AN IDEAL FEEDER'S HEAD

Hereford steer, Peerless Wilton 39th's Defender, Grand Champion at the International Live Stock Show in 1906. Bred, fed, and exhibited by Mr. F. A. Nave of Attica, Ind. Sold to Iowa State College.

Types and Market Classes of Live Stock

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PREFACE.

During the past eight years there has been added to the curriculum in most of our agricultural colleges a new course dealing with the types of farm animals, market demands, and market classes of live stock. More properly speaking, it has been inserted at the very beginning of the work in animal husbandry, forming, as it logically does, the foundation course in the study of that important branch of agriculture. This is a soundly practical study; the student is brought to a much clearer conception of values and a much better appreciation of live stock than was possible under the former system of teaching.

Recognizing the need of a text on this subject which could be placed in the hands of students, the writer prepared and printed a loose-leaf edition which has been used at Ohio State University during the past three years. This met with favorable comment, and requests have been made that the material be put into book form. After careful revision and the addition of a number of illustrations, this is now attempted in the hope that students and teachers and the general reader as well may find such a book useful.

The arrangement of the subject-matter corresponds to the order usually followed in teaching, but may be varied as desired, each section of the book—Cattle, Sheep, Hogs, and Horses— being complete in itself.

The writer desires to express his indebtedness to numerous commission men, buyers for the packing houses, and others who have kindly given their assistance during his quests for information, and to numerous experiment station publications, particularly the series of excellent bulletins issued by the Illinois Station setting forth the results of their study of the Chicago and St. Louis markets. Acknowledgment of valued assistance is due my present co-workers, and also Professors C. S. Plumb and F. R. Marshall at Ohio State University.

Iowa State College. H. W. VAUGHAN.

July 1, 1915.

LIST OF ILLUSTRATIONS.

TABLE OF CONTENTS.

PART FOUR. HORSES.

PART ONE.

CATTLE.

INTRODUCTION.

Cattle are useful to man because they produce meat and milk, both of which are in such demand that the production and marketing of them engage the attention of many thousands of people in America. Over two-fifths of the expenditures of families of medium income is for food. In 1910 there were 20,255,555 families in the United States. About one-third of the national dietary is composed of meat. Milk, butter, and cheese are produced in vast and increasing quantities, being staple articles of food.

America has been an exporter of meats and dairy products to the value of many millions of dollars annually. During the last few years these exports have fallen away markedly and we have now begun to import beef from South America. This change is partially due to a decrease in home production, but is chiefly due to a population increasing at such a tremendous rate that the increase in home production of food does not keep parallel with it. The United States had 7 millions of people in 1810, 17 millions in 1840, 38 millions in 1870, 76 millions in 1900, and 93 millions in 1910. Will it not be 150 millions in 1940, and 200 millions in 1960? Need the producer of live stock feel concern as to the future of his market?

Excepting Australia and New Zealand, the inhabitants of the United States are the most liberal eaters of beef, mutton, and pork. The average per capita consumption of dressed beef in this country was 80 pounds in 1909, and the total consumption of dressed beef, veal, mutton, pork, and lard amounted to 172 pounds per capita. Cuba follows with 124 pounds, the United Kingdom 119 pounds, Germany 113 pounds, France 80 pounds, Denmark 76 pounds, Belgium 70 pounds, and Sweden 62 pounds. The average for Australia is 262.6 pounds, and for New Zealand 212.5 pounds.

Experience has shown that it requires a certain kind or type of cow to produce a large flow of milk, and quite a different kind to produce beef. For this reason, two distinct kinds of cattle have been developed—dairy cattle and beef cattle. The dairy cow possesses certain characteristics which make her useful as a machine for producing milk, and we call this combination of characteristics **dairy type.** Likewise, the beef animal has certain characteristics which stamp it as an animal that will convert feed into flesh rather than into milk, and we call this combination of characteristics **beef type.** This gives us an understanding of what is meant by **type,** and we may now define type by saying it is that combination of characteristics desired by the breeder which makes an animal highly useful for a specific purpose.

Some breeders have endeavored to establish what is called a **dual-purpose type** of cattle. They believe there is need of a cow that can produce both beef and milk, and they have, therefore, tried to combine dairy type and beef type as nearly as possible. The dual-purpose cow does not give as much milk as the dairy cow, nor does she make as much beef as the beef cow. At present the demand for dual-purpose cattle is comparatively limited, but it has been predicted that many farms will ultimately adopt the dual-purpose type as the one most profitable.

Various breeds of cattle have been evolved to meet the demands for each of the three types of cattle. Each breed has its own peculiar and special features not found in individuals of other breeds. These special characteristics constitute what is called the **breed type.** For example, there are six breeds of beef cattle all of which possess beef type, yet each breed is distinctive in certain points which make up the breed type. The breeds of beef cattle are the Shorthorn, Polled Durham, Aberdeen-Angus, Hereford, Polled Hereford, and Galloway.

The dairy breeds are the Holstein-Friesian, Jersey, Guernsey, Ayrshire, Brown Swiss, Dutch Belted, French Canadian, and Kerry.

Dual-purpose demands are met by the Red Polled and the Devon. The Shorthorn breed is also famous for many individuals and several families of dual-purpose type.

Various groups of men in different localities under different conditions and with different sorts of unimproved cattle took up beef production, or dairying, or a combination of the two. In this way originated the various breeds of the three types of cattle as we know them today. Competition does not narrow each type down to a single best breed, because no one breed is best under all conditions of soil, climate, and food supply.

CHAPTER I.

BEEF TYPE.

The following description applies particularly to the fattened steer. Special or additional features of type which should characterize the beef bull and the beef cow will receive attention later. It should be understood, however, that all good beef animals—steers, heifers, cows, and bulls—are similar in the essentials of beef type; therefore, the description given here applies in almost every respect to all classes of beef animals.

General appearance.—When correct in form and fatness, the beef animal presents a massive, blocky appearance from every angle of view. As viewed from the side, the body is rectangular, very deep, and short from shoulder to hip. The body is very wide, and the legs are short and placed squarely under the body. Two dimensions of the beef animal should be great—width and depth; the third dimension, length, should be relatively small. There should be great smoothness of outline everywhere, all the parts being uniformly developed and so blended as to form a symmetrical and balanced animal. The back is uniformly broad, the more width the better. From a side view, the top line and underline are straight and parallel. A fullness of outline is presented everywhere.

An animal showing too much length of middle is referred to as "rangy," while animals standing high off the ground on long legs are termed "leggy." The head should be short and broad, and the neck short and thick. Such a head and neck are associated or correlated with the desired type of body. Rangy, leggy animals usually have long narrow heads and long thin necks. With only the heads and necks of a number of beef animals in view, the best animals may be picked out with reasonable certainty simply upon the general proportions of heads and necks. A straight-edge laid against the side of a beef animal should touch the shoulder and hindquarter and all points between them.

The **head** should be short and broad with a broad muzzle, indicating capacity for grazing and feeding. The nostrils should be large, indicating capacity for breathing and hence a good constitution. The face line, from a side view, should be straight or show a slight inward curve or dish from eyes to muzzle. The head below the eyes should be as short as possible, the eyes themselves being wide apart, large, prominent bright, and clear, and indicative of a gentle disposition. A

Fig. 1. **Correct Type in the Fat Steer.**

Two-year-old Aberdeen-Angus steer, Victor, Grand Champion at the International Live Stock Show in 1911. Fed and exhibited by Iowa State College. Sold for ninety cents per pound.

quiet expression of the eyes means a quiet, contented feeder that will transform feed into flesh; a nervous, restless expression is evidence of an unsatisfactory feeder that will neither consume enough feed nor store up the energy of the feed consumed, but waste it in nervousness and too much moving about. The forehead should be very wide. The jaws should be broad and well muscled. If horns are present they should

not be coarse at their base, but rather fine and nicely shaped and proportioned, tapering evenly to their tips. The ears should be of medium size, fine texture, fringed with fine hair, and neatly attached to the head. The entire head should be clean-cut, all lines being sharply defined, giving a well-bred appearance, sometimes referred to as "character."

The **neck** should be short, thick, and muscular. Its attachment to the head should be neat and trim, while at the shoulders it should show depth and smoothness. A long neck lacking in thickness is frequently found, and it is undesirable chiefly because it is associated with a rangy type of body. When the animal is standing in natural position, with the head up, the top line of the neck should be straight and the poll of the head should be slightly higher than the withers.

The **shoulders** should be very smooth, blending perfectly with the rest of the body. This conformation is secured when the shoulder blade lies snugly against the ribs beneath, and is covered over with a uniformly thick layer of flesh. The withers should not be sharp and fine, nor yet so wide that the tops of the shoulder blades are prominent and outstanding, but should be moderately wide and nicely rounded over with flesh. Rough, angular shoulders, unevenly covered, are among the most common defects of beef cattle. When the shoulders are not properly laid in, but are wide and open, the appearance of the animal is injured, the fleshing over the shoulder is not taken on properly, and, when slaughtered, the carcass lacks the smooth, tidy appearance so much desired. A prominent shoulder also causes the development behind it to appear insufficient.

The **brisket** and **chest** are highly important. The former should carry forward prominent and wide, and be well fleshed, yet neat, presenting a full, well-developed, and trim appearance. The chest, which lies between the shoulders and immediately behind them, ought to be very wide and deep. Too much width and depth are never found. A full, deep chest with large heart-girth indicates a rugged sort of animal possessed of much constitutional vigor. The floor of the chest should be wide, as shown by the distance between the two fore legs, provided width at this point is not due merely to prominent, open shoulders which set the fore legs wide apart. The fore-rib, lying just behind the shoulder, should not be flat, but

should arch boldly so that no flatness or depression exists immediately behind the shoulder. Many beef animals present a hollowness or flatness of fore-rib which detracts much from the desired smoothness of conformation, and reduces the chest capacity. Care should be taken to see that the animal carries down deep and full at the front flanks just behind the elbows. The butcher cares nothing for a beef animal's constitution, but every intelligent feeder places great emphasis on the depth and width of chest, which indicate to him that the steer will be a good doer in the feed-lot. Briefly summing up all the points in the description thus far, we may say that the forequarters should be smoothly laid, smoothly and thickly fleshed, and very wide and deep, showing no lack of constitution anywhere.

The **front legs** should be short and placed squarely under the animal. They should come straight down, and the toes should point straight ahead. For reasons already given, the fore legs should be set well apart. The arm should be wide and muscular at its attachment to the shoulder. Fineness of bone and smoothness of joints are evidences of quality, whereas rough, coarse animals have heavy joints and big shank bones.

The **back** carries great weight, and it is desirable that it be straight and strong. When some people refer to the back they include the entire top of the animal from shoulders to tail. Others mean the top from shoulders to hips. The score card restricts the meaning of this term to that portion of the top lying between the shoulders and the last rib, which is some distance in front of the hip. In this description we shall use the word in the score-card sense. The back furnishes one of the high-priced cuts of beef, and always receives critical attention in judging. It is important, first of all, that the back be very wide in order that it may carry the maximum amount of meat. Beef cattle are never criticized for too much width in this part. Width is secured when the ribs arch boldly from the spinal column; if the ribs are not arched, the back must necessarily be narrow.

Fully as important as the width of back is the depth of flesh which covers this part. When touched with the fingers,

great depth and mellowness should be found. No mere beauty of outline or stylishness of appearance can ever make up for lack of fleshing in a beef animal. The flesh must be there. Dimples or ties, rough spots, or uneven patches of fat detract from the value because the carcass of such an animal will be rough in appearance and uneven in its covering of flesh. If a wide back furnishes greater space for meat than does a narrow one, then length of back might be advised for the same reason. But a long back is not wanted because one of the outstanding features of correct beef type is **compactness,** by which is meant

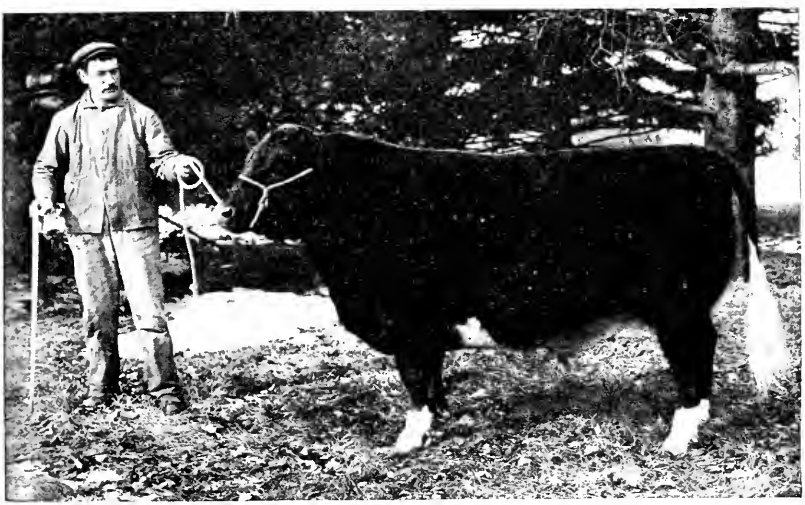


Fig. 2. A Feed-Lot Model.

Prince Rock, a grade Aberdeen-Angus steer, fed and owned by Iowa State College. Note the extreme depth of chest and middle in this steer, giving him a strong constitution and great feeding capacity. His short legs and blocky body indicate heavy gains on feed and quick maturity.

shortness from head to tail, and especially shortness from shoulder to hip. We naturally expect the back to be short, because length there is associated with the undesirable rangy type of animal too often found.

The **ribs** should not only be well sprung, but should also carry down with much depth to help make a roomy or capacious body. A wide, deep middle is essential to digestive capacity. Cattle have thirteen pairs of ribs. In beef cattle they

should be placed close together along the sides, and the last pair should come as close to the hips as possible. This provides a framework upon which the fleshing can be smoothly laid. When there is much space between the ribs, a smooth fleshing is not often found, for then the position of the ribs will be marked by ridges and there will be hollows between them. When the distance is great between the last rib and the hip, it is impossible to get that part filled out smoothly; instead there will be a large "hunger hollow" which detracts much from the appearance. Once more, therefore, the necessity for compactness (shortness) of middle is emphasized.

