover in one year.

In most sections of the country where alfalfa can be grown it proves to be an excellent feed. It will probably furnish more feed to the acre than any other crop which can be grown. It is very rich in protein. In this respect it is richer than bran or shorts. It is also rich in ash matter, thus makes an excellent adjunct to feed in connection with the corn ration. When treated in the same way as the red clover, that is, cut at intervals of four or five weeks, several crops per season may be obtained from the land.

Peas have been used to a considerable extent for swine feeding purposes. They are used especially in Canada and to some extent in the United States. They furnish a considerable amount of feed and are very similar in composition to red clover and alfalfa. The English vetch is also used

and is much the same from a feeding standpoint as peas. A mixture of oats and barley, equal parts; or, one part oats, one part barley, and one part peas; or two parts oats and one part peas, is sown in many sections of the country and used as forage crop for swine. It makes a very good feed for a short time. If different pieces of ground are sown at intervals of two or three weeks, a very good series of forage crops may be provided in this way. Cow peas and soy beans are both very rich in protein and make an excellent feed in any locality where they can be grown. They require a fairly warm climate, thus do not seem to do very well in the northern states. In the southern, however, they stand in the very front rank. Rape has been used quite commonly and is grown very generally throughout Canada and the northern states. When sown broadcast or when drilled in rows two feet apart it furnishes an abundance of green feed. It makes an excellent hog pasture and furnishes as much or more feed than any other forage crop that can be grown. Experienced swine feeders, however, do not seem to like it quite so well as red clover or alfalfa.

Sorghum is grown in many sections of the country and furnishes a very good feed during the latter part of the season. To get the greatest returns from a crop of sorghum it should not be pastured, but should be allowed to grow up and cut and fed to the hogs in small lots. Where it is pastured, there is a great waste, as much of the sorghum is trampled under the feet of the animals.

The feeds mentioned furnish a variety of forage crops during the summer months. It is very important, however, for the man who has a large breeding herd that he make some provision for succulent feed during the winter months. This may be supplied in the form of roots, such as turnips, mangels, carrots, sugar beets, etc. In some sections of the country squash and pumpkins are grown quite largely for swine feeding during the fall months. Some feed them in the raw state; others steam them and feed them in conjunction with grain. Theodore Louis, of Louisville, Wisconsin, one of the most prominent and successful swine men on the continent, always grows an acre of squashes for his hogs each year. He feeds some of them in the raw state, but most of the squashes are fed with grain after being steamed for a couple of hours. In this way he claims he is able to

get excellent results and to make very heavy gains on his fattening swine.

Silage has been used to some extent as a succulent food during the winter months. On account of its large water content a great deal of other feed must be fed in addition to the same if good results are to be obtained.

In summarizing results of the work of the different experiment stations it would seem that red clover stands about first in the list of forage crops, due to the fact that it supplies an abundance of protein and ash; also that it can be grown over a very wide area of country. Next to red clover rape stands about second. After rape, a mixture of peas, oats and barley, or alfalfa, stands about third. In the southern states cow peas and soy beans seem to have the preference.

In growing the forage crops it is not necessary to grow over two or three kinds, but it is very important that the crops be so planted or arranged that a variety of succulent feeds will always be available. Blue grass makes an excellent feed during the early months, and also makes a very good feed during the fall months, but it ripens during the summer months, thus it is not very palatable to the swine.

LECTURE LXXV.

PREVENTION OF DISEASE IN SWINE.

Of all the various classes of stock produced upon the farm, no class has been more remunerative to the farmers of this country than swine. This is due to the fact that they will produce more pounds of meat from a bushel of corn or one hundred pounds of any feed stuff than any other class of animals. At the present day one of the most serious troubles which the farmer who grows swine has to contend with is that of disease. Disease in its various forms as it attacks swine, causes the farmers of this country several million dollars of losses annually. This being the case it is very important that every precaution possible should be taken to prevent the same. Swine, unlike other animals, do not respond readily to treatment once they become affected with any kind of disease. With other animals it is possible to treat them and in many instances save a large percentage when disease of any kind appears in the flock. The opposite is true in the swine herd, thus we readily see the necessity of using every precaution in preventing disease.

For many years we were somewhat in the dark as to the cause of disease in swine. Science, however, has given us much light on this subject. It is now very generally understood that most forms of disease are due to a germ which can be very readily transferred from place to place. Since this is the basis of a large amount of the trouble we can readily see the importance of using every precaution possible to keep the animals in a cleanly condition. Most of these germs or bacteria thrive and make their greatest growth under filthy conditions. Scientists claim that most germs cannot withstand sunlight, thus the importance of having plenty of sunlight in the yards and pens which are used for swine breeding or feeding purposes. These pens should be thoroughly cleaned and disinfected very often. By following such a practice the health of the herd can be very much improved.

Another point which has a beneficial influence on the health of the animal is the kind of feed fed. Some feed stuffs seem to be very influential in keeping the digestive system in good order. Others have the opposite effect.

Among the various feed stuffs which are not conducive to the best health of the animals may be mentioned corn. Still, corn is used in many instances as the sole grain ration or almost the sole grain ration for swine. A variety of feeds is claimed to be very beneficial in this respect. Oil meal, roots, forage crops, shorts, skim-milk and other such feeds are all supposed to have a favorable influence upon the digestive system, thus are beneficial in keeping the animals in good health.

Another important point from a health standpoint is exercise. Where swine are confined in small, damp, filthy yards it is next to impossible to prevent disease. The surroundings are just right and if disease should come in the neighborhood it makes an excellent place for it to start. Swine are not unlike people in many respects. Some people, especially those who are in good health, are oftentimes exposed to typhoid fever and other germ diseases without danger. On the other hand, other people who are not in good health when exposed to any such disease are very susceptible to the same. The same thing is true in the case of swine.

Another important point which will be found to be very helpful in case disease should break out in the flock is that of having the hogs scattered over the farm. By so doing disease may break out in one place and the remainder of the hogs on the farm may not be affected at all. On the other hand, if they are bunched up in small yards and disease should break out, in many instances the entire flock will be affected before it is noticed. In such an instance the only thing to do is to separate the hogs as soon as the disease is noticed, disinfect all thoroughly and transfer them to other yards.

Worms cause much trouble among swine. They may be prevented by judicious feeding. They may be cured by many of the well known worm powders which are advertised in our agricultural papers.

In introducing or purchasing new stock upon the farm the greatest precaution possible should be taken else disease

will oftentimes be brought in in this way. No animal should come upon any farm without being thoroughly disinfected and then quarantined for two or three weeks before being allowed near the rest of the animals. In this way should the animal be affected with any disease, it will have plenty of time to develop the same. Many men have brought hog cholera and other very disastrous diseases upon their farms in this way. They have purchased a hog from what was supposed to be a healthy flock. They have taken the same home and put him with the rest of their swine. In ten days or two weeks the animal will show symptoms of sickness. This is usually followed by other hogs showing the same symptoms. By a little carelessness in this way oftentimes an entire herd of swine has been wiped out by hog cholera. The hog in question may have come from a healthy farm, but in being shipped over some railroad may have been exposed to cholera, thus contracted the disease. A hog which has been brought upon the farm, thoroughly disinfected, quarantined for three weeks and then appeared to be in perfect health, can safely be introduced into the herd.

On each and every farm there should be some provision made for dipping swine. This not only proves to be an easy and effectual method of disinfecting animals which are being brought upon the farm, but it also furnishes a good way for disposing of lice. Every swine herd should be dipped at least twice a year, in the spring and in the fall. There are very few herds of swine that are not affected at some time or other with lice. Some recommend sprinkling or spraying for lice. This is not a very good way to overcome the difficulty, as the lice are usually found on the head close to the ears, under the arm pits, and in other secluded places where spraying could not in any way reach them. Swine thus affected, when put through a dipping tank will be free from all trouble. There are several patent dips on the market, such as Zenoleum and Chloro-Naphtholeum, which give good results.

In addition to all that has been said in regard to the importance of having clean quarters, of feeding the right kind of feed stuffs, of giving an abundance of exercise, of keeping the hogs in small numbers in one place, of providing means for killing worms, of quarantining animals which are to be introduced upon the farm, and of dipping for lice and other

such troubles, we must pay due attention to the vigor and constitution of the animal. Too much stress cannot be laid upon constitution and vigor in selecting stock for breeding purposes. Animals which are strong in constitution can always withstand disease much better than those which are weak in this respect. Constitution is indicated by the width and depth of the chest, by width of head and general active-ness on the part of the animal. In case hogs are troubled with disease it is next to impossible to give them medicine or anything else which will prove very helpful. About the only thing that seems to be feasible is to feed a ration which can be easily digested, keep them in clean quarters, thoroughly disinfect the pens, and let the disease run its course.

For hogs which are very sick from disease of any kind perhaps no kind of feed is more palatable and easily digested than whole milk. It is an excellent feed and has oftentimes proven to be very beneficial in bringing hogs through a spell of sickness. Next to the whole milk comes skim-milk and oat meal or a little shorts. They must not be fed too much grain. The ration must be thin, and the more milk supplied the better the chances for their recovery.

LECTURE LXXVI.

PENS AND SHEDS SUITABLE FOR PIGS.

Pigs like other domestic animals, make their greatest and most economical gains when provided with proper shelter—shelter from the stinging blasts and frosty airs of winter, and from the scorching sun of summer. Experience has taught swine raisers that it will not pay them to withhold shelter and comfort from their brood sows, growing and fattening pigs, in either winter or summer. It is necessary that some sort of shelter be afforded.

It is impossible in this lecture to go into details and show plans for pig houses that will suit all men under all conditions. The most we can hope to do is to point out the fundamental principles that should be observed in the location and building of such structures, while each individual will have to master these principles and build to suit his own conditions.

In the colder parts of the northern states and Canada much more protection would have to be given than would be necessary in the less severe sections of the middle west. But even there warm, comfortable quarters must be provided where little pigs are expected in the fall, winter or early spring months, and some sort of shelter should also be provided against the hot, scorching sun, especially in the south.

Pig houses should be built on high, dry ground where the water from rains and melting snow will easily run away. Perfect drainage should be secured, either naturally or by grading. Not only should the pen be properly located so as to affect drainage, but care should be taken that it is placed so that it will have the protection of a shelter belt if such be present. Another important point to be observed is that it be placed so that prevailing winds will not carry the pig pen odors into the dwelling house.

In all our operations with live stock economy must be considered, and in the building of a pig house cheapness of

cost is a very important consideration which must be regulated by the amount of money which the builder wishes to use for such a purpose. Very useful buildings that will serve every purpose can be erected at a very moderate outlay, while, if a man has the money to spare, there need be no limit to the luxurious quarters which he can provide.

Another important point is that of convenience. Preparing feeds and feeding the same, cleaning out troughs and pens, caring in breeding, care for and management of sows at mating and farrowing time, feeding little pigs, loading pigs for market, lighting, ventilating and many other things which might be mentioned make the swine herder's duties manifold. Farm labor is not plentiful now. It is both scarce and costly, and in planning the pig pen it should be so arranged as to make easy the carrying out of the little details that go to make pig raising both a pleasure and a profit.

Comfort and health are the main objects to consider after cheapness and convenience, and these are secured by providing quarters that are clean, light, dry, warm, well ventilated and free from drafts.

Cleanliness is a point which must receive attention, for it is upon this that much of the success of hog raising depends. Dirty pens and troughs are breeding places for all sorts of disease producing germs. Board floors with cracks are harboring places for filth and are attended with all kinds of unsanitary conditions.

Sunlight must be let into the pen in abundance. In its presence germs cannot live. Where it is denied, sickness is sure to come. Let the pen have numerous large windows in the south and east sides where the sun shines most of the day.

A damp pen is sure to bring disaster to the hog raising business. Rheumatism, lung troubles and numerous other ailments are the result of such a condition. Cement or stone walls are very cold and the moisture inside the pens condenses on such walls and causes endless trouble. Board walls, unless constructed with a dead air space, are almost as bad. Bank pig pens are very undesirable for the same reasons. Hollow cement blocks make a very good wall, but a better one is made by constructing a board wall so as to provide a dead air space. This may be done by placing 2x4's upright, putting a tier of tongued and grooved sheet-

ing on the inside, and on the outside a tier of rough boards overlaid with paper and then sheeted on the outside of this. This leaves a four inch dead air space which is an excellent non-conductor of both heat and cold.

A pig pen should be well ventilated. No animals can thrive in an atmosphere of impure air. But ventilation must be secured without creating an appreciable draft or too great an inflow of cold air. Sufficient fresh air may be created through the cracks in the doors and windows, and the foul air may find an escape through flues leading to openings in the roof. When the weather is very severe the opening should be closed. Another means of admitting fresh air is by the use of the sub-earth duct which consists of one or two rows of tile laid along under the alleyway and having an opening both on the outside where the air enters and on the inside where it escapes into the pens. The outside end should be screened by wire netting to prevent the entrance of rats and other little animals. Flues may be constructed in such a way as to open on the outside at the bottom of the wall and on the inside at the roof, and through this fresh air will find its way into the pens and be distributed. The sub-earth duct plan commends itself because in the winter the air is warmed while passing in as the earth is warmer than the outside, and in the summer the air entering is cooler than the outside air and thus cools off the pen.

While securing ventilation you must not overlook the matter of drafts, for these are very harmful to pigs that are lying down sleeping, and especially the young pigs. All sorts of troubles are brought on by exposure to drafts.

Pigs, too, should have warmth, as it takes less food to maintain pigs in warm quarters, but good ventilation should be sought first as pigs will do much better in colder quarters with good fresh air in abundance than they will in warm ones with the fresh air denied them. Provide a good, clean bed of straw or leaves or some such material, dry walls, good feed, fresh air and sunlight, and healthy, robust, vigorous pigs should be the result, other things being equal.