The development along the side of the animal should be such that all points fill out plump and smooth to meet the same straight line from front to rear. The fleshing over the ribs should be thick, smooth, and even, and the hind flank should be well filled with flesh so that when the hand is placed under it and lifted, it is found to be thick, full, and heavy. If the front and hind flanks carry down properly, the underline will be straight, as it ought to be.

At this point it is well to state that while the middle of a beef animal should be wide and deep, a distended condition of the paunch is not desirable. When this occurs, the animal is referred to as "paunchy." The lines of the middle, both at the sides and along the belly, should be straight and trim, giving a neat, tidy appearance sometimes described as "well tucked up." Given good arch and depth of rib, a steer may be straight and trim in his middle without sacrificing proper feeding capacity, and such animals suit the butcher much better than paunchy ones, because an excessive paunch means much waste when the animal is slaughtered.

The **loin** is that portion of the top lying between the rear edge of the back and the hips. It has no ribs below it, but consists of large muscles, affording the very choicest cuts of the entire carcass—the porterhouse and sirloin. The loin should be very wide and very heavily and smoothly fleshed to afford as high development of this part as possible.

The **hips** should be laid in snugly, and nicely covered over with flesh. The eye should not be able to locate the hip of a well-fattened animal; only when the hands are used should

the point of the hip be possible of location. This helps to give the smoothness desired in both the living animal and the carcass which it ultimately yields. Wide hips cannot be covered over with flesh, and the animal suffers a rough and ragged appearance.

The **rump** is the top between hips and tail-head. It should be level so as to carry out the top line straight and square to the end of the body. Some animals droop in the rump, and some rise prominently; in each case the conformation is faulty. The rump should be as long as possible and as wide as the rest of the top. This permits a maximum fleshing and provides the most attractive form. The width should be carried as uniformly as possible from hips to end of rump. As the tail-head is approached, there is bound to be some rounding off, yet this does not mean that the end of the rump need be narrow or peaked. Rather it should be wide and plumped out with flesh. Beef cattle very frequently exhibit roughness about the tail-head or at the end of the rump on each side of the tail, due to the accumulation of patches or gobs of fat. Smoothness here indicates better fleshing qualities.

The **thigh** begins at the border of the rump and extends down the outside of the limb. It should be wide and plump from every angle of view, and come down with some bulge on the outside to where the thigh naturally narrows. The plumpness and thickness should carry down as close to the hock as possible; viewed from the side, the thigh should be very wide, and when the animal is viewed from the rear there ought to be much thickness from side to side. The hindquarters furnish the third most valuable cut of the carcass and are worthy of careful examination in judging.

The **twist** is the fleshing between the hind legs, just as the thigh includes the fleshing on the outside. It should be very deep and full, filling in the space between the legs and carrying down as far as possible toward the hocks.

The **hocks** and **legs,** by their position, indicate the capacity for fleshing in the twist and also on the thigh. If the hocks are straight and properly placed, showing no special tendency to come together, they will be associated usually with more heavily fleshed hindquarters than otherwise. It is important,

therefore, that the hocks stand squarely under the animal. The shanks should carry straight down, and, as in front, they should be short and show refinement in bone. The joints of the limb should be clean-cut.

The **quality** of the beef animal is shown in bone, skin, hair, and head. Quality, which is synonomous with refinement, is essential because it insures against coarseness of texture in all parts, especially the texture of the muscles. The head should be of medium size and should be clean-cut, presenting a sort of chiseled appearance. The heads of many animals do not exhibit that "finishing touch" which characterizes the head expressive of refinement. Heavy bone, large rough joints, and heavy horns show lack of quality. Perhaps the best indication of quality is the hide, which should be found pliable, easily stretched, and only medium thick when rolled up in the hand. The hair should be soft and fine.

Animals are frequently found which possess too much quality. In such cases there is a delicacy of make-up; quality is purchased at the expense of constitution. Extreme quality is also purchased at the expense of size, for over-refined animals are usually undersized. The proper degree of quality represents the middle ground between two extremes, each of which is undesirable. This middle ground is hard to define; it may be said that all the quality is wanted which may be had without sacrifice of constitution and proper size.

The **fleshing** of beef cattle is of the highest importance. The fact that the butcher's block is the ultimate end, and beef the ultimate product, must never be lost sight of by the breeder, feeder, or judge of beef cattle. All over the body, and more especially in the back, loin, and hindquarters, there should be found a uniformly deep covering of flesh. The flat of the hand pressed along the shoulder, back, or side should find a deep, mellow fleshing, without any patchiness or bare spots. When mature cattle are heavily fed they thicken in their flesh, and this increase in thickness is due not to a growth in muscle, but to a mixing of fat among the muscle fibers, a storing of fat between the muscles, and a laying on of fat externally just beneath the skin. The quantity of muscular tissue remains constant unless the animal is starving, in which case this tis-

sue may be drawn upon to support life. The only factor of fleshing which the feeder has under his control is the quantity of fat. If the animal is matured, feeding is exclusively a fattening process; if the animal is not matured, fattening is accompanied by increase in bone and muscle. The degree of fatness shown by a steer is referred to as his "condition," and this feature will now be discussed.

Condition.—In comparison with dairy cattle, one of the most distinctive features of beef cattle is their ability to fatten easily and to deposit the fat in and around the muscles, thereby making the meat tender and juicy. As pointed out above, the feeding of beef cattle is largely a fattening process. The practical feeder knows, however, that it is not profitable to feed an animal up to his limit of fatness, because the last gains a steer makes are most costly, and such animals do not suit the consumer of beef as well as a steer fattened in moderation. Thin cattle are characterized by a very firm fleshing, so that when the finger-tips are pressed on the back and ribs the flesh is found to be hard and unyielding. When such cattle are properly fattened a decided change takes place; the flesh now has a mellow, yet firm and springy feel, and is no longer hard and unyielding. This firm, springy, and mellow condition indicates that the steer is properly fattened from a market standpoint. When feeding for show purposes, the fattening proceeds further, and, if continued to excess, the fleshing becomes soft and blubbery. To the fingers, such an animal seems incased in blubber, and when the animal is slaughtered this is indeed found to be true.

The best way to determine the state of fatness of an animal is to use the hands in the manner mentioned above. This can be done rapidly, yet thoroughly, by a vigorous handling along the top and down over the ribs and shoulders. Other means of determining the condition consist of examinations of the cod, hind flank, and tongue-root. At these points the fat tends to accumulate extensively, and they are, therefore, good indices of condition. After castration, the scrotum with its content of fat is called the cod. Thin steers show very little fullness of cod, while fat ones have the cod completely filled with fat. Thin animals also exhibit a very light hind

flank. At the beginning there may be little more than a fold of skin; when fat, this part fills out remarkably full and heavy. By placing the flat of the hand beneath it and lifting, the quantity of fat in the flank is easily determined. When a fat steer walks, there is a characteristic roll or swell to the flank as the hind leg swings forward. This is not noticeable in a thin animal. The thickness of the tongue-root may be determined by grasping the part with the thumb and fingers.

Some individuals fatten smoothly, with no special tendency to bunch the fat in patches or rolls at certain points, while others become "rolly," or "patchy," in spite of all the feeder's skill. Patches and rolls are most often found about the tail-head and end of the rump, along the ribs, and at the edge of the loin. The occurrence of these is highly undesirable; they indicate an improper distribution of fat, give the animal a rough appearance, and, when the animal is slaughtered, the carcass is discounted, for then the bunches of fat are very evident and the appearance is spoiled. The fatter the steer becomes, the greater is the tendency toward patchiness, yet many animals begin to exhibit this defect before they are really ripe and ready for market.

Style has actual market value in a fat steer. A stylish steer is one that stands squarely on his feet, with his back level, head well up, and eyes and ears attentive to what is going on about him. This does not mean a nervous animal, but a wide-awake one, full of life, and seemingly interested in the things about him. When he walks, he does it easily and without awkwardness. Other things being equal, such a steer will attract buyers much more quickly than an animal that slouches while standing, showing a pronounced dip in the back, and having an awkward stride when in motion. These two animals may dress out equally high, and yield equally valuable carcasses; the difference is that the first steer forces his good points to the attention of the buyer and shows for all he is worth, while in the case of the second steer, the buyer is left to discover the animal's good points without any assistance from the animal. Cattle with style sell more readily and at slightly higher prices than cattle without style.

Size and weight vary according to age, sex, breed, and fatness. Disregarding breed differences, for this factor need not be considered here, the following figures represent fair standards of weight at different ages for well-fattened steers:

At birth	70 pounds
6 months	450 pounds
12 months	850 pounds
18 months	1100 pounds
24 months	1300 pounds
30 months	1475 pounds
36 months	1600 pounds

Age from the teeth.—The ages of cattle may be determined with a fair degree of accuracy by an examination of the teeth. There are eight incisors in the lower jaw of mature cattle. There are no incisors in the upper jaw, but a tough fibrous pad instead, amply suited to the grazing habits of cattle. The dentition at various ages is as follows:

12 months.	All calf teeth in place.
15 months.	Center permanent incisors appear.
18 months.	Center permanent incisors in wear.
24 months.	First intermediates up.
30 months.	Six broad incisors.
36 months.	Six broad incisors in wear.
39 months.	Corners up.
42 months.	Eight broad incisors in wear.

CHAPTER II.

THE BEEF CARCASS.

Buyers of fat cattle at the large market centers make their bids according to their estimates of the kind of carcasses the animals will yield. These estimates are made with considerable accuracy because the buyers have made a study of carcasses and the cuts which they yield. A similar knowledge of meats is essential to the beef producer in order that he may learn to judge and value beef cattle correctly.

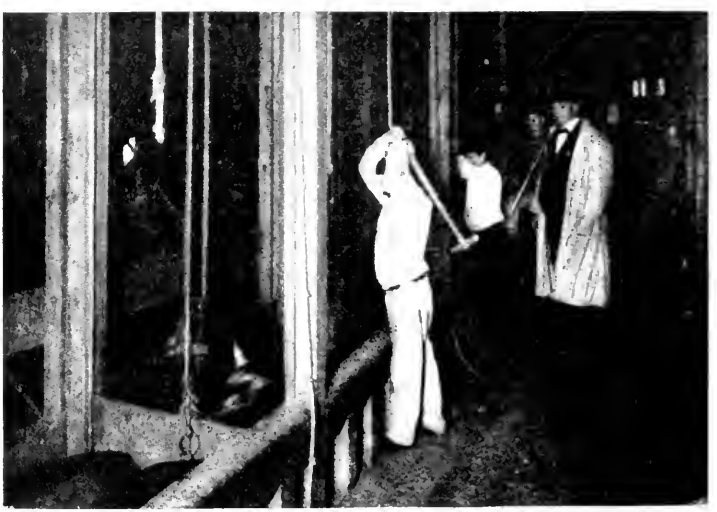


Fig. 3. Knocking Cattle.

Slaughtering.—Upon reaching the packing house, the cattle are driven into knocking pens where they are dealt a sledge-hammer blow by the "knocker" who stands on a platform about even with the head of the animal. They are then rolled on the dressing floor, where a shackle is placed about the hind legs. The carcass is raised and bled, and the head removed. Again floored, the feet are removed at knees and hocks, and the hide is stripped. The carcass is then placed

on a spreader, known as a "beef tree," where it is disembowled, the hide removed entirely, and the back split. An endless chain then conveys the sides of beef through a set of washers to the coolers. The time required for dressing a carcass is less than 40 minutes. The beef remains in the coolers from one to two weeks before it is ready for the market, the temperature being kept at about 38 degrees Fahrenheit. Prime meats require three to four weeks ageing in a refrigerator to arrive at their best.

The offal.—The feet, head, hide, internal organs, loose fat, blood, and contents of stomach and intestines are collectively called the offal or waste of the steer, so called because formerly, with the exception of the tongue, hide, and tallow, this offal was thrown away. Today all of it is valuable for manufacturing into various by-products.

The dressing percentage.—By comparing the weight of the chilled carcass with the live weight of the animal, the percentage of carcass, or what is called the dressing percentage, is determined. This is a very important point in determining the market price of a steer, and the buyer always estimates the dressing percentage when bidding on a load of cattle. For instance, suppose we have a steer of 1,200 pounds weight on foot. When dressed, the carcass weighs say 720 pounds. The dressing percentage would then be 60 per cent. Now suppose we have two loads of 25 steers each. The average live weight of the steers in each load is 1,200 pounds. When slaughtered one load dresses 60 per cent., and the other 57½ per cent. Each load had a total live weight of 30,000 pounds. When dressed, one load yields 2½ per cent. higher than the other, a difference of 750 pounds of carcass—a difference exceeding the weight of a single carcass. The total dressed weight of the 25 steers in the best load was 18,000 pounds; 26 steers of the lower dressing kind would not yield this weight of carcasses by 60 pounds. We will suppose each lot of carcasses brought a wholesale price of $9.50 per cwt. Then 750 pounds of carcass amounts to $71.25, which is the difference in the income from the sale of the two lots of carcasses. This amounts to $2.85 per head in favor of the high dressers. In handling thousands of animals, as

do the large packing firms, the question of dressing percentage is a very important one. The range in the dressing percentages of cattle is from 35 to 70 per cent.

The chief factors determining the dressing percentage of a steer, in the order of their importance are: (1) fatness, (2) paunchiness, and (3) quality of bone and hide. Aged dairy cows which have outlived their usefulness as milk producers are sent to market; they are very paunchy and very thin, and dress around 45 per cent. Well-bred steers, well fattened and with straight lines, that is, free from paunchiness, dress out 62 to 65 per cent. The highest record known to the writer, where the steer was dressed in the usual manner, is 69.9 per cent. Quality of head, feet, and hide is of less importance as a rule than paunchiness or fatness, although in some animals the weight of hide is a considerable item. Commission men who sell cattle on the big markets are always careful that the cattle consigned to them get plenty of feed and water before they are offered for sale. This is called the "fill," and it is important because it corrects the gaunt appearance caused by shipping, and adds weight to the animal. The buyer estimates the fill in various ways, particularly by the degree of paunchiness. Hence the fill does not constitute a fourth factor of the dressing percentage, but is included under paunchiness. On hot days when cattle take a heavy fill of water, buyers stay off the market as long as possible.

The wholesale cuts.—When the carcass has been sufficiently ripened in the cooler, it is ready for cutting up into the wholesale cuts. The full side of beef, half the carcass, has the appearance shown in the following diagram. The wholesale cuts are indicated by the dotted lines.