The combination breeding, farrowing and feeding pen which consists of a large building containing a feed and boiler room and alleyway and properly fitted pens, is one which is very suitable in many sections, especially so be-

cause of its convenience. However, in those parts where diseases are prevalent the small, isolated pens are much safer and hence more preferable. In the larger combination house you have all your pigs together and if the disease breaks out all are apt to be affected, while in the colony system with small isolated pens, one or two pigs may be attacked and be destroyed, say, with cholera, and all the rest of the herd might be left unhurt. This plan necessitates more labor, it is true, to care for the herd, but it is attended with much better results, especially in the corn belt where swine plague and cholera destroy such large numbers. The small pens are constructed quite cheaply and may be built on scantling runners so that they may be easily hauled from one part of the field to another.

Open sheds are sometimes provided for swine to run into. Where such are used they should always open to the south. The north, east and west sides should be tightly boarded and battened so as to protect the pigs from winds and driving snow and rains.

If the larger combination pen is adapted to your conditions you should plan it according to instructions already given in this lecture, and in previous ones, as regards cheapness, convenience and the comfort and health of your pigs.

The pen should be placed east and west so as to face the south. The feed room should be in one end and should be large enough to accommodate grain bins and cooker and fuel. There should be an alleyway of at least five feet in width, but eight feet would be better. Pens should be eight by eleven feet on both sides of the alley. It adds to the convenience if you can have small swing doors, two feet wide, leading from the alley into each pen. There should also be a two and a half foot swing door in the partition separating each pen so that the pigs may be moved easily from one pen to another. Leading from each pen to an outside yard there should be a door two and a half feet high by two feet wide. This can be a drop door which can be easily raised or lowered by having a rope reaching from the alleyway over a pulley in the ceiling just above the door and then attached to the top of the door.

As has been already mentioned, the walls may be made of hollow cement blocks, but a wooden wall as previously described is more desirable.

Cement floors are preferred for several reasons, chief of which are cleanliness, coolness in summer, durability, and they also prevent rats from working underneath and finding harboring places from which they make raids on the grain bins. But they are undesirable in that they are cold in winter and often cause lameness in pigs that are confined in them continually. This difficulty can be overcome, however, by constructing a portable wooden floor six by seven feet on which the hogs may make their beds. A four inch railing spiked around this will be very useful in keeping the bedding in place. In this way the cement can be used for a feeding floor and be easily cleaned, and will at the same time help to save the litter which is a valuable fertilizer instead of allowing it to run beneath the pen to make the hog's environments unsanitary.

A cement trough of eight inches depth next the alley five inches next the pen, and ten inches in width, in place of a wooden trough, will prove a valuable investment because of its durability and cleanliness. The alleyway, too, should be made of cement for reasons already mentioned, durability, cleanliness, prevention of the workings of rats, etc.

Convenience at feeding time is obtained by means of a swinging partition next to the alleyway which is made secure at the top while the bottom is allowed to swing over the inside of the trough when the swill is being poured in from the alley. The door is held there by a long rod which slips down on the other side of the trough. The same holds it fast when in proper position as a partition between the pen and alley.

Any one or more of these pens may be turned into a safe farrowing pen by the use of a simple device. Spike to the three sides of the wall about nine inches from the floor a 2x8 inch scantling and this will prevent the mother from lying on her pigs. When she lies down they can usually get away under this and escape unhurt. The south and east sides of such a pen as we have described should be provided with a large number of windows for the admission of sunlight. If the roof from the north side is elevated three or four feet above the roof from the south side, this vertical space can be filled in at short intervals with the windows which will serve a double purpose—that of ventilation and the admission of light, and sunshine during part of

the year, to the pens on the north side. There should be but one or two windows on the north side, according to the size of the house. A good size for windows is two and a half high by five feet long.

A very suitable height would be eight feet for the south wall, eleven feet for the north wall, sixteen feet to the peak of the north wall.

The colony plan calls for smaller and numerous houses that may be scattered over larger areas. Of these there are different kinds. A small house, eight feet square at the bottom is easily made by sawing 16 foot boards in two. Lay out a foundation with 3x8 scantlings, 8 feet square. Nail these eight foot boards at the bottom and bring them together at the top so as to form an equilateral triangle, and nail to a scantling secured there. Board up both ends, leaving a $2\frac{1}{2} \times 2$ foot opening which can be protected by hanging over it an old sack or a drop door attached with leather hinges. The pigs will get in the way of going in and out and opening these themselves. The cracks should be well battened and the opening should face the south. This house may be put on runners and easily changed from one part of the field to another. It is very convenient for the sow and litter. In order to increase warmth it should be banked up $2\frac{1}{2}$ feet with horse manure. Another house, built on the shanty plan is very suitable for housing brood sows in winter. It is seven feet high in front, four feet at the rear, eight feet wide, and sixteen feet long with a flat roof. In the front there should be a window and at the corner a $2\frac{1}{2} \times 5$ foot door, with the upper two feet of the door fastened shut, but capable of being opened when the attendant wishes to enter. This pen, too, should be well banked up with horse manure and should be comfortably bedded.

Corn cribs with a two thousand bushel capacity or of such capacity as will suit the condition of the feeder, should be placed conveniently near. Sometimes these are built in connection with the hog pen, where pens are placed only on one side of the alley.

Every hog pen should have an outside yard in connection with the pen, in which the pigs may take exercise. These may be large or small, according to the conditions that prevail. All hogs that must be confined in summer should have long, narrow runways, between which may be sown forage

crops of rape, sweet corn, peas and oats, oats and barley, soy beans, or some one or more of the forage crops mentioned in a previous lecture.

Hogs should not be allowed access to a stream coming from sources where contamination from infectious diseases may have taken place. Supply pure water to them at all times in their pens and runways. Scratching posts with kerosone soaked linen are not out of place in a hog house. When hogs are removed from pens the whole apartments should be cleaned and floor, walls and ceiling should be thoroughly disinfected with Zenoleum, Chloro-Naphtholeum or some other disinfectant of equal merit.

In summarizing, provide economical, convenient, comfortable, clean, dry, warm, light, well ventilated, free from draft quarters for your hogs. Special pains taken with little pigs in regard to comfort and warmth, will be amply repaid.

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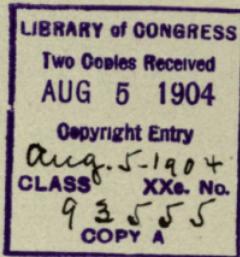
Principles of Breeding
AND
Poultry Management.

BY

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PRINCIPLES OF BREEDING

LECTURE LXXVII.

BREEDING—A SCIENCE AND AN ART.

The subject of animal breeding presents one of the most interesting and, at the same time, most difficult fields of investigation open to the student of animal husbandry. We have records of systematized efforts along these lines ever since the middle of the eighteenth century, when Robert Bakewell sought to develop a mutton breed of sheep, a beef breed of cattle, and a type of heavy draft horse which would be superior to those existing at that time.

Notwithstanding this fact we are still pondering along in the dark so far as many of the principles are concerned. Animal breeding differs from animal feeding in that it takes so much longer to get definite and reliable results. Few men have patience and perseverance enough to follow any line of investigation a sufficient length of time to get reliable and helpful information. Furthermore, man's life is too short in many instances to do much unless he should start at a very early age and continue the same line during his entire lifetime. This is due to the large number of forces which come into operation. There are certain laws which seem to be fairly well understood, and in this connection we will confine our attention to them.

The object in breeding animals should be to produce certain well defined types which are suited to some special purpose or demand. We should use every particle of knowledge available which will in any way aid us in securing this end.

This makes the systematic breeding of animals a science. It is one of the most difficult of the sciences. The term science simply means knowledge systematized. The breeder of live stock, who in his breeding work discovers any point

or points which will be helpful to his fellow breeders, can well be termed a scientist.

The animal breeder who applies the principles of breeding as worked out by the men from Bakewell down to the present day is an artist in the fullest meaning of the word. Art is simply the application of science to some desired end. The breeder of live stock is a moulder of animal form. His work is the greatest of that of all artists. He does not deal with dead forms of material. He is concerned in the moulding and forming of living organisms. If he can by years of systematic study in the mating and care of animals produce a horse with all the parts so developed and blended as to possess the style and grandeur which we sometimes see in the American gaited saddle horse, he has certainly accomplished a high art.

One of the most commonly accepted laws in animal breeding is the law that like produces like. If this were not true in a general way, we would not have any guide at all in our work. Still, this law does not always hold true; in fact, it is doubtful if it ever holds true in every detail. Animals, like people, may possess many characteristics or points of similarity, yet there is always or nearly always some point of difference. It may be in color; it may be in form; it may be in disposition, or one or several of a great number of other things, all of which go to make up the animal.

If the law that like produces like always held true in every detail the breeding of live stock would be a very simple and uninteresting vocation. If such were the case, we would not have our many different breeds and types of live stock. In cattle, for instance, they would all be the same in color, form, size, purpose, and so on. It is that law, which is working all the time, sometimes in a marked way and more often in an apparently unnoticeable manner, that like does not produce like in every detail which makes the breeding of animals difficult, interesting and one of the greatest of the sciences. It is to this law that we owe our marked improvement in the various classes of stock. It was by taking advantage of this law that Bakewell, Booth, Cruickshank and the many other noted breeders were able to accomplish their marvelous work in the field of animal breeding. If in the breeding of animals we are ever to accomplish anything permanent and useful, it will be done by having fixed standards or ideals of what is best, then start out and never let

up until we have reached our mark. This at once emphasizes the importance of a keen eye and a good judge of stock.

It requires a most critical observer to make a good breeder. He must be a broad-minded man, else he will likely get sidetracked by paying too much attention to minor points and not enough to the real purpose. It is said of Bakewell that he always aimed to make the beauty in the form and proportion of his animals contribute to the development of the useful characters. He had a well trained eye which enabled him to detect the slightest deviation of form or any other points desirable or undesirable. Whenever the law that like does not always produce like appeared in his breeding operations he always studied the cause, and if possible applied it at some other time to aid him in his work.

In breeding all classes of live stock we must ever keep in mind that success will be valued by the actual value of the products and the profits to be derived from them. The animal is simply a machine whose duty or work is to convert raw materials into finished products. If we can, by any means or system of breeding, reduce the amount of running expenses of this machine we have accomplished something of value in animal breeding. If we can, by any method of breeding, so perfect this machine that it will turn out a more valuable produce, we have accomplished much. For illustration: If we can produce a type of animal that can be maintained on less than the average ration, it will be more profitable, or if we can produce a meat animal with a larger amount of high priced cuts than the average animal, we are selling our raw material in a better market. There is no subject of more vital concern to the farmer than improvement in his methods of breeding animals. We cannot study this matter too carefully. We must always have utility for our watchword.

LECTURE LXXVIII.

THE INFLUENCE OF HEREDITY AND PREPOTENCY.

One of the most commonly accepted laws in animal breeding is that "like produces like." This simply means the inheritance by the offspring of the characteristics of the parents at the time of procreation. Although there are many exceptions to this law, an examination of the facts will reveal that this law is always in operation, also that it extends to every feature of the organism. While in some instances it may not show up very strongly, this is simply due to the fact that some other law which is more predominant for the time being has obscured it.

The resemblance of the offspring to the parent is very marked in most cases. This is simply the influence of the law of heredity. It is very helpful and valuable in the breeding of our best animals. By means of this apparently simple law we are able to breed definite types for definite purposes. It is the outward guide. Its influence in animal breeding is not confined solely to the external conformation, color markings, and so on. It shows its influence on the nervous system, internal organs and, in fact, in every detail of the animal organism. This being the case, it is sometimes a very dangerous law. Through it, either directly or indirectly, many of the very worst kinds of diseases are transmitted.

In discussing this law it might be well to illustrate the influence of the same by use of a few of the most common and marked examples. The uniformity found in the different breeds of our domestic animals is a very good example. In almost every breed there are favorite families or strains which are noted and valued because through the law of heredity these characteristics can be readily transmitted to the offspring.

The Down sheep, for instance, will invariably transmit their dark face and leg color markings as well as their mutton form to their progeny.

The ability of the cow to convert large quantities of feed

into milk is hereditary in a large measure and is usually transmitted to the offspring.

The peculiar propensities of some kinds of animals to lay on flesh in certain parts of the body is another illustration, and one which is of great practical value to stockmen. Fecundity, also another point which is of vital interest to the stockman, is in a large measure hereditary. In the case of swine certain families have larger litters than others; the same is true in sheep and other classes of animals.

Certain peculiar color markings have also been known to be hereditary. There are numerous other illustrations which might be cited in this connection as belonging to what we call normal characteristics, or those which are not unusual.

Another class of characteristics which are hereditary are those which belong to the acquired or abnormal class. In the acquired class may be placed those characteristics which have been developed by the conditions in which they are placed or the peculiar training they have received at the hands of man.

A few illustrations of this form will suffice to show the influence of this law. The tendency of the dairy cow to give a large flow of milk, which is due in no small measure to the influence of man, is hereditary. In the case of dogs we find certain well defined traits which are transmitted to the young. Young setters, pointers and retrievers, that have never been in the field, will often work with as much steadiness as a dog of long experience. This is an excellent illustration of heredity. These are but a few of many examples which might be cited.

Another class of characteristics which are oftentimes inherited are those of a rather unusual nature called abnormal. They represent something unusual in the way of a freak. In certain human families the presence of an extra toe or finger in one of the parents has oftentimes been transmitted to the children. In some instances of this kind every one of some half a dozen children born to such parents have had six fingers or toes, while in other instances one or two members of the family would be thus affected and the remainder be normal. In some instances the normal members of the family gave birth to children with six fingers or toes. Take the Dorking breed of fowls which has the fifth toe as one of its characteristics at the present time, in early days had

only four toes. The fifth toe was inherited from a five-toed variety introduced into Britain by the Romans.

There are hundreds of illustrations along this line which might be cited. Scientists no longer doubt the possibility of diseases being inherited. This is a point of vital importance to the breeder of live stock. When hereditary disease makes its appearance at the time of birth it is called congenital. Where considerable time elapses before it appears it is designated as a case of predisposition or a tendency to disease. There are certain diseases which are transmitted with greater uniformity than others, yet a predisposition to almost every known form of disease is almost likely to become hereditary. In this connection we will not attempt to describe or enumerate all the diseases which are hereditary, but to notice only those which illustrate the laws of hereditary transmission or that are of peculiar importance to the breeders.