The navel and brisket are usually sold together in one piece, called the plate; otherwise the navel is difficult to dispose of. Sides are usually quartered or "ribbed" between the 12th and 13th ribs. The quarters are called "fores" and "hinds." The forequarter yields the rib, chuck, plate, and shank cuts. The hindquarter yields the round, loin, flank, and kidney suet. Regular hindquarters contain 47 to 49 per cent. of the carcass weight, and fores, 51 to 53 per cent., the averages being about 48 per cent. hinds and 52 per cent. fores.

Hinds are quoted about 25 per cent. higher than fores in cold months, and up to 40 per cent. higher in summer. This variation is due to the large amount of boiling and stewing pieces in the fores, which meats are in greater demand in winter.

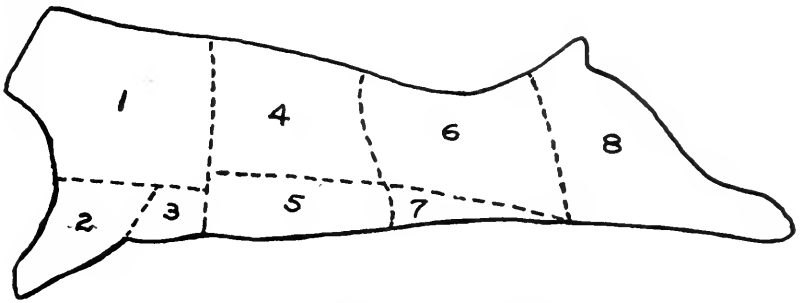


Fig. 4. Wholesale Cuts of Beef.

1, Chuck; 2, shank; 3, brisket; 4, rib; 5, navel; 6, loin; 7, flank; 8, round; 3 and 5, plate; 6, 7, and 8, hindquarter.

The loin is separated from the round at the hip joint. The shank is sawed off just below the shoulder joint. The plate is taken off on a line extending from about the middle of the twelfth rib through the point at which the shank is removed. The rib and chuck are separated between the fifth and sixth ribs.

A 720-pound carcass will yield a 360-pound side. When the side is cut up, the weights of the various wholesale cuts, their prices per pound, and their total values are as given in the following table, the figures for weights representing averages for good carcasses. Prices are given for No. 1, No. 2, and No. 3 grades.

Wholesale cuts	Wts. in lbs.	Price per lb., cents			Total value of parts		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Round	100	10.5	9	7.75	$10.50	$ 9.00	$ 7.75
Loin	60	16.5	15	9.5	9.90	9.00	5.70
Flank	10	4	3.5	3	.40	.35	.30
Rib	35	13	11.5	7	4.55	4.03	2.45
Plate	40	4.25	3.75	3.25	1.70	1.50	1.30
Chuck	82	5.75	5.25	4.25	4.72	4.30	3.48
Shank	18	3.5	3	3	.63	.54	.54
Suet	15	4	4	4	.60	.60	.60
Total	360	9.16	8.14	6.14	$33.00	$29.32	$22.12

High-priced and low-priced cuts.—The average price for the entire No. 1 carcass is, then, 9.2 cents per pound. From the foregoing table it is seen that the loin, rib, and round constitute slightly more than half of the carcass weight, but bring a little more than three-fourths of the return from the sale of the wholesale cuts. The 195 pounds of loin, rib, and round have an average price of 12.8 cents per pound, while the remainder of the side, weighing 165 pounds, brings an average of nearly 5 cents. Hence the packer wants cattle

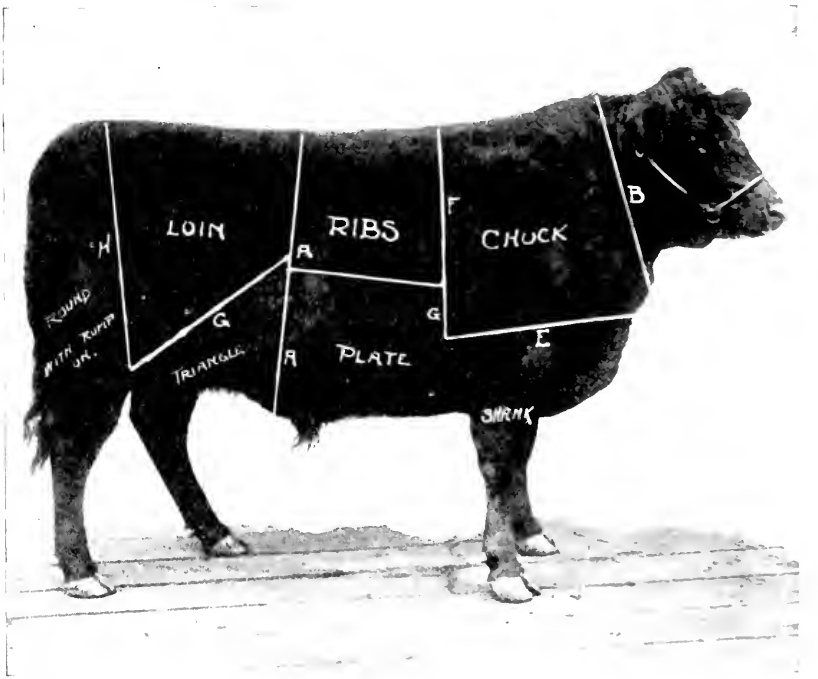


Fig. 5. Cuts of Beef Indicated in the Live Animal.

as highly developed in loin, rib, and round as possible. Buyers of cattle for slaughter emphasize this point. They want cattle smoothly and heavily fleshed in all parts, and especially in the three parts mentioned. The selling price of a load of cattle is greatly dependent on this feature.

Variations in carcasses.—A study of the carcasses in any cooler brings out striking differences. Some are large, being

from 1,500- to 1,600-pound animals; others are from younger beeves that weighed 800 to 1,100 pounds. Some are compact and wide, others are long and narrow. Some are well developed in the regions of high-priced cuts, while others are deficient in this respect. Some carry heavy fleshing, others are very poorly covered indeed. The layer of external fat is very thick in some, these being highly finished cattle fed on grain. Others show practically no external fat. These are from grass-fed cattle—poor pasture too, for a steer puts on some external fat on grass if the pasture is good. Some show a nice intermixing of fat and lean, called "marbling," while others exhibit this feature very slightly, or none at all. The lean meat of some carcasses has a pale red color; in others it is very dark. Some carry snow-white fat; others carry fat of a yellow color. Some beef is fine grained, and some is very coarse and fibrous. Some carcasses have soft bones, somewhat cartilaginous in character; others have hard flinty bones. Size of bones varies a great deal in different carcasses.

To sum up these differences we may say that carcasses vary in respect to (1) size, (2) shape, (3) thickness of fleshing, (4) thickness of external fat, (5) marbling, (6) color of lean meat, (7) color of fat, (8) grain of meat, (9) flintiness of bones, and (10) size of bones. The butcher or packer is interested in all these things, for each is of considerable importance. The packer grades the wholesale cuts of beef, as they vary in these points, into No. 1, No. 2, and No. 3 grades. No. 1 cuts bring the highest price, and between No. 1's and No. 3's there is a marked difference. These three grades are all used on the butcher's block. Cuts from inferior carcasses not suitable for block use are called strippers; these are manufactured into boneless cuts, barreled beef, and sausage.

How the carcass is produced.—Before taking up a discussion of the qualifications of a good carcass, it will be profitable to consider briefly how an animal grows and builds up the parts of its body which eventually make up the carcass. The carcass consists of bone, muscle, connective tissue, and fat. At birth the calf weighs about 70 pounds. Its

bones are soft and elastic, and its muscles are tender. It carries a certain degree of fatness, depending on how well it was nourished before it was born—in other words, on how well its mother was fed. Up to weaning time it subsists largely upon its mother's milk, which is primarily a bone and muscle builder, producing growth.

When weaned, the future of the calf depends upon (1) ancestry, (2) feed, and (3) management. If its ancestors were dairy animals, it will never fatten properly nor make a valuable carcass. However, we are dealing with beef production and will assume the calf is from a good line of beef cattle. If given plenty of feed and good care, in other words every opportunity to develop quickly, the calf rapidly increases in size and its flesh expands and thickens. It also lays on fat. It is hard to fatten young animals because they tend to utilize their feed for growth rather than fat. Growth is increase in bone and muscle. However, with heavy feeding, cattle become fat before reaching maturity, and may be sent to market under 20 months of age weighing 800 to 1,200 pounds. Such animals are called "baby beeves."

Another way to handle the calf is to turn it out to pasture and perhaps help it along with a little grain if the pasture is short. In this case the object is to produce growth only, and the animal may then be finished as a two-year-old. Under this plan the animal should be roughed through the winter with care, otherwise it will receive a setback. A third way to manage this calf would be to put it on pasture where it can get grass if there is any, and get thin if there isn't—so thin that it loses what we may call its baby flesh. In winter, under this system, the animal starves along as best it can, and the result is that it never makes a good beef, even though liberally fed at the finish. Once the baby fleshing is lost through setbacks received during development, the steer does not make as desirable a carcass as he would otherwise.

As an animal increases in age, its bones become hard and flinty. The bones which bear the most strain become most flinty, these being the shank bones. In young cattle the tips of the spinous processes of the vertebrae are soft

and cartilaginous. These "buttons," as they are called, are present up to the age of 18 months; thereafter they gradually ossify, and at about the fifth year the spines are hard to the tips. Similar changes take place in the cartilages on the breastbone before the third or fourth year. The breastbone, backbone, ribs, and pelvis gradually harden and whiten, especially after the age of 18 months. When visiting a beef cooler, the age of the animals from which the carcasses came may be told approximately by the bones. With increase in age the muscles become tougher through use. The muscles which the animal uses most and which do the most work become the toughest in their make-up; these are the muscles of the neck and those used in locomotion, including the muscles of the thigh, shoulder, and arm.

Wild animals store up fat in their bodies as a reserve upon which they rely in times when food is scanty. The bear, for instance, takes on lots of fat during summer and fall, which is resorbed and used to support life during hibernation in winter; he comes out in the spring in very thin condition. The storing of fat is a provision of nature. The camel with his hump of fat furnishes another good example. In the domestic animals which produce meat, man has encouraged this fat-storing tendency by methods of breeding and feeding. That great success has been achieved along this line is shown by the highly finished cattle, sheep, and hogs coming from the hands of the best stockmen. The natural place for the storing of fat is along the back, forming a layer of clear fat just beneath the skin. It is also stored about the internal organs, between the muscles, and within the muscles among the muscle fibers. This storing of fat among the muscle fibers gives the marbled appearance already referred to. Practically no fat is stored up in the muscles which do much work, hence we find the round steak coming from the thigh to be almost completely free from fat, being lean all the way across. The muscles of the loin and back, having little work to do, take on the marbling feature quite easily if the animal is well fed and properly handled. This largely explains why cuts from the loin and back are most tender, although in these muscles there is not the stimulus to the growth of connec-

tive tissue such as is the case in working muscles, and this is undoubtedly another reason why the loin and back yield cuts of superior tenderness.

The following figures show the relative amounts of lean, fat, and bone in the cuts from a good carcass, as compared with those from an inferior carcass.

Name of cut	Good Carcass			Inferior Carcass		
	Lean	Fat	Bone	Lean	Fat	Bone
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Hind shank	28.1	13.5	57.8	43.8	5.0	50.0
Round	72.2	17.0	9.2	82.9	8.2	8.5
Rump	44.7	32.9	22.2	47.4	30.1	21.1
Loin	54.8	33.3	11.1	62.4	24.9	11.9
Flank	46.3	53.2	0.4	49.3	9.2	0.7
Shank	15.2	13.1	34.1	60.8	3.2	35.3
Plate	53.9	34.3	11.5	62.8	21.5	14.7
Rib	61.1	21.5	17.2	66.3	14.8	18.0
Chuck	62.8	21.4	15.1	69.9	15.4	13.6
Neck	54.3	21.9	23.6	67.9	11.7	19.4

A careful comparison of the figures for the good carcass and the inferior one shows that they have about the same percentage of bone, but the inferior carcass shows a considerably lower percentage of fat and, therefore, a higher percentage of lean.

As stated in the previous chapter, the feeding of mature cattle is essentially a fattening process. This is clearly shown by some results at the Missouri Experiment Station, where muscle fibers and fat cells extracted from steers at different periods during the fattening process were examined and measured under the microscope and it was found that while there was very little or no increase in the diameter of the muscle fibers, the fat cells increased enormously both in number and size.

Thus we understand why cattle differ a great deal in the kind of carcasses they yield, depending upon their inherited tendencies and upon their feed and care. The effects of inherited tendencies upon the carcass are discussed in more detail in the next chapter.

The demands of the butcher and ultimate consumer.—The questions which now come before us are: 1. What kinds of lean meat and fat does the butcher want? 2. How much lean meat does he want, and how much fat? 3. How does he want these two substances arranged with regard to each other?

These questions bring up the demands of consumers of meats, for the butcher is guided by what the consumer of beef wants and will pay for. You and I are consumers of meat, and what we like, or dislike, together with the size of our pocketbook, guides the butcher who buys our cattle. Now what do we want? We want meat that is (1) nutritious, (2) tender, (3) juicy, (4) of good flavor, (5) attractive in appearance, and (6) has a small amount of outside fat. Provided beef is well ripened in the cooler and well cooked, there is not much variation in its nutrition or food value. The tenderness depends upon the work the muscle has done and upon the amount of marbling it carries. It is impossible to get too much marbling, the more the better. Meat free from fat shrivels and drys up when roasted, becoming dry and tough. Ageing or ripening in the cooler helps to make meat tender. Juiciness results from the presence of fat and manner of cooking. The flavor depends mostly upon fatness and upon proper ripening of the carcass. The cuts of beef which are most attractive in appearance are those with bright, rich, red lean, snow-white fat, and a high degree of marbling. The consumer desires a maximum of lean meat well marbled, and a minimum of bone and outside fat in the cuts of beef.

All carcasses not suitable for side beef.—Carcass beef which is thick and fat enough so that the entire side can be sold over the butcher's block in retail cuts is known as "block beef" or "side beef." Carcasses that are not thick enough in flesh to be entirely utilized by the retailer are called "cutters." The loins and ribs of cutters may be sold over the block. "Canners" are the worst carcasses to be found, from which none of the regular wholesale cuts may be sold over the block, but which must be disposed of as boneless fresh meats and cured beef products. In this chapter our attention is confined to side beef and to a study of the qualifications of a good carcass.

1. **Weight of carcass.**—The heaviest carcasses seldom exceed 1,050 pounds, and the minimum is about 250 pounds. Sufficient finish and quality are not often found in carcasses weighing less than 800 pounds. No definite line as to weight can be drawn between carcasses of beef and veal, because there are many factors determining the character of the flesh. The greatest demand is for carcasses from 1,200- to 1,400-pound steers, and most of the cattle coming to market are of about these weights. Such carcasses yield retail cuts of a size to suit the average family. Then there is also a demand for heavy carcasses to supply hotels, restaurants, and dining cars, which use large cuts.

2. **Shape of carcass.**—The ideal carcass of beef is compact and has good width in proportion to length, short shanks and neck, and full rounds, loins, and ribs. Large plates, hollow loins, prominent hips, thin chucks, or rangy, loosely coupled sides are especially discriminated against. A "rimmy" side is one showing an unusual curvature of ribs, giving a warped appearance and corresponding to paunchiness in live cattle.

3. **Thickness of fleshing.**—There is a clear distinction between thickness due to fatness and thickness due to muscular flesh. Only the knife can completely reveal the thickness of a side and the relative thickness of fat and lean; even expert dealers are often mistaken as to the actual thickness of flesh in an uncut side.

4. **Thickness of external fat.**—This is referred to as the "finish." Perfect finish consists of a smooth covering of firm white fat over the entire carcass, with the greatest depth along the back, a white brittle "kidney" of medium size, and a lining of flaky fat on the inner surface of the ribs. The rounds and shanks are covered last in the process of fattening. Carcasses show variation in thickness of external fat, ranging all the way from zero to four inches. Beef fat is not palatable to most people. The average consumer does not want more than one-half or three-fourths of an inch of external fat, and if the carcass weighs 500 pounds or less, about one-fourth of an inch is sufficient. It is impossible to secure proper marbling unless a certain amount of fat is put on externally at the same time, but the necessary marbling is

usually secured when one-half or three-fourths of an inch of fat is laid on externally; after this point is reached, the fat is stored externally only. A certain amount of outside fat is necessary in prime beef in order to insure proper ripening in the cooler, and also for proper roasting. In the lowest grade, such as canners, outside fat is entirely lacking and such carcasses will rot before they ripen. A carcass carrying

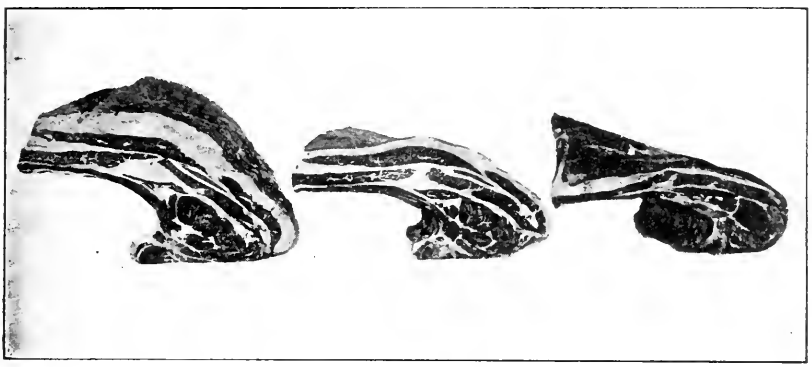


Fig. 6. Beef Ribs.

The rib cut on the left is too fat, the one on the right is too lean, and the cut in the center is correctly fattened. Note that the amount of lean meat is practically the same in all three.

soft, "gobby" fat sells at a discount. Grass-fed cattle yield carcasses that are watery and flabby, with a marked lack of finish. Heifers carry a higher percentage of fat in all cuts than do steers. This is one of the principal reasons why they often sell at a discount in this country while in England they are not discriminated against because the Englishman likes fatter beef.

Cattle fed to a complete finish, as are the beef cattle exhibited at the larger live-stock shows, carry a great excess of external fat—far too much to suit the average consumer. This excess of tallow adds practically nothing to the value of the carcass as food. In a way, the fat-stock shows set a wrong example for feeders to follow. Such a finish results from a long feeding period of 8 to 10 months, and in some cases even longer. A 3 to 6 months feeding period gives a carcass which suits the consumer better, and such a plan is undoubtedly more profitable to the feeder, because the first

gains a steer makes are acquired much more cheaply than the last ones. This does not mean that the farmer should send thin cattle to market; it means there is a place to stop in the feeding of a bullock which results in greatest profit to the producer and best satisfaction to the consumer. A smooth and firmly finished steer is the sort this implies. As

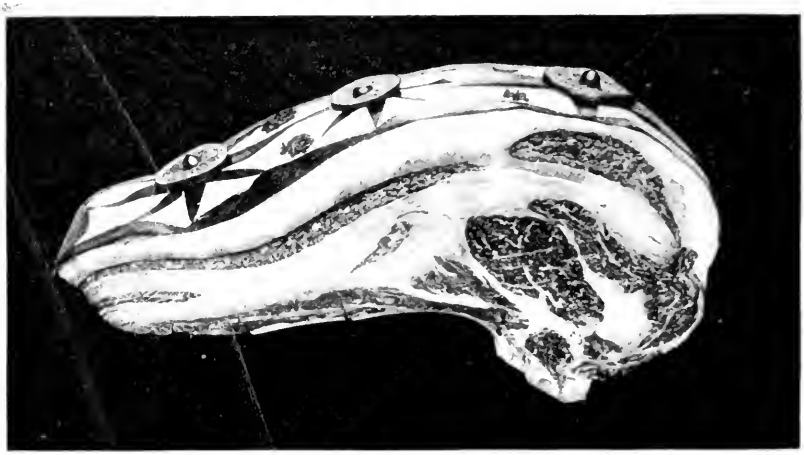


Fig. 7. Well-Marbled Beef.

Rib roast, showing correct proportion of fat to lean, and a high degree of marbling.

bearing on the matter of cost of gains, the Kansas Station found the grain required for 100 pounds of gain with fattening steers for different periods to be as follows:

	Grain for 100 lbs. gain	*Increase of feed required*
Up to 56 days	730 pounds of grain.	
Up to 84 days	807 pounds of grain.	10 per cent.
Up to 112 days	840 pounds of grain.	15 per cent.
Up to 140 days	901 pounds of grain.	23 per cent.
Up to 168 days	927 pounds of grain.	27 per cent.
Up to 182 days	1000 pounds of grain.	37 per cent.

These figures indicate the heavy cost of thoroughly fattening a steer, and the importance of selling as early as possible.

5. **Marbling.**—The highest quality of beef is that which contains the largest proportion of well-marbled lean.

6. Color of lean meat.—The meat from grass-finished cattle is dark in color. Grain feeding gives the best color—a bright, rich red. Dark color is due to the presence of much blood in the tissues. Anything which causes the blood to flow into the tissues in large quantities results in dark color. Exercise or excitement will bring about this condition, hence the dark-colored flesh of western range cattle, and of grass-fed cattle in general, is not due to the nature of the food, but to the amount of exercise made necessary in ranging about at pasture. Stags and bulls kill out dark because of their restlessness, and of heifers in heat the same is true. Dark carcasses break down (decompose) quicker than light-colored ones, and customers object to the appearance, hence butchers have two good reasons for disliking a dark-colored carcass.

7. Color of fat.—A clear white color of fat is desired. An unattractive yellow color is rather frequently met with. Some packers believe the yellow color is due to the kind of feed upon which the animal was fattened. Cottonseed meal has been charged with this fault, but experimental work has shown that cottonseed meal does not produce yellow fat. Cattle of Jersey and Guernsey breeding usually kill very yellow.

8. Grain of meat.—This is a little difficult to describe. When the fresh-cut surface is viewed, it should show a smooth, fine-grained appearance, and should feel "velvety" to the touch. Meat with fine grain comes from the animal with quality, that is, one with fine hide, hair, and bone. Such an animal is finely textured throughout, and if well fed, so that the baby fleshing is preserved, a carcass with fine-grained flesh will result. Some meats are very coarse indeed.

9. Size of bones.—The bones should be as small as the weight of the carcass will allow. From the producer's standpoint, however, such carcasses do not always represent greatest profits, because extremely fine-boned cattle do not usually make the greatest gains on feed.

10. Flintiness of bones.—As already shown, flintiness of the bones is an indication of age. The most desirable carcasses are those of young animals approaching maturity, the meat from old ones being tough, dark-colored, and lacking in marbling. The bones of cows and heifers, and of dairy-

bred animals, turn hard and white earlier than those of steers, indicating quicker maturity.

Grading carcasses.—As to the relative importance of the above factors in grading carcass beef, it may be said that finish (by which is meant the thickness and smoothness of outside fat) is particularly essential, with thickness of flesh, fineness of grain, color of lean and fat, fineness of bone, and shape of carcass of about equal importance. From what has been said we now understand why the loin and rib bring such high prices as compared to other parts of the carcass; it is because of their superior tenderness, marbling, and palatability, combined with attractive appearance. The round brings a good price because it contains so much lean and so little bone and external fat. Other parts of the carcass are as nutritious as the loin, rib, and round, but are difficult to cook in such a way that they appeal to us as do the porterhouse, sirloin, and rib roast. But a carcass will yield only so much of these, hence the great variation in the price of the various wholesale cuts. It is perhaps well that there are cheap cuts of meat and cheap carcasses, for there is a great percentage of population not able to buy any other kind. The packer does not want all beef to be of highest quality. He must take care of the second and third class trade as well as the fancy trade. But the producer of market cattle must aim to produce the highest quality of product, for this work requires skill, and skill always commands a higher reward than unskilled effort. Anybody can produce medium or inferior beef, and the price obtained is in proportion.

Sex differences.—Steer carcasses are identified by the cod fat and generally by their full, fleshy rounds and loins, heavier, coarser bones, and short necks as compared with cows. They show more quality and finish than any other class, and are sold as carcass beef more extensively than any other class, except heifers. Heifer carcasses are distinguished by the udder, and usually they have smaller bones, more prominent hips, more angular rumps, less development of lean meat, and they average lighter in weight. The tendency in heifer beef is to carry the fat more extensively as kidney suet or gobby fat than do steers. They have flatter loins, flatter plates, and

longer, thinner necks than steers. Carcasses of cows have the bag trimmed off as closely as possible. The form is angular, the neck long, the bones hard and white, and the majority lack thickness of flesh. Fat cow carcasses often carry an excess of kidney fat and bunches of fat on the back and rump. The flesh is seldom as well marbled as that of heifers or steers. Cow carcasses require more ageing or ripening to make the meat tender. Dressed bulls are easily recognized by the heavy neck and heavy shoulders, thick rounds, dark color, coarse-grained flesh, and absence of cod fat. They have rough shape and the bones show maturity. The coarse dark flesh has no marbling as a rule, and but few bulls are suitable for dressed beef. They are used for sausage and the rounds are made into smoked beef hams. Many stags approach steers in form, quality, and finish; others resemble bulls.

All carcasses of cattle are classified and graded as follows:

Classes	*Grades*
Steers	Prime, choice, good, medium, common
Heifers	Prime, choice, good, medium, common
Cows	Choice, good, medium, common
Bulls and stags	Choice, good, medium, common
Cutters	Good, medium, common
Canners	Good, medium, common

Conclusion.—The study of the beef carcass therefore teaches:

1. That well-bred cattle yield the best carcasses and bring the highest price.
2. The market wants young, highly finished cattle.
3. Steers yield the most desirable carcasses.
4. The best results come from a method of management which offers no chance for a setback during growth and fattening.
5. The breeder and feeder of beef cattle should secure as high development of loin, back, and hindquarter as possible.
6. To bring a good price, cattle must dress high.
7. To dress high, cattle must be free from paunchiness and must be fat.

8. Broadly speaking, heredity regulates the lean meat, and man regulates the fat.

9. Feeding is a fattening process.

10. Fatness is desirable because it adds weight, makes perfect ripening possible, gives tenderness and juiciness to the meat, and increases the dressing percentage.

11. Cattle may be made too fat.

12. Carcasses vary widely in weight, shape, thickness of fleshing, thickness of external fat, marbling, color of lean, color of fat, grain of meat, and size and hardness of bones.

13. Ancestry, age, feed, and care determine what sort of a carcass an animal will yield.

14. Half of the carcass meets with strong demand and sells high, while the remainder sells low.

15. There is demand for carcasses of all weights, but the strongest demand is for handy-weight carcasses from cattle weighing 1,200 to 1,400 pounds.

16. To secure the greatest returns, the feeder should send his cattle to market well done after a short feeding period, but not in an excessively fat condition resulting from long continued feeding.

CHAPTER III.

THE VALUE OF TYPE IN BEEF MAKING.

In order to determine just what advantages are possessed by the beef-type steer as compared with dairy-type steers, some experiments have been carried out which have resulted in interesting findings. It has long been known that beef steers suit feeders and butchers better than steers of dairy breeding. It has been claimed that beef steers gain faster in proportion to feed consumed, that they fatten more readily, dress out higher, yield a more valuable carcass, and hence bring a higher price on the market. Experimental results have upheld some of these views and disproved others.

In 1903, the Iowa Experiment Station conducted a series of experiments dealing with the comparative merits of the two types for beef production. The object was to provide answers to the following questions: 1. Which type of steer makes the greater gains from pounds of feed consumed? 2. In the gains made, what differences exist between the two types as to distribution of such gains over the body? 3. Which type of steer yields the greater profit to the feeder? 4. Which type shows the greater amount of offal? 5. Which type carries the higher percentage of tallow? 6. Which type carries the higher percentage of valuable cuts? 7. In considering the various commercial cuts from the two types, what differences are to be found as regards: weight, thickness, covering of fat, marbling, color, and fineness of grain? 8. Is the low price paid for dairy-type steers due to prejudice, or to an actual inferiority in the value of the carcasses?