Scrofula and its allies cover a large and very important class of troubles which are more or less hereditary. In this connection much of the trouble is due to constitutional defect as indicated by a narrow, slack chest, indicating lack of vigor and stamina. This is especially true in tuberculosis, which is one of the most common and destructive troubles to cattle.

Bone spavin, curbs, ring bone, navicular disease and other similar troubles of the bones and joints are in most instances of a hereditary nature. These troubles are very seldom present at birth. They usually make their appearance before the animal is six years old, or as soon as the parts in question are subjected to a strain of rather severe nature, such as any horse is likely to receive at hard work.

Barrenness in animals belongs to this class and is very likely to be inherited. These illustrations are but a few of the large number which might be cited, still they show the varied influences of this law in its relation to animal breeding.

By the law of prepotency is meant the superior influence which one particular breed of animals has over another breed, or the one particular parent has over another parent in transmitting its characteristics to the offspring. This is an important law in the improvement of our animals. It rarely happens that we find an equal mingling in the offspring of the natures of both parents. For some reason or other the offspring generally possesses more of the characteristics of one parent than of the other. In many respects this is a

great advantage to the breeder. By securing a prepotent sire he can oftentimes remedy a common defect in his whole female herd.

Prepotency is supposed to be governed by the vigor of the animal, the age of the animal, and the length of time during which its ancestors have been bred along a special and distinct line. Certain breeds of cattle like the Galloway are supposed to be more prepotent than some of the newer breeds, due to the fact that the Galloway is one of our very oldest breeds. Certain families are more prepotent than others, due to the fact that they have been bred along a distinct line for many generations.

Prepotency is usually treated as breed prepotency and as individual prepotency. The former is general and the latter special in its influence. The same law seems to act in the same way in both cases. The division has a special and real value to the stock breeder. Breed prepotency is seen when animals of any of the old and well established breeds, such as Shorthorns, Galloway, Jersey, Merino and many others, are used on other breeds, or on the ordinary stock. The offspring will nearly always bear a very marked resemblance to the one of the above mentioned breeds used.

Individual prepotency is seen in many of the families of the different breeds of stock. In the trotting horse we find certain sires which sired more noted animals than others, due to their superior prepotency. In Shorthorn cattle certain bulls have sired large numbers of prize winners, and so on in all the breeds. This peculiar power which one parent possesses in a greater degree than the other in determining the shape, color, temperament and so on of the offspring is known as prepotency. A thorough knowledge of this law is very helpful to the breeder, as nothing but prepotent sires should be used in the breeding herd.

LECTURE LXXIX.

ATAVISM AND ITS INFLUENCE IN ANIMAL BREEDING.

The law of atavism simply means a "throwing back" or reverting to some form, color or other characteristic which formerly existed but does not at the present time.

In the breeding of animals many problems rather complex in nature present themselves. If the first law that "like produces like" always held good, there would not be any differentiation in animals. They would all be the same in every detail. Such is not the case. Some animals resemble one parent, some the other parent; some possess in a certain measure the characters of both parents. In some instances the young in one or more respects does not resemble either parent, but resembles some remote ancestor perhaps four or five generations back. This "breeding back" or "throwing back" is called atavism. In this connection Mr. Darwin cites the following interesting case: "A pointer bitch produced seven puppies. Four were marked with blue and white, which is so unusual a color in pointers that she was supposed to have been bred to a greyhound instead of a pointer; thus the whole litter was condemned. A gamekeeper, however, saved one as a curiosity. Two years afterwards a friend of the owner saw the dog and declared that he was the image of his old pointer bitch Sappho, the only blue and white pointer of pure descent which he had ever seen. Upon close inquiry they found that the young dog was a great-great-grandson of Sappho."

In the case of poultry we have many illustrations of this law. In one instance a poultry fancier crossed his fowls with Malays. He tried very hard to eliminate the Malay characters, but in vain, as they would appear from time to time even forty years afterwards.

Miles refers to an interesting case in cattle breeding that occurred in the Kennebec Valley. At one time there were a few polled cattle in that valley, but they finally became extinct. For thirty-five years after the last of these polled cattle was killed the cattle on a particular farm all had horns, but at the end of that time a polled animal made its ap-

pearance in his herd having all the characteristics of the original breed.

It is also stated on the authority of Mr. Sidney that in a litter of six pigs two young ones appeared with the marks of a Berkshire which had been used twenty-eight years before.

The occasional appearance of horns or "scurs" in the polled breeds of cattle, which have been bred pure for many years, furnishes another example of this law.

In early years tan color spots were common on the face and legs of the Spanish Merino. These disappeared entirely for many years, but at the present time many flocks are to be found with these markings, no doubt the result of atavism.

The same thing may be said of the dark noses of Shorthorn cattle and the tendency for the ears of the Poland China and other drooping-eared breeds to become erect. These are illustrations of atavism.

We could go on and cite hundreds of cases to illustrate this law, but it is not necessary. There is no doubt but that such a law is constantly in operation in animal breeding. It is of vital importance to the breeder to have an understanding of this law. It simply makes the breeding of animals a more complicated and uncertain business. How are we to know what to expect when we mate two animals? Is it possible to overcome these objectionable features which appear from time to time? There seems to be but one method of combating this trouble, and that is by keeping a very careful record of the ancestry of the animals. In fact, the name and breeding alone is not sufficient. We should have somewhere a complete description and history of each animal. If we had this back for a long period of years we might then be able in a greater degree to prophesy what the progeny should be.

This emphasizes the value of the pedigree. It furnishes a means of tracing the history of ancestors, for the purpose of determining the characters that are liable to be transmitted by atavistic descent. That is the only means available at present in most herds. In some, however, where a complete register is kept, we are able to get much valuable information concerning each animal. It would be of great value to our stockmen if each and every breeder kept an individual record of his animals. The breeding of animals is a complicated subject, thus every possible method should be practiced which would simplify this problem.

LECTURE LXXX.

INFLUENCE OF LAW OF CORRELATION.

By the law of heredity and other influences we have discovered that when two animals of extreme diversity of type are mated the offspring does not, as a general rule, have the peculiar or extreme characters of either parent developed as fully as either parent. They seem, in a sense, to blend together and form a happy medium. This same thing is illustrated in photography. By the continuous focusing of a camera on a number of different animals, using the same plate all the time, and then developing the same, we will discover that if there were certain characteristics in common in all of the animals these will be very marked in the photo. On the other hand, if every other animal is of a different type to what the preceding one was we will have nothing but a blur.

In the same connection where animals which have some points in common and in other respects are widely different are mated the offspring will show prominence of those characters which are in common and the suppression of those which are different in the parents.

In the arrangement of these dominant characters in the organization there seems to be a principle of development and suppression, which is designated by naturalists as the law of correlation. The law may be defined in a simple term as follows: Any peculiarity in the development of one organ or set of organs is usually accompanied by a corresponding modification or suppression of organs belonging to some other part of the body.

This law seems to be in keeping with nature, that is, that each and every part should be properly developed. If by artificial means, or by selection, we seek to develop one particular part, that in time the same will be checked as other necessary parts will not be developed in a sufficient degree to sustain life.

In blind people where the sense of sight is lacking some

of the other senses are generally unusually developed. The sense of touch, for instance, usually attains a delicacy that is surprising when compared with that of the average person. There are some instances of blind people who could tell colors and shades of colors by the touch.

People who are affected with color blindness seldom, if ever, have an ear for music. In some blind people the sense of smell is so highly developed that it is used in distinguishing persons. Some blind people are enabled to perceive the entrance of a stranger in a room by the sense of smell. Cats which are white in color and have blue eyes are usually blind.

We could go on and enumerate a large number of examples to illustrate the basis of this law and its influences. It certainly should be of interest to stockmen. An understanding of it may be helpful in accounting for some of the many disappointments in animal breeding. In this day and age, we hear much about the desirability of having an all purpose, general purpose, or dual purpose animal. By such an animal in the horse world we would mean one which combined the speed of the trotting horse, the strength of the draft horse, and the docility of the coach horse all in one animal. That such an animal would be desirable cannot be doubted. It would be a most useful animal on any premises. Can such an animal be produced with any degree of certainty is another question.

Practical experience would indicate that such a thing is not possible. In some instances we may find animals which in a measure have the requisites of an all purpose animal. They will not stand the crucial test of comparison with the best of any special class. The 1,300-pound horse has too much weight to measure up with the lighter bodied, more angular, fleet footed thoroughbred on the race course. The same thing is true when compared with the trotting bred horse. On the other hand, it cannot compare with the heavy draft horse weighing a ton or more, when it comes to heavy pull.

It may have the energy, the pluck and the willingness to do its best, but it has not the weight, and that is what counts. When the steam engine was first invented it was thought necessary to have cog wheels and a track to correspond to insure its usefulness in pulling a load. This idea failed and the engine would not work. A light horse oftentimes fails to pull a heavy load up a hill, but when part of the load is put on

the back of the animal, thus giving it extra weight, the task will be accomplished without any trouble. This illustrates the impossibility of producing a horse suited to all kinds of labor. If proficient in one, he is lacking in the other.

The general purpose cow, or the dual purpose cow, as she is commonly called, belongs to the same class. There was a time when all of our cattle were the same. The cow gave milk enough to feed the young. Man, however, by selection and feeding has developed two distinct types, one the high-class beef animal and the other the high-class dairy animal. It is not difficult to breed either one of these types, when but the one quality is wanted. It is a most difficult matter to breed an animal which combines these qualities in a fair degree, to say nothing of getting an animal equal to the ideal beef animal from a meat standpoint and possessing the milking propensities of the Jersey or Holstein. This is impossible. It is possible, however, to breed an animal which will have a fair beef form and at the same time possess medium milking qualities.

This is really the dual purpose cow and is much nearer to the type of cow which formerly existed than either the dairy or beef types, both of which are in a large measure artificial. This same principle holds true in the breeding of all classes of animals. When we start out to secure an unusual development of one part of the body, the same can only be secured at the sacrifice of some other part. This is the law of correlation of parts, which simply means a regular and uniform development of all parts and organs of the animal.

LECTURE LXXXI.

INFLUENCE OF THE LAW OF VARIATION.

The breeder of live stock notices from time to time changes in his animals; the progeny do not always resemble the parents in every particular. This difference in some instances is very slight and confined to just a few points. In other instances these changes are very marked; so marked as to present an animal very different from either of the parents. It is doubtful if there ever was an instance in animal breeding in which the offspring did not in some way, perhaps very little, differ from the parents. This being the case, we can see that there is some law at work all the time, which produces results different from the first law, that of heredity, which is that like produces like.

This new law is called the law of variation, and may be defined as the law that like does not always produce like. In a sense it is antagonistic to the law that like produces like. Still they both seem to operate in animal breeding in a useful manner. The first law might be more properly defined by saying that like produces like in a general way. This would allow of some minor points of difference which are always present. It may be a slight difference of form, in any one of its numerous details. It may be a difference in temperament, in color, in function or in any one of a great many other points which might be mentioned. This is one of the most important and useful laws in animal breeding. Without it, it would be impossible for us in any way to improve our animals. It may act in the way of improvement or in the way of deterioration or retrogression. It is to this law that we owe the presence of so many different breeds of live stock. It is through the influence of this law that we are able to breed animals for special, definite purposes, such as the ideal beef steer and the highly developed dairy cow. They both represent variations from the original type. It is through the influence and presence of this law that our various breeds and types of animals retrogrades so rapidly

when the conditions for retrogression are present. Thus, we can easily understand the necessity for the stockman to have a full understanding of this law in its action and the causes which render it most influential.

In this connection we will discuss in a very brief manner some of the causes of variation and the influences of the same in animal breeding. The causes of variation in animals are numerous, but in this connection we will mention a few of the most striking examples, such as changed conditions of life due to climatic influences, food, general care, selection and so on. Thus we can readily see that variation in a certain degree can be controlled by the man in charge. Food is a most influential factor. The high type of beef animal which we have at the present time is the result of liberal feeding and judicious selection. The kind of feed fed will have a marked influence on the conformation of the animal. For instance: Liberal feeding of roughage will develop the digestive organs, thus expand the body. In this way the large barrel and capacity of the dairy cow has been produced. On the other hand, by the use of concentrates in feeding swine the length and capacity of the intestines of swine has been materially increased over that of the wild hog, which had to secure a considerable portion of his food by grazing.

The size of the animal can be materially increased or decreased by the amount and nature of the rations fed. Swine, for instance, when fed on a ration of corn alone for a number of generations will dwindle in size of body and boney framework. When fed on feed stuffs rich in ash and protein the opposite results will be obtained.

Selection is also an important factor and is one of the most important points in accomplishing variation of a desirable and useful kind. The fine wooed breeds of sheep are a good illustration in this respect. By good care and proper selection they have been developed up to their present state of perfection.

Selection always plays an important part in all desirable variation, whether it be in sheep, horses, cattle or swine. The climate also has its influence. Its influence, however, is not so marked in the case of our domestic animals, as in those in their wild state. This is due to the artificial influences which man has introduced in animal management by improved buildings, thus better shelter from climatic changes. The Shetland pony and the Galloway breed of cattle are both

good illustrations of climatic influences. These animals in their native land have to rough it and are exposed to a rugged climate. When introduced into other countries, where they are more liberally fed and better housed, they lose their rugged coats and increase in size.

Variation as treated thus far might properly be designated as natural variation. We have another kind which sometimes manifests itself in another form; a rather unusual form, and is called spontaneous variation. It differs from natural or ordinary variation in that it is much more marked and usually confined to individuals rather than to a number of animals in a herd or breed. Natural variation usually is recognized as a slight change in form, color, or some other point, and generally affects a number of animals in a herd or breed. Spontaneous variation is more marked in its influence and less general in its distribution, as in many instances not more than one animal may be affected in a herd. It is in a measure something over which the breeder has no control. It usually comes as a surprise and cannot be easily accounted for. Some claim that it is due to a severe shock given to the mother, or mental impressions at the time of conception, or during the early stages of pregnancy. These influences do not, however, explain all the cases which occur. Some illustrations along this line might be cited. A calf with six legs, or two heads, would be a good illustration. A rabbit with one ear, any radical variation in color, such as a red Aberdeen Angus, and so on, would belong to this class. On account of the infrequency with which these variations occur, they seldom if ever perpetuate themselves.