Four beef-type steers and four dairy-type steers were put on feed January 1, 1903, and fed one year. The steers were on dry feed during the entire time, so that the exact amount of feed consumed by each lot might be known. Of the four beef steers, two were high-grade Herefords, and two, purebred Angus. The four dairy steers consisted of two Jerseys and two Holsteins. The ages at the beginning

of the test were approximately as follows: Average of Herefords, 16 months; of Angus, 18 months; of Holsteins, 24 months; and of Jerseys, 18 months. The feeds given were mixed hay, sorghum (during July and August), corn meal, bran, oil meal and gluten feed. The conditions were alike for all the animals, and the feed was the same, but each animal was given all he would clean up regularly. At the end of the feeding test the cattle were bought in separate lots by the head buyer of a packing company of Des Moines, Iowa. The prices given were the market prices for such steers, December 28, 1903.

Following is a summary of the first part of the investigation:

	Beef steers	*Dairy steers*
Average weight at beginning, lbs	685	574
Average gain per steer, lbs	606	598
Average value of feed consumed per steer	$47.27	$45.18
Average cost of one pound of gain	7.81c	7.63c
Percentage of dressed weight in slaughter test	61.7	57.15
Selling value, average price per pound	4.888c	3.752c

The dairy-type steers made their gains at a trifle less cost per pound than did the beef steers, indicating that their digestive and assimilative functions were slightly more vigorous in this instance. The gains made by the dairy steers were not distributed on the body in such a way as to command the highest prices. The beef-type steers made a large proportion of their gains on the back, loin, and hindquarters, while the dairy-type steers showed but little increase in thickness on these parts.

The beef-type steers were far more profitable to the feeder, for although both lots made approximately the same total gains, and although the average of the four dairy-type steers compared with the average of the four beef-type steers shows that the former made his 600 pounds of gain cheaper by $1.70 than did the latter, nevertheless this 600 pounds gain of the beef steer brought $7.18 more on the market. When $1.70 is deducted from $7.18, there is left $5.48 profit in favor of the beef animals, or a total of nearly $22 for the four head. Nor does this represent all the financial advantage

of the beef-type steer, for the value of the initial weight (685 lbs.) of the beef steer was increased to a greater degree by feeding than was the value of the initial weight of the dairy-type steer. The report of the experiment furnishes no initial valuations, hence a complete accounting in this regard cannot be made.

Following are given the weights of the cuts from the carcasses, expressed in percentages of the total carcass weight; also the wholesale and retail prices of these cuts.

	Weights in percentages		*Wholesale price per lb.*		*Retail price per lb.*	
	Beef	*Dairy*	*Beef*	*Dairy*	*Beef*	*Dairy*
Ribs	9.27	8.80	12.25	10.25	17.6	16.
Chuck	25.97	26.78	5.5	5.1	10.	10.
Brisket	5.92	5.72	4.	4.	6.	6.
Plate	3.85	3.48	4.	4.	6.	6.
Navel	3.00	2.72	4.	4.	6.	6.
Shank meat	.53	.66	5.	5.	6.	6.
Shank beef	2.60	3.04	2.5	2.5	3.	2.8
Loin	17.55	17.09	14.9	12.5		
					S. 17.6	16.
					P. 23.1	21.
Round	17.74	18.88	7.	7.	12.	12.
Rump	5.19	4.78	7.	7.	10.	10.
Flank steak	.66	.58	10.	10.	12.5	12.5
Flank beef	2.16	1.67	5.	5.	6.	6.
Cod fat	1.98	1.56	3.5	3.5	3.5	3.5
Suet	3.48	4.18	3.5	3.5	3.5	3.5

NOTE: S, sirloin; P, porterhouse.

It will be observed that the carcasses were cut up into a greater number of parts than result from the regular method of cutting explained in the previous chapter, but the differences in the cuts are not great enough to prevent a full understanding of the above table.

On the basis of the above figures we are able to determine the relative profits of the beef- and dairy-type steers to the wholesaler or packer. This is shown as follows:

	Beef steers	*Dairy steers*
Cost of 4 live steers	$242.52	$170.64
Cost of killing at $1.50 per head	6.00	6.00
Cost of carcasses and offal	$248.52	$176.64
Received from sale of hides, tallow, and tongue	36.13	30.27
Cost of dressed beef	$212.39	$146.37
Cost of dressed beef per lb	.0715	.0583
Actual wholesale returns when beef was sold	232.61	179.83
Margin between cost and selling price of dressed beef	20.22	33.46

The last item in the above table is interesting. It shows that there was $20.22 margin for the beef-type steers and $33.46 for the dairy-type steers, or a difference of $13.24 in favor of the dairy-type cattle. If this difference in margins were applied to the live-weight price of the dairy-type steers, their price per cwt. would have been 28 cents higher; in other words the dairy-type steers would have brought 4 cents per pound, instead of 3¾ cents.

At a meat demonstration in January, 1904, conducted by Mr. John Gosling, some further important differences were brought out between the cuts from the dairy- and beef-type carcasses. Mr. Gosling is recognized as one of the leading authorities on meats in this country. In grading the carcasses, he placed three of the beef-type carcasses as No. 1, and the other as No. 2. Two of the dairy-type carcasses were graded No. 2, and the other two as No. 3. The color of the flesh was fairly good in all eight of the carcasses, although in the Jersey carcasses it was somewhat dark. The external color (or color of the fat) was good in all except one —a Jersey—which killed very yellow. The other Jersey killed very white, although, as a rule, carcasses of Jerseys or grade Jerseys are very yellow. The spines in the backbone of the dairy-type carcasses were hard, indicating the early maturity of the dairy-type. They were much more cartilaginous in the beef-type carcasses, although the ages were nearly the same. The fore-ribs from the dairy-type steers were light and lacking in marbling. The Holstein ribs lacked depth, and were very irregular and rough. The dairy-type steers carried more kidney fat or suet; this is a cheap product which increases the dressing percentage, but reduces the value of the carcass when excessive.

The answers to the questions asked at the beginning of the experiment are, therefore, as follows: 1. The gains from pounds of feed consumed are practically the same for both the beef and dairy types. 2. The beef-type steer uses his gains to slight advantage as compared with the dairy-type, placing a slightly greater percentage of his gains in the valuable cuts. 3. The beef-type steer yields the greater profit to the feeder. 4. The dairy-type steer shows the greater

amount of offal. 5. The dairy-type steer carries the higher percentage of tallow. 6. As regards the percentage of valuable cuts, there is very little difference; if any, it is in favor of the beef-type steer. 7. The beef-type steer yields cuts that are heavier, thicker, usually covered with whiter fat, nicer in marbling, and a little better in color of muscle. There is no apparent difference in fineness of grain. 8. The low price paid for dairy steers may be due partially to prejudice, and to the greater expense of carrying and selling the low-grade carcasses, but it is chiefly due to an actual inferiority in the carcasses. They are unsatisfactory to the consumer, because they do not furnish thick and well-marbled cuts; they are unsatisfactory to the butcher, because they furnish low-grade carcasses which are difficult to dispose of; and they are decidedly unsatisfactory to the feeder, because they yield him little or no profit, and both breeder and feeder waste their time in producing such a type of steer for beef purposes.

In an earlier experiment at the Iowa Station, James Wilson and C. F. Curtiss found the quantity of fat about the internal organs of fat steers of the various breeds to be as follows:

Breed	*Average dressed weight*	*Loose tallow*	*Per cent. of loose tallow to beef*
Shorthorn	1,092	145	13.3
Hereford	1,022	129	12.6
Red Poll	990	125	12.6
Galloway	1,088	147	13.5
Angus	1,137	157	13.8
Devon	815	123	15.0
Swiss	1,017	119	11.7
Holstein	862	155	17.9
Jersey	880	166	18.8

This table gives further evidence of the tendency of the dairy breeds to deposit proportionately more fat about the intestines, paunch, kidneys, and caul. Experiments at the Kansas Station substantiate the results of the Iowa investigations.

Professor W. A. Henry, of the Wisconsin Agricultural College has the following to say in *Feeds and Feeding* relative to the comparative merits of beef-type and dairy-type steers:

"Beyond that which can be expressed in figures or stated percentagely lies that indefinable something described by the word 'quality' which enters into all objects of barter. No one can compare a bunch of well-fed beef-bred steers with one representing the dairy breeds without being impressed by a difference not measured by the scales. The matter at issue may be illustrated by a condition in the fruit world: No orchardist will hold that the Baldwin apple tree necessarily grows faster than the seedling apple tree, or that it will make wood and fruit on less material from soil and air. Neither will he hold that Baldwin trees necessarily yield more barrels of fruit than seedlings, nor that a given measure of Baldwin apples contains more juice or human food than the same measure of common seedling apples. Fruit growers do rightfully assert, however, that the market wants Baldwin apples and will pay more for them than for common seedling fruit, and that from this judgment of the market, be it reasonable or unreasonable, there is no appeal. Beef cattle have been bred for meat production—it would be passing strange if they did not excel for that purpose."

CHAPTER IV.

AMERICAN CATTLE MARKETS.

The largest live-stock markets of the United States are located in the central part of the country. With the West and Central West on the one hand as the great breeding and feeding ground, and with the East on the other as the chief region of consumption, it is logical that the large markets have a central location. Following are the twelve largest cattle markets and their receipts of cattle during 1914:

1. Chicago	2,237,881	7. Denver	406,903
2. Kansas City	1,827,246	8. Sioux City	349,082
3. St. Louis	1,040,957	9. St. Joseph	322,348
4. Fort Worth	990,763	10. Pittsburg	310,141
5. Omaha	938,817	11. Indianapolis	256,885
6. St. Paul	467,507	12. Buffalo	241,715
Total			9,390,245

From the figures we see that the Chicago market is the largest in the United States, in fact Chicago is the largest cattle market in the world. The 2,237,881 cattle received at Chicago during 1914, if placed end to end, would reach out in a line 4,250 miles long. Their total value was $191,788,783. Texas and western range cattle constitute about nine per cent. of all cattle received at the Chicago yards. Chicago also received 363,614 calves during 1914, valued at $4,908,790. Cattle weighing 300 pounds per head or less are classed as calves.

The great markets of the Middle West are points of focus of never-ending processions of beef animals moving from western ranges and cornbelt feed-lots. Upon reaching market, the cattle are either slaughtered at the great packing houses located at the stock yards, or are shipped out of market on the hoof. Both dressed carcasses and live animals are shipped to various cities and towns to fill the orders of retail butchers. For example, the Chicago packing houses slaughtered 1,430,770 cattle in 1914, and the remaining 807,111 head were shipped out alive. Of the latter number, only 217 head

were exported, while 521,625 were shipped to various parts of the country for slaughter, and 285,269 were taken out for feeding. The average weight of Chicago cattle in 1914 was 1,002 pounds.

The chief business of the Denver, St. Paul, and Buffalo markets is forwarding cattle—only about 30 per cent. being retained for slaughter. Centers whose shipments are less than 70 per cent., but more than 50 per cent., include Chicago, Kansas City, St. Louis, Omaha, Indianapolis, Fort Worth, St. Joseph, Louisville, and Cincinnati.

Early cattle markets.—A century ago, cattle markets were small and largely local in character. The "West" at that time comprised what we now designate as the Middle West, embracing Kentucky, Ohio, Indiana, and Illinois, and the live-stock business and the meat business of that time were far different propositions than today. There were no railroads, no live-stock cars, no refrigerator cars, no steamships, and no large live-stock markets. Every large town had its own stock yards or cattle market to which cattle were driven from the surrounding country and sold to butchers. The cattle business and the meat business were local affairs of small dimensions depending upon the size of the town. In time, New York, Philadelphia, Boston, and Baltimore became rather large markets, and in some instances cattle were driven long distances to supply them.

Early methods of transportation.—This was before the days of railroads, and even after the railroads came, very few live animals were carried until about 1860. Prior to 1850, it was the general practice to drive live stock to market on foot. At that time, in many parts of the country, pasturage was free along the routes, and the animals were driven by easy stages, reaching market without very much depreciation. George Renick, of Ohio, was perhaps the first man to find an outlet for cattle fattened in what was then "The West." He was one of the first settlers of the Scioto Valley, having come in with his brother, Felix, from Virginia and selected large tracts of land near the present site of Chillicothe, Ohio. In 1805, against the advice of his neighbors, he successfully drove sixty-eight head of cattle from the Scioto to Baltimore, and disposed of them at a profit. This gave a great impetus

to the western cattle business of that time, and afforded a means of marketing corn. In 1817, Felix Renick drove one hundred head of prime Shorthorn steers to Philadelphia, receiving $134 per head for them. He became the leading producer of high-class cattle in Ohio, and one of the most extensive breeders and feeders in the United States. R. R. Seymour, of Ohio, fed 100 to 700 head annually, and in 1841 drove 840 head to Philadelphia.

One route from Kentucky to New York City covered about 800 miles and required over ten weeks to complete it. Another route from Lexington extended to Charleston, S. C., a distance of 550 to 600 miles. Drives to the eastern seaboard were made from as far west as Iowa, and even Texas cattle passed eastward in this manner. There is record of a drove of several hundred cattle from Texas passing through Pennsylvania, on the way to New York City, which had left Texas four months previously. Sheep were driven across country also, notably from Vermont to Virginia. Large numbers of hogs were driven to market, but they were a more active type than the modern fat hog. By 1860, few hogs were driven any considerable distance. Today we do not even drive hogs from the farm to the shipping point, but haul them in wagons.

Development of large markets.—The large live-stock markets grew up with the country. As long as the market was simply the scene of barter in live animals for local use, no large markets were developed. About 1830 pork-packing was begun, and this furnished the first impetus to the creation of large markets of more than mere local importance. Pork could be pickled, salted, and smoked, and the fat rendered into lard, and the products thus produced could be shipped to distant points. As these products met with good demand, pork-packing was the natural beginning of a vast meat-manufacturing business, tending to centralize the hog markets, and much increase them in size. So far as cattle were concerned, however, the development was not parallel. Outside of an article known as barreled beef, which was put down in salt, packers had found no method of handling beef as they did hogs. Not until the era of the refrigerator car, beginning in 1875, were

cattle of much interest to packers, and not until that time did the large cattle markets reach a maximum development.