Natural variation is one of the most important factors under the control of man in the higher development of our animals. By means of this law man has accomplished much, and by a thorough understanding of the same and its application he can still do a great deal towards the betterment of our domesticated animals.

LECTURE LXXXII.

INFLUENCES AND CAUSES OF FECUNDITY.

The percentage of increase in the breeding flock or herd is an important matter. In many instances it determines in no small way the profits or losses accruing from the breeding establishment. It is of vital importance in the horse breeding business that the percentage of increase should be high. The same is true in the cattle, sheep and swine breeding operations. It has a double influence in the case of the dairy cow, where the value of the calf and the product of the cow must both be considered. This being the case, we can readily see the importance of giving every attention possible to the maintenance of a high standard of productivity in the herd, stud or flock.

The regular bringing forth of young freely and abundantly in the case of those animals which produce more than one at birth is known as fecundity. It differs from prolificacy in that the latter is used generally with reference to the number of offspring only at one birth, while the fecundity covers the ground of regularity as well as the numbers at one birth. It differs from fertility in that fertility refers only to an animal being in condition to produce young, not necessarily producing regularly as is implied by the fecundity. By fecundity we mean regular breeding, free or easy breeding, and large numbers at one birth in the case of those animals which produce more than one. It is the very opposite of sterility or any inclination toward barrenness. It is usually applied to females, but is in a measure applicable to males as well, as they no doubt have an influence in this respect.

The reproductive powers of animals are easily influenced. A full understanding of the causes which may adversely influence fecundity should be of value to the stockman, so that he may avoid those causes so far as possible in his breeding operations.

One of the most common of the causes is the lack of exercise due to confinement. While this may affect both the

male and the female, its influence is usually most manifest in the case of males. This is due to the fact that they are much more likely to be confined than females. Still in some instances females which are being prepared for exhibition purposes may be thus affected. It is highly important that all animals be given an abundance of exercise. In the case of male animals which cannot be allowed the freedom of the herd, a paddock of some kind should always be supplied so that exercise may be had at the will of the animal. Food may also exert an undesirable influence on fecundity. This is especially true when supplied in an irregular manner and with uniform conditions. By uniform conditions we have reference to scanty supplies in times of exposure to storms. A scanty supply of food is nearly always associated with decreased fecundity in the herd, stud or flock. This is noticeable in those animals which are bred in countries of sparse pastures. These animals are always shy breeders in their native land, but when introduced into other countries having a more liberal supply of feed their fecundity improves. This is well illustrated in the Spanish Merino sheep which were for many years maintained in large flocks and generally on scant rations. These sheep were decidedly lacking in their breeding qualities when first introduced into this country. Since then they have made marked improvements in this respect. The same thing is true of the range sheep bred in this country. Their productive capacity is always much improved when they are placed on arable land and given liberal rations.

The nature of the food also has an important function in this connection. Food which is rich in sugar is undesirable and has a bad influence on fecundity. Food lacking in succulence also is undesirable. The breeding animal does best and is most fecundant when on grass, thus the necessity of supplying succulent feed during the winter season. It keeps the animal in a healthy, sappy condition. Liberal rations of the most nutritious foodstuffs always have a favorable influence on fecundity. In fact it is out of the question to expect good results without liberal feeding. In the case of sheep it is always advisable to feed them very liberally at mating time. By so doing the yield of lambs may be materially increased. The same principle applies to other animals.

Animals in very high condition, especially where such is the result of corn feeding or some other highly carbonaceous feed which causes a plethoric condition of the system, are

seldom if ever useful breeders. This overloading with fat seems to in some way have an undesirable influence on the procreative organs. Animals which have been fitted for show purposes should be gradually reduced in flesh by use of roots and plenty of out-of-door exercise. In this way their usefulness may be retained. Too close breeding, such as in-breeding or in-and-in-breeding, is very likely to have an unfavorable influence on fecundity. This is very likely a provision of nature so as to avoid the continued practice of too close breeding, which has a tendency to concentrate the weak or undesirable qualities in the offspring. This system also injures the size and weakens the constitution of the animals.

In the case of twin calves, where one is a male and the other a female, the female seldom, if ever, breeds. She is called a "free martin." The cause of this barrenness is supposed to be due to the fact that the generative organs of the female partake somewhat after those of the male.

Fecundity to be secured in the highest degree in the breeding of animals should be the aim of every breeder. To accomplish this end he must feed liberally on those feed stuffs most nutritious, give the animals plenty of open air exercise, avoid a high degree of flesh or fat in his breeding herd, and avoid too close breeding of animals which are in any way related.

LECTURE LXXXIII.

INFLUENCE OF IN-BREEDING AND LINE BREEDING.

Among the many interesting phases of animal breeding no one is of more general interest or has given rise to more controversy than the subject of in or in-and-in-breeding. From the earliest records to those of the present day we find this method has been more or less practiced. That it has been beneficial cannot be questioned. That it has in many instances been detrimental is also likewise true.

By in-breeding or in-and-in-breeding is meant the continuous practice of mating those animals which are closely related and then in turn using the offspring in the same way for generation after generation. The closest case of in-breeding is that of brother and sister. The breeding of mother and son or father and daughter and so on are examples of close breeding. In fact, any method which brings together animals of close blood lines may be called in-breeding. Where this method is pursued generation after generation it is designated as in-and-in-breeding.

In-breeding is necessary in the beginning of any new breed of stock, as it is the surest and shortest method yet known of intensifying desired qualities or characteristics in the offspring.

By following this method of breeding for a few years the desired characteristics become fairly well intensified, then more open or wider breeding methods are resorted to. In-breeding is oftentimes resorted to as a means of securing some desired end in many of the oldest and best established breeds and herds. For instance, some particular color, shape of body, flow of milk or quality of milk may be obtained in this way. In the development of the many of the best herds of Shorthorn cattle in-breeding was practiced in a large degree. In some instances certain breeders, who for jealousy or other reasons did not care to patronize other breeders for sires, used animals of their own breeding, thus followed in-breeding for generation after generation. There is no doubt

but what it is the surest and quickest method yet known of intensifying certain qualities either desirable or undesirable in the breeding herd.

So much for the advantages of this method. We will now discuss some of the objectionable features of this practice. One of the first objectionable features noticeable will be a reduction in the size of the animals. This is very apparent in those herds of cattle or swine in which the sires have been selected from the male offspring of the herd from time to time without regard to family relationships. It is impossible to retain the size of the animals when in-breeding is resorted to in the herd, stud or flock.

Another objectionable feature of in-breeding is its influence on the constitutional vigor of the herd. That a weakened constitution and greater delicacy of the system follows this system of breeding is very evident from the fact that tuberculosis and other diseases is so much more prevalent in those families where this system of breeding is practiced. As stated in the previous lecture the powers of fecundity may be unfavorably influenced by continued in-breeding. There is no doubt but what it has a tendency in this direction. A study of the closely related families of many of our recognized breeds of stock and the breeding records of the same will reveal this fact.

In-and-in-breeding cannot be carried on for any considerable length of time without evil results making their appearance.

They may appear in any one of the ways mentioned, or more likely in all of those mentioned. A decrease in size and a weakened constitution are always noticeable and are very injurious from a commercial standpoint.

Evil results from in-breeding can usually be remedied by the introduction of new blood. In doing so nothing but strong, vigorous animals should be selected, as weak animals would not in any way remedy the trouble. The most obvious objection to in-breeding or close breeding is the difficulty of securing animals that are free from constitutional defects, and the danger arising from the tendency of such defects to become dominant in the offspring.

Line breeding is often practiced. It differs from in-breeding in that in line breeding those animals of very near relation are not bred together. Those from the same foundation stock which are some three or four generations removed are used. In the formation of new breeds in-breeding is of necessity used

for a while. This cannot be avoided. As soon as there are several animals of the breed, some of which are not very closely related, line breeding is then resorted to. In this way the desirable characters are intensified.

In many of the old and well established herds and breeds line breeding is practiced. It is then called family breeding. In this way the good qualities of a certain family may be preserved and maintained for many years without experiencing the difficulties resulting from the practice of in-breeding.

This method of breeding to be successful must be practiced with much care and good judgment. The success of the breeder will depend on his ability to keep within safe bounds. He must ever be on the alert for any indication of weakness of constitution, decrease in size or any other weakness which is likely to follow in-breeding.

Both of these lines of breeding were used extensively in the formation of our breeds of stock, also in the establishment of many of our best herds. In the past their presence was in many instances a necessity. At the present time it is doubtful if such methods are of any special advantage in our breeding operations.

LECTURE LXXXIV.

INFLUENCES OF CROSS-BREEDING AND GRADING.

By the term cross-breeding, in the strictest sense, we mean the pairing of animals of two distinct breeds. In this sense it may be considered to be the very opposite of in-and-inbreeding. It is the mating of animals which are in no wise related.

Unfortunately the terms "cross-breeding," "crossing," "out-breeding" and "making a cross" are very often misused and interchanged so as to mean the mixture of blood of different families of the same breed. For example, in the Shorthorn breed of cattle we have several distinct families, such as the Bates, the Booth and the Cruickshank. A man breeding the Bates family might for some reason or other desire to use a Booth bull. This would be termed "out-breeding" or an "out cross," because it belonged to another family. Strictly speaking, however, by cross-breeding we mean when animals of two distinct breeds are used, such as the Shorthorn and the Galloway, the Berkshire and Yorkshire, the Shropshire and Cotswoold, or the Clyde and Shire.

This method of breeding has been practiced extensively on all classes of stock. It is still used in all sections of the country more or less indiscriminately in most cases. For many years it was used most extensively with sheep. The Leicester and the Southdown were both used very extensively for this purpose. In more recent years the Shropshire has been used in many sections of this country for crossing purposes.

In the central west the crossing of the different breeds of swine has been very commonly practiced. Several of the newer and larger breeds have been crossed with the Poland China with the hope of increasing their size and the size of the litter.

That the crossing of breeds has been beneficial in the building up and improving many our breeds of stock cannot be questioned. Practically all of our present improved breeds

of sheep owe their origin in part from this method of breeding. The same thing is true of our breeds of swine, while the same method has been practiced in a small measure at least in the building up and improvement of our many breeds of horses and cattle.

In the foundation and improvement of the breeds of stock crossing was introduced for various purposes. In some instances where the animals of one breed were under-sized, by the introduction of a cross from some new breed which was noted for its size this difficulty could be remedied. In the same way many other weaknesses in the breeds were overcome. Certain of our dual purpose breeds of cattle were built up by the crossing of two breeds; one noted for its dairy properties and the other for its beef making qualities. To this class belongs the Red Polls of today.

In swine breeding if a breed were lacking in length, size or some other point a cross from some other breed which was strong in these points was introduced. In this way much good was accomplished. The crossing of pure breeds in this country is practiced to a considerable extent. In most instances it is being used as a short cut to some desired end. For instance, with the hope of increasing the length of certain breeds of hogs, or to increase the bone or the size of the litter in those breeds which are under-sized or inclined to produce small litters. It is also used in a similar way with the hope of improving our sheep, cattle and horses.

In many instances the first cross gives very good results where the offspring are intended for market purposes. They oftentimes are an improvement over either sire or dam. This method is very unsatisfactory where the young are intended for breeding purposes, as then you must either go one way or the other. For the purpose of producing market animals, it is not to be commended, as it is too expensive, involving as it does the purchase of new breeding stock from time to time as the cross-bred animals do not make desirable breeding animals.

As previously stated, it is used with the hope of making a short cut to some desired end. This same end can usually be obtained by careful selection, feeding and management of the stock on hand. There is always a cause for retrogression in stock. The cause should be removed and new blood of the same blood introduced rather than resorting to the uncertain method of cross-breeding.

The grading up of stock is a subject which should be of vital interest to every farmer. This is the class of stock which is to be found on over 70 per cent. of our farms. These animals are bred and reared for market purposes.

By grading up we mean that system of breeding where the sire belongs to some one of our pure breeds and the dams are of common or mixed breeding. This is the most economical method possible of improving our domestic animals. It is the method which each and every man can practice. It does not involve very much expense. The sire is the only necessary outlay. Where the herd, stud or flock is small, two or more men may combine and use the same sire, thus reducing the outlay for the purchase of the same.

A very common mistake that is often made in the grading up process is to select an inferior sire. Quite often the culs which would not be used for breeding in pure bred herds are selected for this purpose. This is a mistake, because in the grade or common herd there is more need for a good individual than in many pure bred herds. He need not be so expensive as many of the most sought for sires in the pure bred herds. It is not so necessary that he have all the fancy points so far as color markings and other such points are concerned. These are, in a large measure, fads, something which from a packing standpunkt is not called for.

The sire for the grade herd must possess those characteristics in a full measure which are of practical value, such as beef form in the beef animal, milk in the dairy cow, mutton and wool in the sheep, ability to make economical gains of the right kind in the hog, and good draft form in the heavy horse and the desired type of the light horse. These are the points which mean money on the markets of the world, thus they must be sought for in the sire to be used in grading up the herd, flock or stud.

LECTURE LXXXV.

NATURAL BREEDING.

In the previous lectures we have discussed some of the various laws which are concerned in animal breeding. We have also discussed some of the methods commonly adopted in the creation, improving, and building up of new breeds and in maintaining those already in existence. We have given due consideration to the advantages and disadvantages of the various methods. In most of them there seems to be as many or more undesirable features as there are commendable ones. In this connection we will consider the question of animal breeding from a practical and logical standpoint. By natural breeding we simply mean that method of breeding which will, from time to time, give the best results and apply to all conditions. In breeding Shorthorn cattle, for instance, instead of breeding the Bates, the Booth, the Cruickshank or any particular family, you would select those from any or all of these families of excellence, regardless of family or color. Your only motive would be to breed a type of Shorthorn which would approach as nearly as possible your standard of excellence. A standard of excellence is always necessary, else nothing definite and lasting can be accomplished. The only restriction you would make would be that the animal in question was a pure bred Shorthorn eligible for registration in all the herd register associations of that breed. This would be necessary for future protection from a sale standpoint.

By following this method you would not have to resort to in-breeding or line-breeding unless when such a method was the only possible source through which you could secure the desired type sought for in your breeding business. Breed from the best and the best only would be your motto.

The same thing would apply to all other breeds and classes of stock. There would be no necessity for cross breeding. Each and every breed would have plenty of good animals within its own breed.

This method of breeding is the only salvation for a number

of our breeds at the present time. It differs from the existing methods of breeding in that it does not run to fads and fancies in the line of color markings, shape of ear, family strains, and so on. This fad or fancy breeding has been the ruination of some of the very best breeds of stock this country has ever seen. Good pedigrees are desirable, but there is such a thing as paying too much attention to the pedigree and not enough to individual merit. They must both be given due consideration. The only safe method of breeding stock is to have a standard of excellence and always select animals with the view of approaching this end, regardless of fads and fancies, as they will always sooner or later bring you disaster.

LECTURE LXXXVI.

THE FORMATION OF NEW BREEDS.

From time to time the student of animal husbandry is attracted by some new breed of stock. These have increased so rapidly that at the present time we have in the neighborhood of one hundred distinct breeds of live stock belonging to the horse, cattle, sheep and swine kind. The advisability of having so many breeds is a pertinent question for discussion. There are those who claim that the more breeds of live stock we have the better, as each and every additional breed will make the competition that much keener, thus improvement along all lines will inevitably follow. There may be some just ground for such claims. Perhaps these new breeds do in a measure cause the breeders of the old and well established breeds to look to the laurels of their stock and strive to keep them in the foremost rank by improvement.

There would not be any just reason for the introduction or the creation of something new unless it was to possess in some measure at least qualities of a desirable nature which were not to be found in those which previously existed. This being the case, we would naturally expect that our domestic animals have made wonderful strides along the line of development during the last century and a half.

So much for the claims of these new breeds. Many of them have, in a small way at last, made good their claims. Others, on the contrary, have not been able to measure up, thus have never gained any particular prominence or popularity. Merit alone is the test. Where there is just merit there will be a permanency, a growing and lasting popularity. This being the case, we should be justified in assuming that those breeds which made little or no progress since their initial bow have failed to measure to the standard. It is very doubtful if it is necessary to have so many distinct breeds of stock. Would it not be better for the live stock industry to have fewer breeds, thus stronger associations, higher standards and more complete records of the various animals of the different breeds? Many of our so-called breeds of stock at the present time are in reality sub-breeds of some main or parent breed.

By the removing of the horns a new breed is formed, which does not differ in any other detail from the original breed, except that in many instances it does not measure up to the mother breed from a utility standpoint. This is due to the fact that the promoters of the new breed have given most of their attention to the removal of the horns, and in so doing have lost sight of the points which made the mother breed prominent and worthy of its place. The same thing is true of a large number of our new breeds which are claiming the attention of the public. That they are different in some respects to the former breeds cannot be denied, but that this difference makes them more desirable is another and very different question. In many instances the utility feature is lacking, thus the new breed is of no real value to the live stock industry.

The time has come when a few of the more substantial breeds are likely to gain in public favor and many of the new breeds or sub-breeds are likely to gradually give away to their more useful competitors.

In the formation of a new breed the greatest precautions should be taken to retain all the desirable qualities of our present animals and to introduce such new features as will be of practical value to the industry, rather than to just have something different from what previously existed. The greatest of care and the best of judgment should be exercised in the selection of the foundation stock. Generally too much leniency is allowed in this respect. By so doing animals of inferior quality will be admitted which will always be a detriment to the breed.

Before a new breed can be formed and a special and separate registry association be organized for such a breed, evidence must be available that this so-called new breed is different in some distinctive feature from all other breeds. It is not necessary that it must have merit to start a new breed, but this feature will have to be demonstrated before it will become popular in the eyes of the people.

In organizing a registry association only certain animals possessing the desired characteristics should be registered as foundation stock. Thereafter no animals should be registered except those whose sire and dam are foundation stock or trace directly to them. In this way the more recent associations have been organized and maintained for the protection of the owners of this particular breed in question.

POULTRY MANAGEMENT.

LECTURE LXXXVII.

THE POULTRY INDUSTRY AND ITS RELATION TO THE FARM.

Although the poultry industry is now a large one, we can see no reason why it should not in a short time very materially increase its present output both in meat and eggs.

A little more thought on our part put into the care and management of our fowls and a greater attention to the market demands are the main factors that will operate to make of the poultry industry one of the most productive in connection with our farm operations. The thin, blue colored, bony carcasses that hang on hooks in front of grocery and meat market windows are not inviting nor are they conducive to making a market for the meat products of the poultry flock. What we should do is to find out the type of fowl that will produce a plump breasted, well fattened chicken with a minimum of bones, neck and waste matter—a chicken that will mature early and furnish the largest percentage of nutritious and palatable meat with the smallest percentage of offal. Boilers, roasters and broilers of this sort properly killed, prepared and put on the market will sell readily and will create a demand for more of the same sort.

In the production of eggs, too, there is great room for improvement. A proper understanding of the markets as well as an understanding of the breeds and their care and management for the best production of eggs at different seasons of the year is imperative in order to derive the maximum returns from this end of the poultry business. Clean, fresh eggs always command the highest price on the market. Brown eggs on some markets are worth from 3 to 5 cents more than white ones. Eggs uniform in size and color are more attractive and bring better returns to the producer. Winter eggs are always in great demand and bring high prices.

On the ordinary farm poultry may be counted on to give a large return for the amount of capital invested and cost of labor to care for them. They scratch about and hunt for worms and grubs; pick up seeds that would otherwise be wasted, eat the refuse from the garden, such as lettuce, cabbage leaves, beet and onion tops, peas and corn. In the orchard, too, they make their presence felt by destroying insects such as the plum curculio. They take the waste products from the kitchen and the dairy.

It is true that poultry at certain times make themselves somewhat of a nuisance, but the same might be said of all our animals if preventive precautions are not taken. When the garden is being made and when the small fruit is getting ripe the flock should be shut up in suitable quarters or shut out from the garden by means of hen-proof wire fence.

We can think of no greater source of pleasure and profit from the same outlay than that derived from the investment in a medium sized, well selected, well cared for flock of poultry on the farm.

LECTURE LXXXVIII.

BUILDINGS, SHEDS AND YARDS SUITABLE FOR POULTRY.

Poultry, like other classes of live stock on the farm, require suitable protection if we are to look for the greatest gains from our flock. The different forms of houses—to suit the fancier, specialist and farmer where only a few fowls comparatively are kept—though differing somewhat in size, design, materials used, conveniences and cost, must be, in the main, constructed upon the same general principles if the greatest success in the end is attained. Successful results have been achieved in so many different kinds of houses that it would be impossible in this lecture to describe them, so we shall content ourselves with the outline of a few of the principles that prevail in all well managed poultry houses.

In the first place, we all are agreed that a poultry house should stand on high, dry ground—preferably a gravelly or sandy knoll, as such locations easily drain themselves. If such are not to be had, then the scraper should be used to make a slightly elevated spot on which to build. If advantage can be taken of a windbreak or a location behind other buildings so as to protect it from the cold north and west winds, all the better.

Successful poultry raising so far as housing is concerned makes the following demands: That there be furnished a large amount of room, light, warmth, pure air, dryness, freedom from draughts, roosts, nests, comfort and cleanliness. The sheds, if such are provided, and the yards should furnish ample space for exercise.

Room. Fowls should not be crowded, nor is it wise to keep them in very large flocks; much success has been achieved where only 15 to 25 hens were kept in a bunch, while success has attended also the bunching of from 60 to 70. It is safer to deal in the smaller numbers, as one is less apt to experience the losses that sometimes result from housing in the larger

flocks. If but one room is provided, each fowl should have from ten to fifteen square feet of floor space. If roosting and scratching pens are in separate apartments, each fowl should have five to six square feet of floor space in roosting pen and ten to twelve in the scratching pen. Provide a roosting space of seven to eight inches for the smaller Mediterranean fowls, such as the Leghorns, eight to ten for Rocks and Wyandottes, and ten to twelve for the larger Asiatic breeds—the Brahmans and Cochins. In the yard in summer from one hundred to one hundred and fifty square feet of grass should be allotted each fowl.

Light. Sunlight purifies the floors, roosts and drop boards and helps to keep the fowl in a vigorous, healthy condition. In order to make provision for a large admission of sunlight at least one-third of the south and east sides should be glass. The windows if placed high up will allow the sun to do its most effective work in shining into the remotest corners of the house. In some cases windows are placed in the roof of the scratching pens.

Warmth. The roosting apartment must be warm and comfortable for the fowls while at rest. In order to make the roosting apartment warm a small part may be curtained off from the rest of the house so that the heat from the fowls' bodies will warm it sufficiently. The scratching or exercising part should be light and cool, but free from draughts.

Pure Air. Ventilation must be secured, as fowls cannot remain in a healthy condition in foul, damp, stagnant air. But in securing change of air we must be careful to prevent draughts, especially in those apartments where the fowls roost.

Roosts. Roosts should be made of 2x3s. They should be planed off smooth, rounded slightly on the upper corners and should be free from splits or cracks, as vermin lodge in these crevices and are hard to dislodge. The roosts should be placed low—not more than three feet from the floor, and should be at least eighteen to twenty inches from the wall. If more than one roost is used, all should be on a level, for if you put one higher than the other the fowls will crowd for the higher roost. Low roosts are easier to mount and to fly from. A drop board should be placed under the roosts twenty inches in width for single roosts and thirty-six inches for two roosts. This must be made of planed inch lumber so that it can be easily cleaned at least twice a week.

The nests can be placed under the drop board. They must be fifteen inches wide and eighteen inches deep. Hens like to steal away in a quiet place to lay, so it is best to leave the opening on the side next to the wall. A little drop door may be arranged on the back from which to gather the eggs.

Roosts, nests and drop boards should be so arranged that all can be taken out easily, should you wish to give the quarters a thorough cleaning. The inside must be whitewashed now and again. This will add to the appearance as well as imprison vermin that may be lurking about in the crevices.

A ground floor serves a good purpose. Raise it four or five inches above the ground outside. Put in three inches of coal ashes or gravel and fill in the remainder with sand or make it entirely of sand. In August the upper two inches of sand may be removed and the space filled in again with fresh material. Let this be done early so that the floor may be well dried out before the poultry have to be enclosed. The sand floor should then be covered with chaffed clover hay, alfalfa or straw, which must be frequently renewed. As has been already mentioned, the drop board and roosts should be put in so that they may be easily taken out for cleaning and a sun bath.

The partitions ought to be made of matched lumber to about four feet in height and the remainder of wire netting. Each partition should have a door large enough for a person to walk through. Down at the bottom of the wall, leading from the pen to the yard or scratching pen, there should be a small opening, 10x12 inches, through which the hens may pass in and out.

A cheap, convenient, suitable house for the ordinary farm is made somewhat as follows: It is made in the form of a lean-to, sixteen feet long, ten feet wide, eight feet high at front and four at rear. The frame is made of 2x8 scantling. It is single boarded and battened all around except in the little roosting compartment farthest from the door. This part is made warm by means of paper and matched lumber on the outside, and front of the roosts there is hung a canvas drop curtain which, in severe weather, may be lowered to keep in the heat generated by the fowls themselves. A door may be left in the corner, and this doorway has hung over it a piece of sacking or something of that nature. In the upper front is a large window for the admission of light. A pen of this kind has given excellent satisfaction for the production of

winter eggs; the hens continuing to lay except in the severest snap.

Large yards are necessary for the poultry to run in during the summer months if they must be confined. Let the yard be at least fifty feet long by thirty feet wide. If there are trees in this yard, all the better, as they will provide the shade that is required during the hot weather. The yard may be fenced with wire netting six feet high for the larger fowls, while at least a seven or eight foot fence will be required for the lighter breeds. The yard should be well grassed, clean and supplied with pure water for drinking purposes.

LECTURE LXXXIX.

MARKEABLE POULTRY PRODUCTS—EGGS AND MEAT.

Spring and summer are the seasons most favorable and natural for the economic production of eggs. An egg is never more palatable than when it is fresh. Brown eggs are preferred on many markets because customers have taken a fancy to them for table use and for cooking. It should be our business to put forth strong efforts to satisfy a demand for those products which, with a little care on our part, can be easily supplied from our farms. Large eggs are preferred to small ones. The old country market demands that an egg weigh at least two ounces to be up to the standard. Ten dozen should weigh fifteen pounds. For every half pound below the standard the price drops at the rate of about one cent per dozen.

Clean eggs are sought for rather than the unsightly dirty eggs that are too often found in the egg basket and box during the spring and summer months. When the eggs are gathered it would not take very long to see to it that dirty eggs are washed before being put away.

Uniformity in any product adds to its attractiveness. If eggs are sorted into lots of small, medium and large they will on many markets bring a larger price than when lumped off without any assortment having been made.

When cleaning and assorting have been attended to the eggs require to be set away in a cool, dry place—40 degrees to 50 degrees F.—where they will remain without harm for a few days until they are marketed. A small 12-dozen case with paper apartments makes a very convenient means of storing away the eggs and carrying them to market. The merchant must see to it, too, that the eggs are kept cool and dry until delivered to his customers. By looking after these details a good substantial trade can be worked up that will result favorably for the producer. Winter eggs are always in demand and bring the very highest prices. It should be the ambition of the farmer to try if possible to secure the means and methods of producing this high priced commodity.

Spring and summer eggs are bought up and put in cold storage at a little above 32 degrees and kept to supply the winter markets, though these eggs cannot bring the price of fresh-laid eggs. It has been found on investigation that eggs in shipment, if close to apples or onions or such like, will take on bad flavors.

Egg preservatives are used to keep eggs until the winter months. The egg thus preserved cannot take the place of the fresh egg for table use, but does very well for cooking purposes. The lime water preservative is prepared by using one pound of fresh lime in four gallons of water. Stir the mixture well and allow to settle. Drain off the liquid into a crock, which should be closely covered to prevent the air from entering, as it weakens the solution. Fresh eggs may be put into this every day as they are gathered. Be careful not to put cracked or spoiled eggs in, as they will destroy the others.