The advent of railroads marked a decided turning point in the development of the live-stock industry and the live-stock markets. However, it was a long time after the hauling of live stock had been taken up by railroads before it was done efficiently. An account of one of the first shipments of cattle from Kentucky to New York City, made in 1852, shows how crude and expensive were the first attempts at transporting cattle by rail. One week was consumed in driving the cattle, one hundred in number, from near Lexington, Ky., to Cincinnati, where they were loaded in box cars and shipped to Cleveland. They were taken to Buffalo by boat, where they were given several days rest and then driven to Canadaigua, N. Y. They were at once hauled to Albany in immigrant wagons, rested two days in a feed-yard, and sent to New York by boat. The cost of the shipment from Kentucky to New York City was $14 per head.

The cattle markets of the United States migrated from east to west, following closely upon the settling up of the country. It was at one time believed that Albany was to be the final gateway for western cattle. Next Buffalo, Pittsburg, and Cincinnati were in turn regarded as the future great market of the country; but eventually it became evident that Chicago, by virtue of location and railroad facilities, was to become and remain the largest cattle market in America. This fact was clearly established by 1870.

Chicago's early cattle trade.—The history of Chicago as a cattle market extends back many years to the time when a few hundred animals were driven in to supply the garrison at old Fort Dearborn. It was not until the advent of railroads, however, that Chicago took prominence as a live-stock center. When railroad communication with the Atlantic seaboard was established and lines were built from Lake Michigan toward the Mississippi, a revolution was brought about. Half a dozen stock yards were located in various parts of the city, and when these became glutted, the cattle were grazed on the surrounding prairie until a price could be realized. Mess pork and barreled beef were staple articles known to the trade under

the appetizing names of "sow belly" and "salt horse." Dressed beef was then unknown to commerce, artificial refrigeration was not even speculated upon, the refrigerator car existed merely as an idea, if at all, and the canning of meats had not been attempted. Armour was not a prominent name at that time, Swift had not yet discovered Chicago, and nearly every concern then engaged in the manufacture of meats has since gone out of business.

Prior to 1870, the Chicago cattle business was almost exclusively a matter of buying, selling, and shipping live animals. Then there were no market papers to inform the producer of the state of the market, and no well-organized commission firms to attend to the disposal of his stock. The producer did most of his own selling. There was danger of finding the market glutted, or shipping facilities swamped. Since that time a trade mechanism and a trade demand have grown up, bringing a constant market and quick, sure sales for the cattleman. The loss by wear and tear in shipment from farm to market has been reduced to a minimum.

In the early days it was all guesswork—guesswork as to how long it would take to reach the market, guesswork as to the freight charges, guesswork as to promptness in handling the stock by railroads, guesswork as to the condition of the market, guesswork as to the price the animals would bring. Luck usually counted for more in determining the profits than did skill in the preparation of cattle for market.

Founding of the Union Stock Yards.—In 1865, John B. Sherman purchased two of the principal yards then in existence in Chicago, and founded the present Union Stock Yard and Transit Company, thus laying the basis for a greater live-stock trade at Chicago. In 1876 the Chicago market comprised 475 cattle yards, 675 covered hog and sheep pens, 375 chutes, 15 corn cribs, and 10 hay barns. The company owned and operated 24 miles of railway, had put down several miles of macadamized streets and alleys, and installed a drainage system. The market could then accommodate at one time 20,000 cattle, 100,000 hogs, 15,000 sheep, and 1000 horses—in all, 136,000 animals. About one hundred commission firms were then doing business.

The Union Stock Yards today.—The Chicago yards now occupy an area of 500 acres, 450 of which are paved. There are 25 miles of streets, and 300 miles of railway tracks. The number of pens is 13,000, of which 8,500 are double-decked and covered; there are 725 chutes, 25,000 gates, 25 miles of watering troughs, and 450 commission and other offices. The water system has a reservoir holding 10,000,000 gallons, and pumps with a daily capacity of 8,000,000 gallons, of which 7,000,000 gallons are consumed on hot days. Separate accommodations are provided for each kind of stock; sheep and hogs are kept in sheds of two or more stories each, and cattle occupy open pens holding from one to several carloads. These yards would hold at one time 75,000 cattle, 125,000 sheep, 300,000 hogs, and 6,000 horses and mules. It is estimated that 50,000 people earn a living at the stock yards and the packing plants, and that 250,000 of Chicago's population are more or less dependent on the live-stock industry.

Since 1900, a yearly average of more than 15,000,000 animals have found a cash market at Chicago. Since 1865, 104,137,000 cattle, 7,624,000 calves, 295,618,000 hogs, 116,578,000 sheep, and 3,071,000 horses have been handled, making a grand total of 527,028,000 animals, the value of which was $10,082,342,000. Sixty per cent. of the cattle received at Chicago have been slaughtered there, also 83 per cent. of the calves, 72 per cent. of the hogs, and 75 per cent. of the sheep. The business often amounts to $3,000,000 in a day, and averages more than $1,000,000 for every business day of the year. Not infrequently 2,000 carloads of stock are received on Monday or Wednesday, the largest market days. When unloaded, the stock is taken in charge by some one of the many commission firms who sell to the packer, shipper, speculator, or feeder, and remit the proceeds to the consignor.

Average carloads.—Reports of stock yards and railroads show that the average number of meat animals to the carload is for cattle about 25, hogs in single-deck cars about 75, and sheep about 120 per deck.

Sources of receipts.—The corn-growing area of the Mississippi and Missouri valleys affords the best facilities for the production of meat animals, and this area is tapped at many

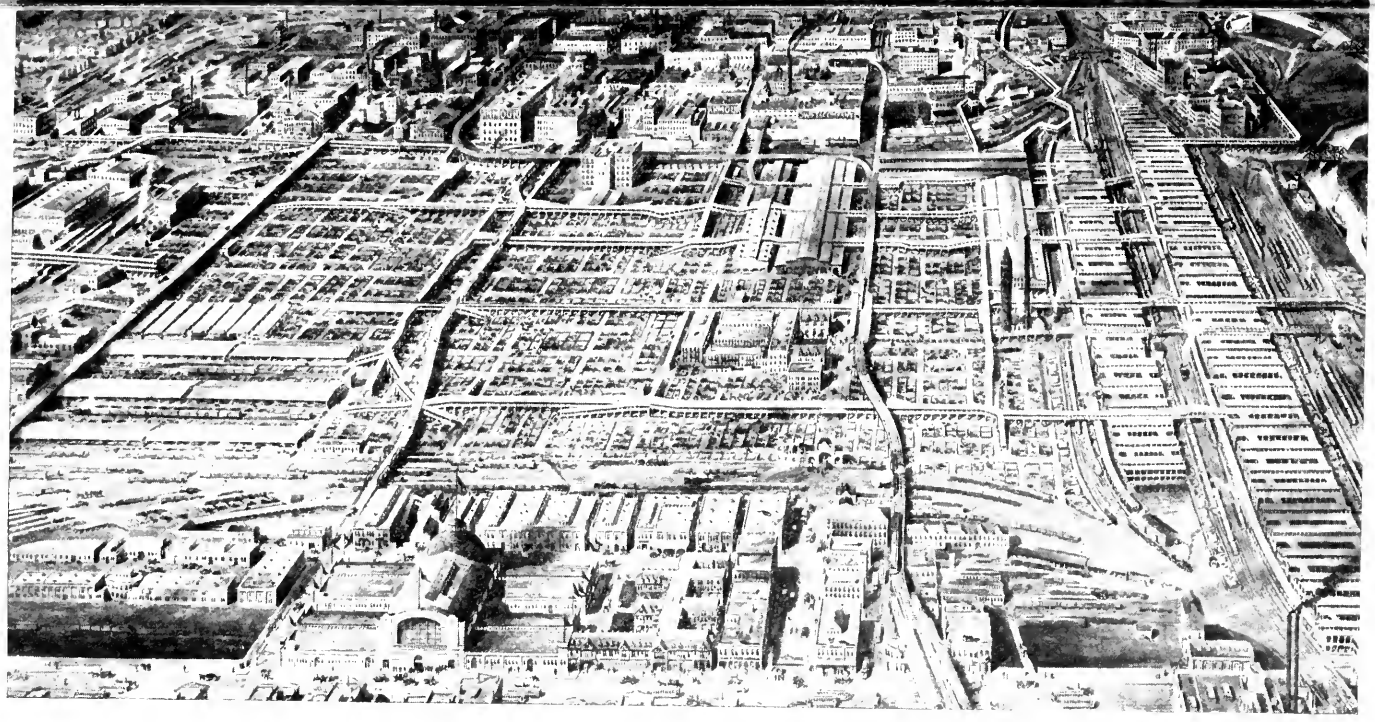


Fig. 8. Union Stock Yards, Chicago.

In the foreground is Halsted Street, the International Amphitheater, and the Stock Yards Inn. To the left and rear of the Amphitheater is the horse sales section. In the distance is "Packingtown" surmounted by lofty smoke-stacks. The Exchange Building, sheep barns, hog sections, and the la rge area of cattle pens may all be easily seen. Note the long overhead cattle chutes connecting distant parts of the yards, the numerous railway tracks, and the elevated railway which crosses the yards.

points by lines of railway centering in Chicago. The corn-fed cattle of Iowa, Nebraska, Missouri, Kansas, Illinois, Indiana, and Ohio, and the grass-fed cattle of Montana, Wyoming, the Dakotas, and Texas, have easy access to Chicago. Steers are sold in Chicago that were born in Texas, matured in Montana, and finished in an Iowa feed-lot. Sheep often experience similar wanderings before reaching market, but hogs usually come direct from the farm on which they were farrowed.

Federal inspection.—Federal inspection for disease is rigid and includes live animals, carcasses, and packing-house products intended as food. Nothing has done more to instil confidence in packers' meats than has the rigid governmental inspection. Packers' losses are frequently heavy on account of this inspection, mainly owing to tuberculosis. Crippled animals may go into the food supply. Diseased animals, diseased meats, and dead animals are consigned to the rendering tank, the products of which are grease, glue, and fertilizer.

Development of the packing industry.—No explanation of the rise of the large live-stock markets in America is complete without some reference to the development of the immense packing industry. The history of the meat business is closely interwoven with the history of the live-stock markets, the two enterprises being mutually dependent upon each other. The Chicago market benefitted not only from its location and shipping facilities, but to a great extent also because of the large packing interests which centered there. That part of the yards where the group of packing plants is located is called "Packingtown." The various plants composing it are owned by Armour & Co., Swift & Co., Nelson Morris & Co., Libby, McNeill & Libby, Anglo-American Packing Co., Roberts & Oake, Hammond Packing Co., Western Packing Co., Louis Pfaelzer & Co., Sulzberger & Sons, Boyd-Lunham Packing Co., Miller & Hart, Independent Packing Co., Brennan Packing Co., and others. Many of these firms do a big business in dressed beef, thereby increasing the demand and helping to sustain prices for live cattle at Chicago. As already pointed out, hogs benefitted from the packing industry long before cattle, because beef did not interest packers to a great extent until the invention of artificial refrigeration and the substitution of

the tin can for the oak barrel. Arthur Libby introduced canned corn beef in 1874, which was followed by dozens of palatable canned preparations. Previous to the installation of ice machines, packing operations were largely confined to the season of low temperatures.

In 1876, about 250,000 cattle were slaughtered in Chicago, and more than three-fourths of these were handled by two firms—the Wilson Packing Co., and Libby, McNeill & Libby. The Wilson Packing Co. canned 15,000 to 16,000 head of cattle annually, and Libby, McNeill & Libby over 180,000, about one-half being canned and the other half put in barrels and tierces. Three-fourths of the product went to Great Britain.

The refrigerator car.—There have been three eras in the evolution of the American meat industry: (1) The era of pickled meats, such as hams, pork products generally, and salted beef; (2) the era of the refrigerator car; (3) the era of complete utilization of by-products. The supremacy during the first era was first at Cincinnati, but it shifted to Chicago in the early sixties. As early as 1868 a refrigerator car had been invented, and in 1869 the first consignment of dressed beef had been shipped from Chicago to Boston, but the attempt was not successful. In 1875, G. F. Swift, who had come to Chicago that year, and who founded what is now Swift & Co., fitted up a car and shipped it east successfully. Thereupon, this branch of the packing business was entered into rapidly, thus eliminating freight charges on the 40 to 44 per cent. waste of the live animal, the shrink on cattle during the long haul, the expense of feeding and watering en route, and the loss of those which died in transit. It cost $4.00 to $4.40 to ship a steer of 1,250 pounds weight from Chicago to New York, while the freight on the 700 pounds of fresh beef yielded by the animal would amount to only $3.15, not including the expense of icing. From Kansas City to New York the saving amounts to about $2.50 per head.

Pioneer exports of beef.—Still greater savings have been effected by changes in the export trade. Mr. John J. Bate, of New York, was the first to undertake shipments of dressed carcasses to Europe. On February 11, 1875, he made a small shipment to Liverpool which arrived in good condition. This

was followed, on June 6, by a larger shipment, and on August 10, a still larger consignment to Liverpool was made, all arriving in good condition. In October, 1875, Mr. Timothy C. Eastman began his first shipments of fresh beef from America to England; Mr. Eastman is generally regarded as the pioneer in this enterprise. He built up a very large business which continued many years. Others entered into the industry, and shipments were made from New York, Philadelphia, and Portland, Me. American beef was found in no way inferior to British beef, and was sold at from four to six cents lower retail rates. The advent of American meats caused considerable excitement among British farmers and stockmen, and considerable prejudice against our meats was aroused at some points, which has never been wholly overcome. The business increased rapidly, meats being successfully shipped from Chicago to England. A saving of more than one-half in shipping expenses is effected by exporting dressed beef rather than its equivalent in live animals. From Argentina to England, two-thirds of the live-weight expenses are saved by sending dressed beef.

The modern packing plant.—No better illustration of the growth of the packing industry can be had than that afforded by the rise and present proportions of one of the large packing plants at Chicago. In 1885, this concern was capitalized at $300,000; in 1886, at $3,000,000; in 1896, at $15,000,000; later at $35,000,000; since 1906 it has been $50,000,000. It has 9,000 stockholders to whom it distributes $3,500,000 annually in dividends. Its profits in 1907 were $6,200,000. It has packing plants covering 206 acres in seven American cities, has 90 acres of buildings, 237 acres of floor space, and has distributing houses in over 300 American cities, 41 cities in Great Britain, and 32 cities in Asia, Africa, and Continental Europe. Its profit on dressed beef sales is less than two per cent., but the money is turned over several times during the year. Its assets are $100,000,000. It converts into dressed meat in a year 1,634,000 cattle, 470,000 calves, 4,635,000 hogs, 2,547,000 sheep, and hundreds of thousands of chickens. Not counting poultry, it consumes over 1,000 head of live stock every hour of the twenty-four during every day of the year.