Poultry meat is considered a delicacy if it can be secured in the proper form. In the late winter and early spring months broilers, small plump chickens, weighing from one to two and a half pounds, are in great demand, and because of their scarcity command a high price. Roasters at three to four pounds are in demand at almost any season. Can we not plan to satisfy, to some extent at least, the demands along these lines that are made by the people in our towns and cities? We must carefully develop this industry and secure for our care and labor remunerative returns. Study the markets to find out exactly what is wanted. A creamy, white-fleshed, plump breasted three and one-half to four-pound chicken is the one which seems to give greatest satisfaction to our customers, and these are by all means the cheapest for us to produce. The white breast meat constitutes the most edible, delicious parts of the chicken. We should aim to secure this kind with short wings and legs and short neck and small head. Light colored birds usually dress cleaner than the darker ones. Customers do not like any feathers on the legs, nor do they like to see any development of spurs. Coarse legged poultry indicates a coarseness of bone throughout and this means a large per cent. of offal. Lean, scrawny chickens will contain about 70 per cent. to 75 per cent. of offal. The well fatted chicken contains a much larger percentage of edible meat and this meat is of a much superior quality, being tender, juicy and of delicate flavor, depending, of course, upon the age of the bird. Old cocks and hens are tough and

too highly flavored, and are not desirable from a market standpoint. These delicacies in the form of poultry products are not all to be sold; the farmer and his family should share in the pleasures that are a direct result of their labors.

LECTURE XC.

BREEDS OF POULTRY.

Poultry is divided into breeds which may be classified (1) according to use, that is, from a utility standpoint or from a fancier's standpoint, or (2) they may be classified according to origin, e. g., the Rocks and Wyandottes are spoken of as American breeds; the Leghorns, Andalusians, Minorcas, Black Spanish, as Mediterranean breeds, and the Brahmas and Cochins as Asiatic breeds; these may be spoken of again as the medium, light and heavy classes—layers and non-layers, sitters and non-sitters. For reference we give a short description of a few of the more important breeds.

Light Breeds—Leghorns. The Leghorns belong to the light breeds; they are great egg producers, especially during the summer months. Some strains will produce eggs in winter. They cannot be relied upon to sit. The eggs are white and rather small. They require warmer quarters in winter than some of the other breeds because of their large combs, especially the males. They are very active fowls and are great rustlers. They are too small to make good meat producers except as broilers.

There are several varieties of Leghorns, chief of which are the Single-Combed White, Brown and Buff. The Black, Rose-Comb White and Brown are also raised. The egg of the Single-Comb White is a little larger than that of the other varieties. Both males and females have large combs. Care must be taken that they do not get these frozen in winter.

Blue Andalusians. The Andalusians are midway in size between the Leghorns and Minorcas. They too are non-sitters and lay large white eggs. They do their best work in summer. They are blue in color, but cannot be depended upon to breed true. They are hardy, vigorous and good mothers.

Minorcas. Minorcas are the largest of the light breeds. There are several varieties, chief of which is the Single-Comb Black. The Single-Comb White and Rose-Comb Black are bred to some extent. They are fairly hardy and vigorous and lay a large white egg. The standard weight for hen is $6\frac{1}{2}$ pounds; cock, 8 pounds.

American Breeds—Plymouth Rocks. Barred, White, and Buff are the three varieties which constitute this breed. The oldest and most popular of these is the Barred variety. All three are fairly hardy, and lay large brown eggs. They are only fairly good summer layers, but can usually be depended upon for winter eggs. They are sitters and make good mothers. They have single comb, clean, yellow legs, and yellow skin, and make a very good utility bird.

The standard weight for hen is $7\frac{1}{2}$ pounds; cock, $9\frac{1}{2}$ pounds.

Wyandottes. Of these there are the White, Black, Buff, Silver Laced, Golden Laced, Partridge, and Silver Pencilled varieties. The White variety is the most popular one from a market standpoint. In general characteristics they resemble the Rocks, but are a little blockier, with a rose comb, and are a pound lighter in weight.

Orpingtons. Black, White, and Buff varieties constitute this breed. They are about a pound heavier than the Rocks, possess the same general characteristics, but have white legs and flesh. They lay large brown eggs, are fairly good summer layers, and do well in winter. They are sitters and make good mothers. They usually have single combs.

Rhode Island Red. The Rhode Island Red is a comparatively new fowl which was originated in Rhode Island. They are said to be fairly hardy, and only fair winter and summer layers, are sitters, but only fair mothers; a brown egg breed, have yellow legs and skin and mature early. They are reddish buff in color, with a strong tendency to black colored tails and wings; also black ticking in the hackle feathers. Weight of hen is $5\frac{1}{2}$ pounds; cock, 7 pounds.

Games. The Indian Game is of interest to the farmer because of the large amount of breast meat which they carry. They are only fair layers of medium sized brown eggs. They give a good account of themselves when crossed with Rocks, Dorkings and Wyandottes for the production of a market carcass.

Dorkings. The Silver Grey Dorking is the favorite variety of this breed. They are exceptionally good market fowls, only fair layers of large, white eggs. They have white legs and skin and possess five toes. They are perhaps not quite so hardy as some of the other breeds and do not stand confinement very well. Weight of hen, $6\frac{1}{2}$ pounds; cock, 8 pounds.

LECTURE XCI.

SELECTION, CARE AND MANAGEMENT OF BREEDING STOCK.

Pure-bred or high-grade poultry are much more economical to raise than the ordinary scrub that finds a place on so many of our farms. In the matter of egg production they give much better returns both in summer and winter, and in the production of meat they put on flesh faster, cheaper and present a more uniform product in size, shape and color and the flesh possesses a more desirable flavor.

The farmer should, then, select some good, pure breed that will suit his conditions.

For the production of summer eggs, the White or Brown Leghorns, the Minorcas or Andalusians are all good, and will fill the egg basket with medium-sized white eggs. But these breeds give poor returns as meat producers and are of little or no account as winter layers. Nor are they good sitters. What the farmer wants is a general purpose breed that will give a good account of itself as an egg producer and at the same time produce good market fowls. The Barred Rock, White Wyandotte and Orpington all stand in high favor as general purpose breeds. The Rocks and Wyandottes have yellow legs and yellow skins, which put them in general favor on many of our American markets, while the Orpington is a white-legged, white-skinned breed, which character makes it a very suitable bird for the English market and some of our home markets. The Dorking is the most typical meat producing bird, but it is a forager and does not do so well in confinement, nor is it as hardy as the other three breeds mentioned.

In choosing a breed to suit our conditions it is well to look to the particular strain as well, for much time has been spent in the development of particular strains as heavy egg producers, as sitters or non-sitters, as winter or summer layers. Having chosen our breed we should then aim by selection, care and management of our breeding stock to improve our

flock along those lines that will tend to make them more productive of eggs and flesh.

Our breeding birds should be carefully selected according to the standard already described.

In early spring fifteen to twenty strong, vigorous females should be enclosed in a clean, dry, light, airy, roomy pen with a cock possessing similar characters to those of the females—all good representatives of their breed. They should be kindly treated at all times—never frightened by dogs or strangers. Their diet should consist largely of green foods and meats with a light grain ration. Give them whole grain in their litter for their early morning feed. This may be scattered the evening before. They will scratch about in search for this and will gain the exercise so necessary to the production of strong, vigorous germs in the eggs to be hatched. Give them a mash at 9 o'clock and then some ground bone or meat and some roots, carrots, turnips or mangels at noon, and a mash of mixed grains, bran and shorts and sour milk at 4 o'clock, and then some whole grain, oats or cracked corn the last thing before going to roost. Feed plenty this time so that there may be some left for them to search after in the morning. Supply them with grit and shell-producing elements, such as gravel, ashes, lime or dried egg shells. Keep plenty of clean, fresh water before them at all times. It must be borne in mind that good results will not follow if hens are fed only grain foods, vegetables and meat are necessary. Too much grain causes the hens to get fat and lazy; the eggs, if they lay any, will be weak in the germ or perhaps thin-shelled and easily broken. Breeding stock must have exercise and you must see that they are induced to take it.

No eggs should be saved for hatching until the cock has been with the hens at least ten days. Where we are trying to improve our flock as egg producers we should use trap nests so that a record can be kept of our breeding hens through all their laying period, and by setting eggs from those that are heavy layers we shall perpetuate the egg laying habit in their offspring. We can, too, in this way perpetuate any of the desirable qualities which characterize the parent stock. When a hen wishes to set, make a nest for her in a quiet place where she is not likely to be disturbed. The nest should be about fifteen inches square. Place a sod in the bottom and cover it with chaff or straw. Dust some sulphur in the nest or place in it some dried tanzy. Do not set a hen

in an old nest, as it is usually infested with vermin. It is easier to prevent the chicks from being infested with mites than it is to cure them. It is well to place under the hen for the first few hours some china eggs in order to find out if she is going to be a good sitter. Put a box over her for the night. After twelve hours take these away and place under her thirteen of the eggs from the breeding flock. See that only uniformly large eggs are used for this purpose. They give stronger and more vigorous chicks. Keep the hen well supplied with food and fresh water. When the eggs have been under the hen eight days they may be examined by holding them up to the light of a house lamp. The infertile eggs will at this time appear clear, while the fertile ones will appear dark. If a number—say three—of the hens have been set at the same time it may be that all the fertile eggs can at the end of eight days be placed under two of the hens.

It is a difficult problem to get eggs suitable for hatching during the winter months where hens have to be confined. Where the breeding flock can have the run of a manure pile, scratch about and have an abundance of out-of-door exercise, much better results are obtained. When in confinement the germ is usually so weak that it dies in the shell, or if a chick hatches it is so weak that it has but a short lifetime.

Four cocks to a hundred hens when running loose together will give a large percentage of fertile eggs. When the breeding season is over the cocks should be separated from the hens and put in their own enclosures and fed a diet of green food, and a ration similar to that of the laying hen. His quarters should always be warm enough so that there will be no danger of his comb freezing.

LECTURE XCII.

JUDGING POULTRY FROM A UTILITY STANDPOINT.

This lecture is intended to enable one to pick out a utility bird; but it is not intended to be used in judging poultry from a fancier's standpoint any farther than conformation is concerned.

A utility bird up to the required weight given for the standard of the breed for a good sized, early-maturing bird is what is wanted for the market. As the feeding bird in order to be an economic producer must possess constitutional vigor, so must the parent stock.

The Male. He should be a bird of good general appearance, low-set, broad, deep, with vigorous stylish carriage, and should possess the size and color and other characters that go to make up the breed.

A medium length, broad, strongly curved beak, a wide head, a large, full, bright eye and medium length of neck are indications of constitutional vigor and good feeding qualities. A long, slender beak, small, sunken eye, long, narrow head and slim neck go with delicacy of constitution and should be discriminated against.

A long, straight, shallow breast bone with a covering of muscle to give it a plump appearance is what is desired. A deep, angular breast bone gives the dressed carcass a rough appearance that detracts very much from its selling price when placed on the market. Thick-fleshed white breast meat attracts the consumer.

Broad shoulders are looked for and this breadth should be carried well back to the tail, as this adds to the size and weight and gives a larger bird at time of maturity. The back should possess only medium length, as this gives a plumper, more symmetrical carcass.

A strong, well-muscled thigh is very desirable, not because the thigh meat is the best, by any means, but strong, well-muscled thighs usually indicate a strong, vigorous, heavily-meated bird. The legs should be straight, strong and set wide apart. The bone should not be coarse, but it should

possess sufficient size with quality to carry the body during his period of usefulness. If the leg are bent in at the joints it is an indication of weakness of bone and also of constitution. He should be thickly covered with feathers fine in quality.

In summing up, the cock should be a vigorous, low down, thick, blocky bird, with an abundance of breast meat, a strong constitution, strong, straight bone and a wealth of plumage, and should weigh $8\frac{1}{2}$ to $9\frac{1}{2}$ pounds.

The Hen. The hen, like the cock, should possess a pleasing general appearance. The head should be medium short and broad with a medium short, strongly curved beak, a large, full, bright eye, and a medium, short, strong neck—indications of strength and constitutional vigor and easy to keep. A long, slim beak, sunken eye and long head and neck are indications of weakness of constitution. The breast bone should be long, straight and only medium depth, with a plump covering of white meat to give the round, full appearance to the breast.

Broad shoulders, with width carried back to tail and a medium length of back are very desirable.

The thighs should be large and plump; made so by a large development of muscle.

Short, strong, straight legs are as much sought for in the hen as in the cock. Long, weak, knock-kneed legs do not go with a good producer of either eggs or cockerels for fattening.

Then hen, too, should be covered with a thick coat of feathers and present the appearance of a low-down, blocky utility female weighing from $7\frac{1}{2}$ to 8 pounds.

LECTURE XCIII.

IMPROVING THE FLOCK.

Many investigations have been conducted to ascertain the relative value of pure-bred and scrub poultry as economic producers of eggs and meat. The results of these are quite conclusive in favor of the pure-bred. In the production of eggs they yield a larger and more uniform product. As a market bird the pure-bred gives a larger, plumper, juicier carcass, more uniform in size and color. They are earlier maturers and put on flesh more economically.

The farmer owning a flock of pure-bred poultry will think much more of them; will take more pride in them; and will consequently give them the care and attention that is necessary for one to realize the greatest profit from any class of live stock. Knowing these facts, it follows that we should seek to improve our poultry either by establishing a pure-bred flock or by carefully and intelligently grading up the one we already have.

Dairy farmers have been busy for years improving their dairy herds by increasing the quantity, improving the quality, and lengthening out the period of lactation of the individual cows in the herd. This improvement has been effected by the use of the Babcock test and scales together with proper care and management of the stock, selection, mating, feed and care.

Cows that gave a good account of themselves at the pail (that gave at least 6,000 pounds of milk a year) were kept as breeders. Heifers were saved from these cows and were trained to milk a long time. Bulls were saved from good producing cows and were mated with heifers from good milkers in order to perpetuate in their offspring the good milking qualities which they had inherited from their ancestors. Pure-bred males were always used and these must show in their pedigree good performing ancestors on the dam's side even to the third and fourth generation.