The products amount to 350 carloads each working day, besides large local sales in the seven cities where plants are located. It annually consumes 565,000 tons of coal, burns 6,000 cords of hickory wood, has 63,000 engine horse-power available, runs 30,000 electric lights, sends and receives 1,388,000 telegrams and 4,279,000 letters.

The American packing industry has made the outlet for American meats practically world-wide, and has afforded to the American grower of live stock an opportunity not enjoyed by producers elsewhere. The development of the American meat industry made a demand for cattle; cattle made a demand for corn, and increased its price; corn land rapidly increased in value, and with it all have come better farmers, better farming, and a more prosperous American agriculture.

The cattle business of today.—The unknown quantities of shipping and marketing, which were the bugbear of the cattleman of earlier times, have been reduced to a minimum. The producer of cattle knows, or ought to know, if he is to succeed in his business, just what grade his cattle will be classified under when they come before the buyer. Each class has its own price, varying from day to day in response to supply and demand. Daily market reports put the producer in touch with conditions and prices, and commission men advise him by letter whether it is a good time or a bad time to ship. Whereas charges were formerly uncertain, now they are definitely fixed, and the feeder can figure out all expenditures to the cent before his cattle start for market. Railway rates are much lower than twenty-five years ago, transportation is more direct and fast, there is much less cruelty to the animals in transit, less loss in transit, and less shrink between feed-lot and market. Yardage at Chicago is 25 cents per head for cattle and 15 cents for calves, hay is $25 per ton, and the commission for selling cattle is 50 cents per head. As success in the commission business rests upon soundness of judgment, honesty, and skill, very few consignors undertake to do their own selling, but do it more profitably through the medium of the commission man. Today it is almost entirely a question of intelligence and industry in the business of cattle breeding and

feeding. The market still fluctuates, to be sure, yet not in the violent fashion of old, and, as compared with early conditions, certainty has displaced uncertainty, giving stability and foundation to a great permanent cattle industry.

CHAPTER V.

FASHIONS IN MARKET CATTLE.

England and America, and other countries inhabited by English-speaking people, lead in meat consumption, especially in beef consumption. "The roast beef of old England" is well known as characteristic of the Englishman's culinary tastes, but Youatt records that in the time of Henry VIII. the English people were "strangers to beef and mutton." The consumption of beef was confined principally to the summer months, and it sold at a very low price, so that there was no encouragement toward the production of beef cattle or beef. Instead, cattle were valued for milking purposes and most of all for field labor, and not until they had served a number of years as draft animals were they fattened for the butcher. Six-year-old oxen were sold from the plow to be fattened and then brought $50 to $75. There is record of an ox that was worked until fifteen years old and then fattened fairly well. Those most certainly were not days when men talked of baby beef. Size, usefulness for field labor, and for dairy purposes were the qualities chiefly sought. Prior to the close of the eighteenth century, there was little exercise of care in the breeding of cattle, and feeding was an unknown art. But conditions gradually became better; England became more prosperous and wealthy, and there arose a demand for more and better beef, for which higher prices were paid. This impetus gave rise to the formation of the breeds of beef cattle, all of which originated in England and Scotland, unless we consider the Polled Durham and Polled Hereford real American breed creations, which, of course, they are not, being the result of slight modifications of English breeds.

When beef production was begun in earnest, more attention was given to size and quantity than to quality. Judging from the records of early weights of cattle, and from drawings made at that time, cattle were ponderous, rough, slow-maturing beasts, and very patchy with great lumps of tallow.

The ideals of those days were exemplified by such famous animals as the Durham Ox, weighing 3,024 pounds at five years of age, and The White Heifer That Traveled, weighing 2,300 pounds. These were early Shorthorns. Among early Hereford cattle a bull, The General, weighed 3,640 pounds at six years. Another bull, Wellington, weighed 2,912 pounds, had a girth of eleven feet, three inches, and measured eleven feet, four inches, from muzzle to tail-head. Another Hereford bull, Hamlet, weighed 2,800 pounds, and a steer reached 2,912 pounds.

In England and America the attainment of large weights continued to be the aim of beef producers until rather recent times. Early maturity was not given much attention. It was simply a matter of making each animal as large as possible before consigning it to the butcher. Cattle were grown and fattened cheaply in those days, and the advantages of young, quick-maturing, highly-finished cattle were not so marked, nor was a good price offered for any except matured beeves. Stockmen at Albany, N. Y., offered $1,000 to anyone who would deliver a bullock weighing 4,000 pounds. Prior to 1856, two Illinois cattlemen fed one hundred head of high-grade Shorthorn steers and marketed them at an average weight of 1,965 pounds. About the same time, another feeder collected a lot of one hundred grade steers and fed them to the enormous average of 2,377 pounds as four-year-olds. These feats are said to have widely advertised the Shorthorn as a beef-making breed, the paramount consideration of cattle feeders at that time being the attainment of great weight and immense bulk.

Fat-stock shows are, in most respects, criterions of market demands in cattle. The champions of early days were big, matured steers. In 1891, the Chicago Fat Stock Show eliminated classes for three-year-old cattle; that date marked the turning point toward what has since become known as "baby beef." The tendency is more and more toward the finishing of younger, quicker-maturing animals. The changes that are being wrought are not plainly evident unless comparisons are made extending over a period of years, or unless the operations of some of the more progressive feeders have been followed during recent times.

Breeders and feeders now put much stress on quickness of maturity. This they have secured by selecting short-legged, blocky, compact animals, which type reaches maturity much more rapidly than the long-legged, more rangy type, popular in the early days. Some sacrifice has been made of size and weight in order to produce a type that will make beef quickly, yet the better breeders are careful to maintain a

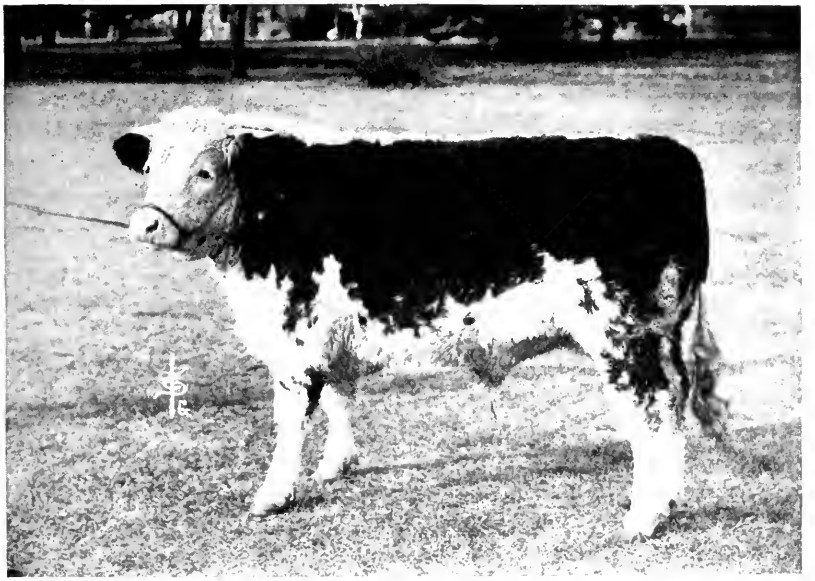


Fig. 9. Prime Baby Beef.

Hereford steer, Peerless Wilton 39th's Defender, Grand Champion at the International Live Stock Show in 1906. Bred, fed, and exhibited by Mr. F. A. Nave of Attica, Ind. Sold to Iowa State College.

proper degree of size along with the low-set, blocky type of body. The change has been vastly beneficial to the breeder, feeder, butcher, and ultimate consumer.

Baby beef are choice and prime fat cattle, between 12 and 24 months of age, weighing 800 to 1200 pounds. Yearlings make 25 to 50 per cent. more meat for the grain consumed than the same animals would make if kept until two or three years of age. The small, compact carcasses cut up with less

waste, and furnish thick, light steaks such as are most in demand, because they are cheaper and of a size adapted for domestic use. Such cattle will not dress out quite as high as older cattle, but the difference in percentage yield of carcass is due to a greater amount of tallow in the older animal, which materially lessens the older animal's superiority in this regard. The production of baby beef necessitates starting the fattening process at birth and carrying it on simultaneously with growth; the animal receives full feed from start to finish. As stated by the Breeder's Gazette: "The making of baby beef is a continuous performance which shows 365 days in the ordinary year and 366 days in the leap year. It is readily observable that there is no such thing as 'warming-up' or 'short-feeding' calves intended for the buyers of prime baby beef. Cattle may be 16 to 18 months of age and afterwards warmed up a bit, but they will not class as baby beef and they will not bring the prices of that article."

Baby beef can only be produced from well-bred calves, as only well-bred ones mature early enough to meet the market requirements for this kind of cattle. Such calves are hard to buy and the producer of baby beef cannot feel assured of obtaining them season after season by purchase, but is practically compelled to breed them for his own use. As breeding and feeding are rather distinct lines of enterprise, and as few feeders care to maintain a breeding herd, or have facilities for doing so, baby beef production is much less followed than would be the case if good calves were readily available. Furthermore, it has been shown that only those feeders skilled in the art of finishing cattle, and fully equipped to give the animals every chance, can successfully produce baby beef.

Profits in cattle feeding come from skill in feeding and managing, and also from intelligent buying and selling. There is practiced what is known as "speculative cattle feeding" in which feeders emphasize the buying and selling more than they do the actual feeding of the animals, the object being to buy on a low market and sell when the market is high. Omitting from further consideration this speculative feature, it may be said that the sources of profit in feeding a steer are (1) the increase in weight of the animal, and (2) the increase

in the value of the animal's initial weight. For example, if we buy a thin steer at seven cents per pound, and feed him six months, we increase not only his weight, but also his value per pound. If the initial weight was 1,000 pounds, six months' feeding should bring him to a weight of 1,325 pounds, and he should sell at eight and one-half cents per pound without any rise of the cattle market during the feeding period. Then the net income to the feeder would be as follows:

325 pounds at 8.5c	$27.63
1000 pounds at 1.5c	15.00
Net income	$42.63

The difference between the cost price and selling price per pound is spoken of as the "margin." The steer feeder counts on at least 1.5 cents per pound margin, and when feedstuffs are high in price the margin should be not less than 2 cents. As shown by the above calculation, older cattle may be handled on narrower margins than young ones, for if the initial weight of the steer had been 500 pounds instead of 1,000 pounds, other factors remaining the same, then the net income would have been less by $7.50. As a matter of fact, however, the younger steer would probably make his 325 pounds of gain somewhat cheaper than the older steer, thus compensating, in part at least, the advantage of the older animal. As long as thin two- and three-year-old steers may be purchased for feeding, there will be no marked increases in baby beef production. The time is now at hand, however, when a large percentage of beef cattle must not only be fed on the farms of the Mississippi and Missouri valleys, but bred there also. As it is no longer profitable for the farmer to first grow a steer and then fatten him, the growing and fattening processes must be combined, and the cattle sent to market under 24 months of age; in other words, beef production must be placed very largely on a baby beef basis.

Clay, Robinson & Co., of Chicago, in a recent communication to the writer, had the following to say concerning baby beef production: "There has been marked increase in the production of this class of cattle for the reason that the public demands them. For years the tendency has been toward the

maturing of cattle at a younger and younger age. It was not so many years ago when an animal was not considered ready for the market under four years old, but evolution in beef production started, and the most desirable beeves in the market today are prime, fat yearlings."

The above quotation is good evidence of the buyer's attitude toward baby beef. As showing the possibilities for profit to the producer of such cattle, the Kansas Station fed 130 grade Shorthorn, Hereford, and Angus calves that had just been weaned, and during seven months' feeding secured an average monthly gain of 56 pounds per head. The average weight at the beginning was 408 pounds; when sent to market seven months later, the average weight was 800 pounds, and the age was a little over one year. All except 32 head were heifers. The remarkable feature of this demonstration was the small amount of feed consumed. It required only 503 pounds of grain and 509 pounds of hay to make 100 pounds gain in weight. The best record was made by 10 skim-milk calves that were fed alfalfa hay and corn. They consumed only 439 pounds of grain and 436 pounds of hay for every 100 pounds of gain. When older cattle are fed, it usually requires about twice these amounts of grain and roughage to secure 100 pounds of gain.

E. M. Cassady & Sons, of Whiting, Iowa, made a test of the cost and rate of gains made by Hereford steers started on feed as calves and yearlings. These steers were of the same breeding, having been bred on the Cassady farm from the same sire and dams. The calves weighed 475 pounds when put on feed, and were charged at $6.00 per cwt.; the yearlings weighed 775 pounds, and were charged at $5.70 per cwt. Although the calves were fed for a longer period than the yearlings, the average cost of 100 pounds of gain was $10.80 for the calves, as compared with $15.65 for the yearlings. The calves made a profit of $20.00 per head, and the yearlings made a profit of $14.00.

The Indiana Experiment Station found that when feed prices were such that it cost $5.92 to produce 100 pounds of

gain on baby beeves, it cost $7.22 to make the same gain on yearlings, and $8.98 on two-year-olds.

Steer and Heifer Beef.

The heading of this chapter, "Fashions in Market Cattle," implies that the demands of the cattle market are subject to change. The truth of this has been shown by the preceding discussion of the trend away from the old-time, heavy, matured beeves, and toward the finishing of younger cattle. The word, "fashions," also implies that the market indulges in some practices that are not entirely utilitarian and practical,

Fig. 10. Prime Fat Heifer.

but are more or less fanciful and whimsical. That this is true will be shown by a consideration of the cattle market's discrimination against fat heifers as compared with fat steers. When the heifer is well fed, she is consigned to a lower class than a steer of the same breeding, same fatness, same quality, same age and form. In some countries, heifers outsell steers for beef purposes. In this country there is discrimination in price against heifers on the market, and for that reason heifers are rarely as well fed as steers.