Now the same plan should be followed in the improvement of our flocks.

A good method of starting a pure-bred flock is to buy, in the spring, from some reliable source, a couple of sittings of eggs from a good laying strain of utility fowls. Be sure that the strain is right, for there are good strains and bad strains. Strains that will lay in winter; strains that will lay ten dozen eggs a year; and strains that will not lay three dozen; strains that will want to sit all the time, and strains that will scarcely ever ask for that pleasure. Some strains possess early maturing characters without coarseness, while there are others that are coarse, ungainly looking fowls no matter what attention you give them. All these strains, and many others, may be found in the same breed, depending upon the methods that have been employed in developing them.

Having your two or three sittings hatched and reared in the fall, separate the cockerels and pullets. You will likely be able to dispose of the pure-bred cockerels to good advantage to your neighbors, if they are from the right kind of stock. If you cannot, put them in a crate and get them ready for market. Do not keep them at any rate. Procure a cockerel from some breeder to mate with your best bird to get your eggs for your next crop of chickens.

When your pullets begin to lay it is a good plan to procure what are known as trap nests. By using these you will be able to keep a record of each hen's laying. When time for mating comes shut up eight or ten of the hens, that have proven themselves good layers, and that are otherwise suitable, with a good cock, and in ten days eggs may be saved for hatching. The good layers may be marked by puncturing a hole in the web of the foot or by a band of some sort around the leg. Never allow a cock to run with hens, except when you want eggs to set, and then only with the breeding hens. Set the eggs under brooding hens, as mentioned in a preceding lecture, and continue making selections based on type and performance. Use cocks that are from good laying strains. Feed and train the hens so that they will increase their egg laying propensity, and in this way an excellent egg laying strain may be built up and perpetuated. Breed only from mature hens.

Grading Up. Many farmers have already some good laying hens among their scrub flock. Cull out those that are poor producers, procure a PURE-BRED cock as already described, and mate him with the good layers. Set the eggs and make careful selection in the fall. Fatten and kill ALL the cock-

erels. If the old cock has given a good account of himself, trade him with some breeder for another of equal merit, so that you will not have to in-breed your stock. In-breeding is likely to lead to weakness in your stock, though it is used much by poultry breeders to intensify the blood and cause greater prepotency in the transmission of desirable characteristics in producing show stuff. By following this system of procuring only pure-bred cocks and selecting the best females, in four or five years you will have a high grade flock (practically pure-bred so far as utility is concerned).

LECTURE XCIV.

MANAGEMENT AND FEEDING FOR EGG PRODUCTION.

The production of summer eggs is not a difficult matter at all. Nearly every farmer with his ordinary scrub flock will always have some eggs to carry to market. There are so many producing eggs at this season of the year that the supply is large and the price naturally falls until there is very little margin left for the producer.

During the last winter we have seen eggs 50 and 60 cents per dozen, and in many of the eastern cities the price reached even a higher limit, going in some cases to 75 cents. This is, of course, very hard on the consumer, but the seller reaps a handsome profit. During the past winter there was a great scarcity, due probably in part to a reduced number of laying pullets on account of cold, wet seasons of 1903 and 1902, when young chicks could not be successfully reared. The exceptionally high prices of the winter of 1904 can be accounted for in part, but taking one year with another the winter egg is the one that yields the large profit to the producer, and it will continue to do so for sometime, at least, until a very much larger number of men have learned how to breed and feed for winter eggs.

There are three or four essentials to success in this business. In the first place, we must have the right breed. Some breeds are naturally summer layers. These are the Leghorns, Andalusians, Minorcas, all of which may with care have certain strains bred for winter laying. The American breeds, Rocks, Wyandottes and the English Orpingtons, are better winter layers. In choosing a breed for winter layers it is better to select one from the last three named. But it must be kept in mind that more depends upon the strain than upon the breed. There are good and poor laying strains in every breed. The laying character depends upon the breeding and training rather than upon the breed.

Young pullets are usually the best winter layers. These are obtained by having chickens hatched along the middle of

April, not later than the first week in May. These birds, if hurried along to early maturity, should arrive at that stage not later than six to seven months and should start laying about the first of November. You cannot expect good returns from stock that is weak in constitution or lacking in vigor. Select strong, matured pullets $6\frac{1}{2}$ to 7 months of age from a laying strain for the production of winter eggs. Keep a record of these pullets and mark them in some way so that the best ones may be kept the next winter as breeders from which to raise the future flock. We believe that "like produces like," so that by breeding from these good layers we shall obtain others of their kind. During the second winter, those that are being retained as breeders should not be fed on a laying ration until near spring, when we want eggs to set. When this time comes, have them shut up with a cock from a good laying strain and feed all on a laying ration. Eggs set from these hens should give us the winter layers we are seeking. To breed this kind of birds will require the patience and perseverance that are so necessary to make any of our live stock operations a success.

Yearling hens that moult early will usually give a good account of themselves in the winter. Some poultry men manage their yearling winter layers somewhat as follows: In July they turn them into a grassy enclosure, where they receive very little feed except grass and water and a half handful of grain per day. These hens when taken in and fed on a laying ration will usually commence laying in a short time. Hens over two years old are not profitable layers except in rare cases found in the lighter breeds. Proper housing is necessary. The house for winter laying should be dry, light, well ventilated and comfortably warm, from 40 to 50 degrees. Fowls are better to be in cooler quarters that are dry, light and well ventilated than in warmer quarters lacking these. The housing has already been taken up quite fully in the lecture on "poultry houses," so that nothing further is necessary here except to add that every precaution be taken to add to the comfort of the fowls in the way of nests and roosts. These should be so arranged that they can be taken out easily to be cleaned and rid of vermin.

Best results are obtained in summer by keeping the hens enclosed in a large run where they can have grass and exercise. Each hen should have at least 125 to 150 square feet of grass to pick over.

The feeding of winter layers is one of the points which is commonly overlooked. You may be ever so good to the best laying strains of pullets, but if the ration is not carefully selected you will have no eggs. The ration of the laying hen in winter should be as nearly as possible like that obtained when running free in the summer. Grain, vegetables and meat in about equal parts should give excellent results. The grain should be a mixture of barley, oats, crushed peas, and buckwheat, if these can be secured. In winter, especially when the weather is cold, corn may be added. Too much corn causes the hens to get fat and lazy, when they take to the perch and spend most of their time there. This grain mixture may be fed to advantage early in the morning, or late at night. It should be scattered around in the litter so that the hens will scratch about for the first two hours of the morning for it, thereby gaining sufficient exercise to keep them in a good healthy condition. At 9 o'clock they should be given a mash made by mixing about equal parts of bran, shorts, ground corn, ground clover, or alfalfa leaves which have been steamed. In winter this mash is made by mixing with water and is fed warm. In summer sour milk may be used. About a quart of this is fed to fifteen hens.

At noon they should receive some vegetable food such as cabbage, mangels, turnips, carrots or sprouts. At 3 o'clock another mash should be given, and at night the whole grain should be scattered in the litter just before they take to the roost.

A pound of ground raw bone should be fed twice a week to fifteen fowls. Meat should be given them regularly at noon. Boiled liver, beef heads and such like will supply this part of the ration in winter. Animal meal and blood meal mixed with grain about 1 to 16 is a good form in which to supply this part of the ration in summer, as the other forms become putrid in hot weather.

Grit, gravel, oyster shells and lime should be supplied in abundance. Give them plenty of pure water to drink in winter. Keep them in good healthy condition by giving them exercise and fresh air. It is a good thing to throw the doors open a good part of the day so long as the fowls are kept moving about in search of food. Do not allow the hens' combs to freeze as this will stop their laying.

LECTURE XCV.

FEED STUFFS SUITABLE FOR POULTRY.

The body and feathers of a fowl consist of water, ash, protein and fat; so it is clear that the feed supplied must contain the compounds that will supply these. About one-half of the dry matter in the body of a fowl is protein and about 8 per cent. is ash. Investigations made by Jenter at the New York Experiment Station show that the body of a Leghorn hen—body, blood, bones, feathers and viscera—contains 55.8 per cent. water, 21.6 per cent. protein, 3.8 per cent. ash, and 17 per cent. fat.

A fresh egg is made up of, shell, 11.4 per cent.; water, 65.7 per cent.; fat, 8.9 per cent.; protein, between 11 and 13 per cent. Of the total dry matter in an egg, including the shell, there is 35.6 per cent. ash, 25.9 per cent. fat, and 33 to 38 per cent. protein.

Carbohydrates and Fats. These supply the fat forming and heat producing compounds. The fats are capable of doing about 2.4 times as much work as the carbohydrates. These are contained in the common grains used as feed stuffs.

Ash. This is the material from which bone and shell are built up.

Lime is the compound which enters so largely into the composition of the egg shell, and must be supplied in some other way than in the ordinary feeds—grain and grass.

Animal Feeds. These consist of highly nitrogenous feed stuffs made from meat scraps, blood, dried fish and skim milk.

Waste meat, such as beef heads, scrap and other waste products may be fed either cooked or raw. If cooked, the juices in which the meat is cooked should be mixed in with the mash.

Dried blood is a concentrated food containing a large percentage of protein. It can be fed in mashes to growing chicks or laying hens. It should be mixed 1 part to 16 of meal.

Ground Raw Bones. If raw bones are ground up fine so fowls can eat them they are much relished.

Milk. Sour skim milk and buttermilk are both excellent feeds for fattening poultry or for laying hens. Nothing has been found that will satisfactorily take the place of these feeds.

Vegetable Food. In compounding a ration for fowls, vegetable foods such as cabbage, turnips, mangels, carrots, clover and alfalfa serve excellently in adding to the bulk and succulence. Cabbage may be suspended from the ceiling so that it will hang above the floor within reaching distance of the fowls. Working at this they obtain much necessary exercise. Turnips and other roots may be suspended in like manner or they may be fastened on a nail on the wall. Clover and alfalfa are very suitable for litter. Sometimes fowls take too much of these dry vegetable foods and as a result their crops become impacted.

Grains. Of the grains there are many that are very suitable. The kinds for you to use are the ones that are most easily and cheaply obtained. Wheat is the food par excellence for hens. Corn is also a very excellent food for poultry. It is, of course, a fattening food and should be fed as such. It is better to feed it cracked or ground. Cracked corn sprinkled among the litter keeps the hens scratching to find these nutty morsels, and in this way they obtain much valuable exercise. Ground corn may be fed to advantage with other grains in mashes. Whole corn is large and easily seen and does not afford the exercise in the search for it.

Oats, with the hulls on, are somewhat bulky, and on this account are not so desirable in this entire form; but when hulled the oat grain for growing or fattening poultry is very excellent.

Buckwheat partakes somewhat of the nature of corn and is a good fattening food. In order to accustom hens to it, it is well to boil it for them the first two or three times. After that they will usually take to it readily. Sometimes it is necessary to starve them a day in order to get them to eat it the first time.

Barley on account of its coarse hulls is better to be ground and fed in mashes with other grains. It, too, is somewhat of a fattening food.

Bran and shorts serve an excellent purpose in a poultry ration in that besides furnishing growing material they tend to keep the digestive system in a good, healthy condition. There are many seeds, too, around the farm that can be used

to good advantage in the feeding of poultry. It must be kept in mind that variety in the rations is the secret of much of the success in poultry feeding.

Lime. A large amount of lime must be utilized by laying hens in the manufacture of shells. This can be furnished them in winter or summer, if confined, by giving them finely pounded oyster shells, lime or previously dried egg shells. The egg-eating habit is oftentimes forced upon hens by our failing to furnish them with the necessary elements for the structure of shells.

Grit. A hen has no teeth. Her food is masticated in what we call the gizzard. This is a strong, muscular sack with a tough membranous lining. This sack contains numerous small, sharp, hard stones which serve to crush and grind up the food that must pass through it. When hens are confined they should be furnished with coarse coal ashes or gravel in order that they may be able to secure the necessary "grit" with which to grind their food.

Pure, fresh water should be supplied in abundance at all times. Galvanized drinking tanks can be had at a very moderate cost.

LECTURE XCVI.

REARING CHICKS—FEED, CARE AND MANAGEMENT.

The little chicks should have a good start when they first emerge from the shell in order that they may be able to make the best of their opportunities afterward. In giving them this start we have an important part to perform in seeing that the parent stock are fed and managed so that they will produce eggs possessing highly vitalized germs. To do this we must furnish them plenty of vegetable and animal food and an abundance of pure, fresh air. The egg chosen to give birth to the chick should be large and be covered with a sound shell. The egg should be set under a hen that has given evidence that she will be a good mother. Strong, healthy chicks when hatched may soon succumb to the attacks of parasites—the three varieties of lice that infest fowls. Precautions must be taken to prevent the ravages of these pests. Do not set a hen in an old nest, as it is almost sure to be infested. Put a moth ball, some tansy or sulphur in the nest before placing the eggs under the hen. Dust insect powder into the feathers of the brooding hen two or three times during her sitting period. Take a cloth that has been moistened with coal oil and rub it over the hen's breast. These precautionary measures should kill all lice that may have infested either the hen or the nest. If the future quarters are well removed from the hen house and kept clean there should be no trouble from lice. After the little chick is born warmth is much more necessary than food. He requires a temperature of at least 90 degrees F., and this will be furnished by the hen if the chicks are left in the nest with her. No food is required by the chick for thirty-six hours after it is hatched. Nature has provided for it, so that we need not concern ourselves in regard to his diet until this period of from thirty to thirty-six hours has elapsed. Many chickens are lost from the attack of diarrhoea. This is caused by giving them cold water to drink, sloppy food or by allowing draughts to blow over them. "An ounce of prevention is

worth a pound of cure." When the chicks are thirty to thirty-six hours old remove them with the mother to a small coop that has been previously constructed, rain-proof on top, back and sides, with vertical slats $2\frac{1}{2}$ inches apart in front. This may be conveniently made of a dry goods box two feet square and two feet deep, or it may be built on a more elaborate plan if time can be spared and tools and materials are at hand. Place the coop out on a grassy sod and place around it an enclosure about as large as a wagon box, 8 to 10 inches high. After a week this may be removed and the chicks allowed free range within call of the mother hen, which is kept in confinement.

When placed in their new, clean quarters give them their first meal prepared as follows: Take about equal parts of onions, hard boiled eggs and dry bread. Chop everything fine, including the shells of the eggs. Do not moisten with anything. Feed this ration dry for two or three days, when oatmeal may be substituted for the bread and some meat scraps or boiled liver in the place of the onions and eggs. Give them tepid water to drink. Cold water is apt to cause digestive troubles which, if once provoked, are likely to cause serious losses. If little chicks are confined, grit should be mixed in their food. Sand and gravel should be always at their command. At ten days to two weeks old they should have scattered in their litter a mixture composed of five parts cracked wheat, three parts finely cracked corn, two parts millet. This will keep them scratching and will afford them exercise, which is all-important to the growth and development of healthy chicks. Twice a day, now, they should receive a mash composed of one part cornmeal, one part oatmeal and one part bran mixed with sour milk. When fed the milk should be squeezed from it and the mixture crumbled to them from the hand. Succulent food must be supplied and may be furnished by giving them lettuce, turnip, mangel, carrot or potato sprouts; sometimes grain sprouts are fed. The chicken's ration should consist of about one-third grain, one-third vegetable and one-third animal food. If the chicks are confined and cannot range about in search of bugs and worms, you must furnish a supply of animal food in the ration. Feed them meat scraps, fresh boiled liver or you may add animal or blood meal to the grain about 1 to 16. We must keep in mind that for the first few days and weeks in the chick's life there is a great drain on the system in order to provide material

for the growth of bone, muscle and feathers. Fat producing foods such as corn will not supply the materials necessary to the rapid upbuilding of these parts, but it will supply the fuel and energy producing elements. The chick when hatched from the shell will weigh less than two ounces. At ten weeks old it should weigh nearly two pounds. At this rate there has been an increase of about 1,700 per cent., an enormous increase in so short a time.

LECTURE XCVII.

FATTENING, KILLING AND PREPARING POULTRY FOR MARKET.

There is usually excellent sale for birds properly fitted and prepared for the market. Creamy white flesh is more desirable on most markets than yellow flesh. Birds weighing about four pounds when finished bring the highest prices. Large, coarse birds are not so attractive; besides, they are more wasteful. Birds with deep, angular breast bones have to be fed longer to make them look well, and so are more costly feeders.

Select young, plump birds weighing three and one-half pounds, or thereabouts, three and one half to four months old. These are placed in crates made somewhat as follows: they are six feet six inches long, twenty inches high, and sixteen inches deep, and are divided into three compartments by solid partitions. The top sides and bottom are made of one and one-half inch slats, one-half inch thick. The slats on the back, top and bottom run lengthwise, while those in front are placed up and down two inches apart, so as to allow the birds to run their heads through them at feeding time. The slats on the bottom are three-fourths inch apart, so that the dropping will fall through. Care should be taken that the last slat is not placed tight against the back, so that the droppings may fall through instead of lodging there. If the droppings lodge in the crates they decompose and the crates become foul. Slat doors are placed in front. A "V" shaped trough two and one-half inches deep is placed along in front to hold their feed.

The crates may in warm weather be placed out of doors, if covered so as to protect them from rain. In cold weather they should be placed in a warm, dark place. The fattening period should not cover more than four weeks at most. After that time feeding is very expensive and only the rougher sort of birds will require the long period, hence the necessity for choosing a right type of bird.

See that all birds are well dusted with sulphur before crating.

The birds should be fed lightly for the first week three times a day. After that they may be given all they will take twice a day. Keep them well supplied with grit. Pure, fresh water should be given them twice a day to drink. Clean the troughs one-half hour after feeding. Four to five birds, according to size, may be placed in each compartment.

Birds take on flesh much faster and more economically when fed in crates than when allowed to run at large or even in pens.

A good fattening ration may be composed of two parts ground corn, two parts ground buckwheat, and one part ground oats made into a mush with sour milk or buttermilk; or two parts ground barley, two parts ground corn, and one part ground oats, mixed with milk; or ground oats without the hulls, mixed with milk. When milk cannot be had, add animal or blood meal about 1 to 16 grain, and mix with water. Add a half ounce of salt to 150 chicks twice a week.

During the last week's feeding a little tallow may be added to the ration, one pound for seventy to eighty birds. Too much corn in the ration colors the flesh yellow.

When the fattening period is over, which should be at the end of three and one-half to four weeks, starve the birds from thirty to thirty-six hours before killing, in order to allow time for all food in crop and intestines to be removed. If the food is left in the bird it decomposes and taints the flesh.

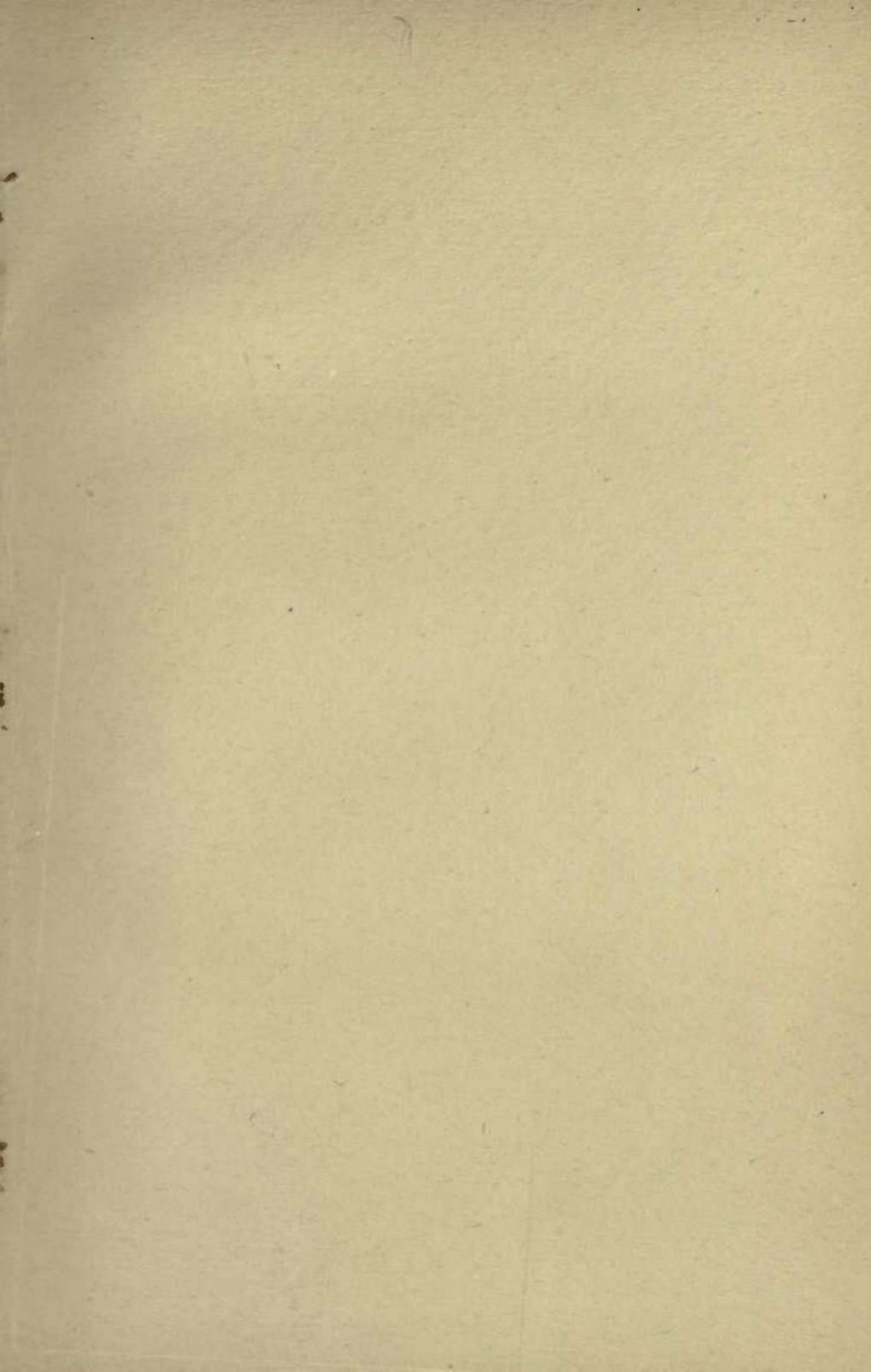
Killing is done in two ways. The plan most in favor is to dislocate the neck. This is done by holding the legs of the bird firmly in the left hand just over the operator's hip, with the back of the bird toward you. Seize the head of the bird with the right hand, the forefinger back of the neck, the crown of the bird in the palm of the hand, and the other three fingers in front under the head. Draw the head down over the right knee, stretch the neck and bend the head backwards, dislocating the neck. Draw an inch and a half from the neck, hold the head down so as to allow the blood to collect in the neck. This method of killing gives a juicier, better flavored product than does that of letting the blood out by cutting deeply with a sharp pointed knife into the roof of the chicken's mouth just below the eyes (from the inside course).

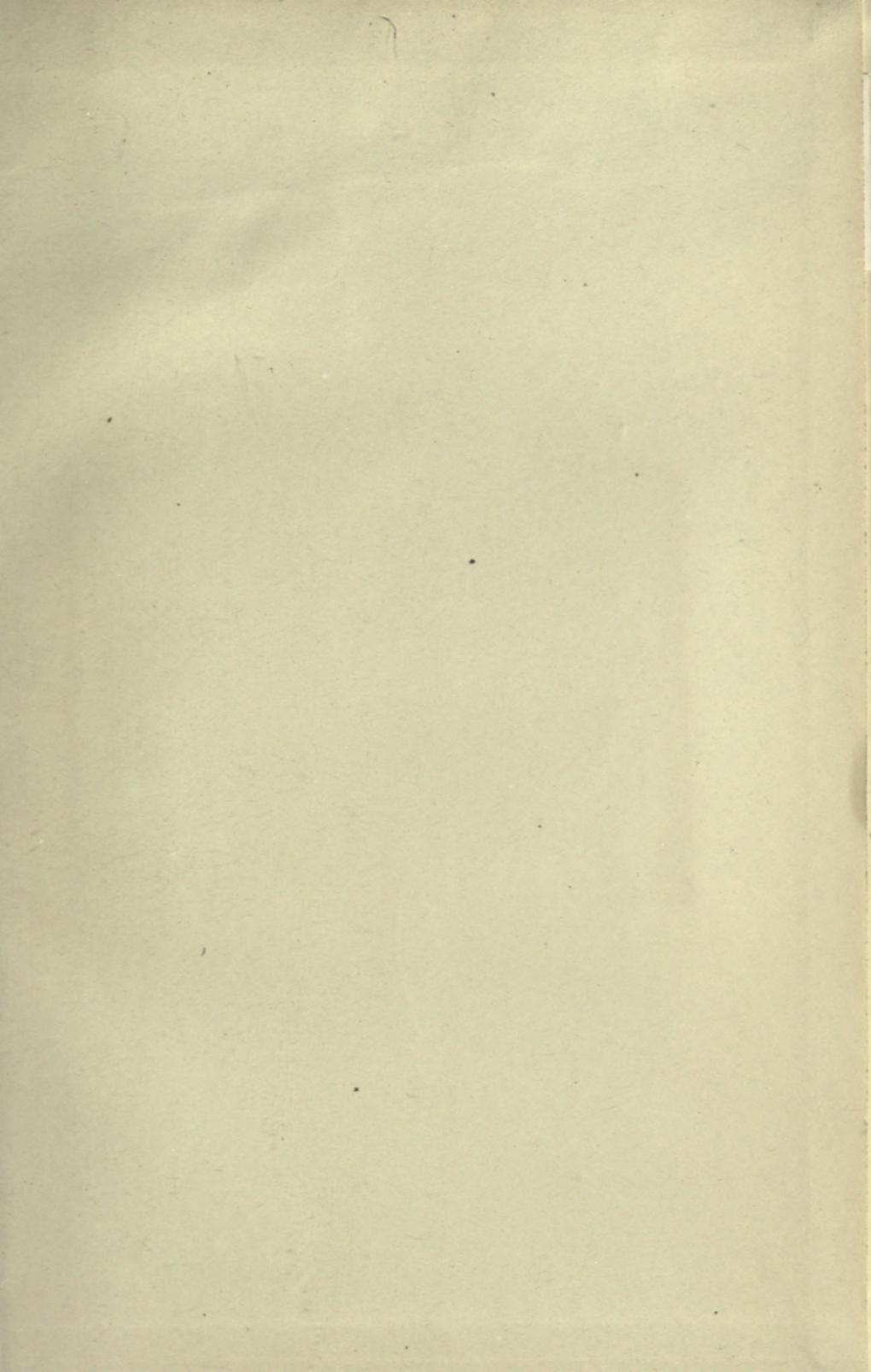
Plucking should begin immediately after the neck is broken. Pull the quill feathers of the tail and wings, strip the back, wings and breast. Never allow the chicken to cool before plucking, as the flesh is sure to tear if plucked cold. Leave

a couple of inches of feathers on the neck nearest the head, a little ruff around the hocks and last joint at tip of wing. Pluck all the rest clean, leaving no pin feathers. Do not tear the flesh. If you should happen to do so in your hurry, be sure to draw the skin together with a white thread. Leave your bird looking as attractive as possible. As soon as you have finished plucking fold the legs up along the breast and place the bird breast down in a shaping board, cover with a paper and place on its back a brick or iron. The shaping board is made with inch lumber. It is simply a right angled trough six inches deep and six feet long. It should be tipped up a little and the birds placed in it side by side with weights to press them into shape. Allow them to cool twelve to twenty hours before packing. They should be packed neatly in a box three feet long, twelve inches deep and twelve inches wide. The box should be lined with parchment paper to keep the fowl clean and dry. Pine or basswood make good boxes. Cedar is apt to taint the meat.

Having a first-class product, you should aim to have it reach the best customers in order that your products may have a ready market. Always have the best article and there will be no danger in regard to its disposition at a good remuneration.

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