In September, 1892, Wilson and Curtiss, of the Iowa Experiment Station, purchased five steers and ten heifers and began an experiment to determine whether a discrimination against fat heifers is justifiable. All of these cattle were yearling grade Shorthorns, all sired by the same bull. Five of the heifers were spayed soon after purchase, and all fifteen head were roughed until January 4, 1893, when they were grain-fed for eleven months, and then shipped to Chicago. There they were sold on the open market to Swift & Co., who made slaughter and block tests of the animals. The results of the experiment are condensed into the following table:

Weights, costs, gains, prices, yields, profits.	5 Steers	5 Open heifers	5 Spayed heifers
Original weight, September 12th, lbs.	4005.	3455.	3998.
Cost, per lb., cents	3.5	2.	2.
Total cost	$140.18	$ 69.10	$ 79.96
Cost of pasture and fodder prior to January 4th.	20.00	20.00	20.00
Weight, January 4th, lbs	4093.	3592.	3994.
Average gain on feed per animal per day, lbs.	2.44	1.99	2.07
Total gain	4032.	3288.	3416.
Average cost feed per lb. gain, cents	5.02	6.04	5.86
Total cost feed	$202.47	$198.70	$200.32
Shrink in shipping, lbs	215.	290.	280.
Selling weight, lbs	7910.	6590.	7130.
Selling price per lb., cents	5.75	4.75	4.75
Selling price, total	$454.82	$313.02	$338.67
Freight, yardage, and commission	24.71	24.71	24.71
Profit	67.46	.51	13.68
Beef (warm weight), lbs	4997.	4110.	4475.
Dressing percentage	63.2	62.4	62.8
Total tallow, lbs	969.5	648.75	701.5
10 loins, per cent. of carcass	16.7	17.6	17.7
10 loins, price per lb., cents	15.	13.5	13.5
10 ribs, per cent. of carcass	10.1	10.8	10.9
10 ribs, price per lb., cents	15.	13.5	13.5
10 rounds, per cent. of carcass	24.1	21.5	21.7
10 rounds, price per lb., cents	6.	5.75	5.65
Margin between live cost and sales of meat and by-products, not including expense of killing and handling	$ 20.45	$ 58.12	$ 64.84

The returns made by the heifers to Swift & Co. would have justified a purchase price of $5.37 per cwt. for the spayed heifers and $5.32 for the open heifers, instead of $4.75 for each, and still have left the same margin of profit as in the

steers. It is clear, then, that the difference in the live-weight value of the steers and heifers was only about 40 cents per cwt., instead of $1.00 a cwt. made by the buyers. Expert opinions secured from Chicago packers as to why the heifer carcasses sold at less price per pound than the steer carcasses were to the effect that heifers make more fat where the steers make lean meat. There is said to be more lean meat in a steer loin and a larger tenderloin. Otherwise, the carcasses were said to be of equal value.

It is a well-known fact that Englishmen make no discriminations against heifer beef, indeed they pay more for it than for steer beef. Wilson and Curtiss corresponded with several Englishmen concerning this matter, and the subtsance of the replies was that heifers yield meat of finer grain and better quality, are good cutters, and yield little rough meat. Rib and loin cuts from spayed heifer carcasses were valued two cents per pound higher than the same cuts from steer carcasses equally well fattened. Plate cuts from heifers were valued one cent higher. Heifer beef was said to be better marbled, more pleasing in appearance, more juicy, and more palatable.

Evidently English and American standards for meats vary somewhat, and public preference has been cultivated along different lines in the two countries. So far as our American markets are concerned, it seems that the difference in prices paid for fat steers and heifers may not be justified by any real difference in the cuts of meat, yet the condition must be accepted nevertheless, and producers must shape their operations accordingly. There is, however, one logical objection to heifers; it is that they are frequently pregnant, which lowers the dressing percentage and may affect the value of the carcass. At the present time the discrimination against heifers amounts to 50 or 75 cents per cwt. for open heifers, and about 25 cents per cwt. in the case of spayed heifers. There is not as much discrimination in price against fat young heifers as against fat heifers of older age.

The question of spaying.—As the experiment just discussed dealt with spayed and open heifers, a word may be said here about the comparative merits of the two from the stand-

point of the feeder. As a rule, open heifers make greater gains because of the setback caused by the operation of spaying. Once recovered from the operation, the spayed heifers gain faster, but do not reach as large weights as open heifers. The recurrence of heat in open heifers and their restlessness at that time retards the gains made, as compared with spayed heifers recovered from the operation. Spayed heifers are said to yield beef of slightly higher quality. Spaying entails a certain expense and there is danger of mortality. The general practice is not to spay when it is possible to separate the heifers and feed them in a lot by themselves. When it is desired to feed heifers along with steers, it is desirable that they be spayed, otherwise the recurrence of heat causes considerable turmoil among the cattle, decreasing the gains made and increasing the cost.

CHAPTER VI.

MARKET CLASSES AND GRADES OF CATTLE.

The large live-stock markets classify their receipts of cattle into various classes and grades, depending upon the quality, condition, weight, and age of the animal. A market class may be defined as a group of animals on the live-stock market, all of which are suitable for a certain commercial use.

There is a clear distinction between type and market class. A type represents an ideal which the breeder or feeder is endeavoring to produce. Types represent only the most highly desirable or profitable sorts of animals, while there are market classes for all sorts of animals—profitable and unprofitable from the producer's standpoint. The market classification represents the practical outcome of producers' attempts to reach ideals, and a visit to any market will show that often they do not reach them. Hence, some market classes have counterparts among the types, and some have not. The latter might be termed the by-products or misfits of the breeder's art. Of these there is always a percentage, depending upon how difficult a task the producer set for himself; the more extreme the type, the greater the percentage of misfits. Most of these misfits are useful, and some return a profit to the producer. There will always be some market classes which return a maximum profit to the breeder and feeder, and these the breeder will try to produce by adjusting his type accordingly and selecting animals for breeding purposes which nearest approach the ideal,—in other words, typical animals. The less profitable market classes are filled incidentally, not through any design on the part of the breeder. Some market classes are composed of animals that have already served one or more purposes; having outlived their usefulness, they are discarded and sent to market. The market is accommodating; it provides a place for all sorts of odds and ends, and hunts up a use for them. Thus, some market classes persist which at first thought have no excuse for being. Everything classi-

fies somewhere. The types are logically much fewer than the market classes.

On the large live-stock markets, cattle are handled according to the following classification:

1. **Beef cattle,** including all fat steers suitable for block beef, and also a few fat heifers.

2. **Texas and western range cattle,** including all grades of Texas cattle and branded cattle from western ranges.

3. **Butcher stock,** including the better grades of heifers, cows, and bulls suitable for block beef.

4. **Cutters and canners,** including mostly thin cows and bulls, but also inferior steers and heifers, in fact anything not suitable for feeding, and too inferior to yield a carcass suitable for block use.

5. **Stockers and feeders,** including thin calves, yearlings, two-year-olds, and older cattle. It may include steers, heifers, cows, or bulls.

6. **Veal calves,** including all grades of veal calves.

7. **Milkers and springers.**—These are cattle of dairy breeding which are usually more valuable for milking purposes than for beef. They are sorted out and sold for dairy purposes.

Beef Cattle.

The beef cattle class represents the cream of the market, including steers and some heifers, which show the effects of good feeding. In this class condition and quality are of more importance than weight. The demand comes from two classes of buyers: (1) Packers for dressed beef slaughtered in Chicago, and (2) eastern buyers who ship for slaughter to Boston, New York, Philadelphia, Pittsburg, Baltimore, Cleveland, Albany, Detroit, and many other cities. The cattle which classify as beef cattle may be divided into five grades or minor groups. A market grade is a division of a market class or sub-class, the division depending upon value. The grades of beef cattle are: (1) prime, (2) choice, (3) good, (4) medium, and (5) common. Each market class is divided up into various grades. For example, we speak of "prime steers,"

"medium steers," "good cows," "common canners," "choice feeders," etc. Beef cattle dress from 55 to 67 per cent. and supply the highest class of trade.

Prime steers.—This is the most select grade of the beef cattle class. Buyers for eastern markets take most of this grade, and packers take the rest. Prime steers are practically above criticism in quality and fatness. They show a high development of flesh in loin, back, thighs, twist, and rump, are very broad and deep, and are free from paunchiness. The head is medium sized and clean-cut. The bone is clean and

Fig. 11. Prime Fat Steers.

fine, the skin pliable and medium thick, and the outlines are smooth and well rounded. The flesh is abundant in all parts, and is firm, yet mellow and springy to the touch. There are no ties, rolls, or patches of flabby fat, but a smooth, even, deep, firm fleshing everywhere. Prime steers weighing from 1200 to 1400 pounds are in greatest demand, although they frequently weigh up to 1600 pounds. Very few steers come to market which grade as prime. At the conclusion of the International Live Stock Exposition, which is held at the Union Stock Yards in December, most of the fat cattle are sold, and

these are usually prime, but it requires much searching to locate cattle of this sort at other periods of the year.

Choice steers.—If a steer is not quite right in quality or condition, but still possesses to a marked degree the characteristics most sought by packers and shippers, he is called a choice steer.

Good steers.—Good fat steers may be of very good quality, but noticeably lacking in condition or finish; they may be finished or in prime condition, yet lacking in quality; or they

Fig. 12. Choice Steer.

may be noticeably deficient in both quality and condition, but still good enough to be above the average grade of fat cattle reaching the market. By far the largest number of steers belonging to the good grade may be said to be a little on the coarse order; they are fat and of good weight, but rather plain.

Medium steers.—These are of about average quality and condition, lacking to a marked degree the finish and quality

demanded in a prime steer. They are generally too paunchy and too lacking in condition and quality to dress a high percentage of beef or show a good proportion of fat. The beef from such steers is not good enough to meet the demands of dealers in beef of the best quality, nor is the proportion of the high-priced cuts large.

Common rough steers.—This is the lowest grade of steers coming to the market. They are very much lacking in form, quality, and condition. Steers of good quality that are

Fig. 13. Good Steers.

not fat enough to be classed as beef steers are classed among the better grades of stockers and feeders; therefore, this grade includes only those steers which are too thin to sell among the higher grades of beef cattle, and too coarse and rough to be sold as stockers and feeders.

Heifers.—Loads made up entirely of heifers do not classify as beef cattle except in rare instances when they are very fancy and in high finish. Two to four heifers mixed in with a load of fat steers are passed without any cut in price if they

are similar to the steers in all respects except sex. However, the beef cattle class is a fat-steer proposition, and market reports always give separate quotations for fat steers and fat heifers.

Sub-class baby beef.—Choice and prime fat steers between one and two years of age and weighing from 800 to 1200 pounds are styled "baby beef" or "fat yearlings" upon the market. These are not separated from the beef cattle class, but constitute a sub-class within it. As pointed out in the preceding chapter, the fat yearling is fast becoming the

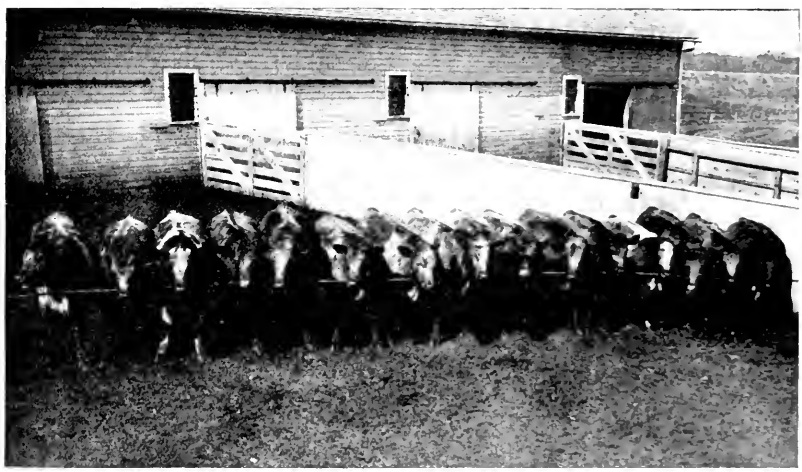


Fig. 14. Prime Baby Beeves.

These are representatives of the famous "blue-grays" so popular in the British markets. They were sired by a Shorthorn bull, and their dams were Galloway cows.

most prominent feature of the cattle market. Beginning in 1904, fat yearlings have steadily increased in numbers, this increase having been most marked during the past few years. Most market reports now give separate quotations for this sub-class.

Sub-class distillers.—These are cattle which have been fed on the by-products of distilleries. Such cattle, with only a few exceptions, are included in the beef cattle class. They sell high because they carry neat paunches which make them

high dressers. Distillery cattle may usually be identified at the stock yards because of their smooth finish, small paunches, and sleek coats of hair.

Source of the beef cattle class.—Cattle which classify as beef cattle in the market sense of that term, come from the feed-lots of the cornbelt states. They are steers which have been grain-fed.

Texas and Western Range Cattle.

Not so many years ago, Texas cattle were distinguished by very long horns, long legs, thin flesh, narrow bodies, and large, deep brands. So many purebred beef bulls have been taken to the ranges, however, that today the long-horned Texan is rarely seen. Texas cattle now carry a high percentage of the blood of the improved beef breeds, and the heads are either naturally polled or have short or medium-length horns. Many prize-winning bulls have been bought by western cattlemen and turned loose upon the range, and to-day range cattle usually have the low-set, blocky form and flesh-making qualities of their sires. There were no cattle in America prior to its discovery; the old-fashioned Texas and western cattle undoubtedly sprang from animals which escaped from the hands of early Spanish explorers or were left behind when they were forced to make a retreat.

The best western cattle are used for the same purposes as the best native cattle, but being largely grass-fed, they are more subject to shrink during shipping. Perhaps one-half of the cattle on the ranges of the West and Northwest are now bred there, whereas nearly all cattle in those sections were formerly bred in Texas and nearby states and taken north for feeding. Mr. James E. Poole, of the *Chicago Live Stock World,* says: "The two-year-old exodus of other years to the Northwest now stops at Kansas pastures, going thence to market the same season instead of being double-wintered in the North. So inadequate is the stocker supply that Montana graziers, outbid on the Texas two-year-olds, have been compelled to cross the Rio Grande to secure Mexican cattle for the purpose of replenishing their depleted herds." Cattle bred in Texas, but fed in Montana, are known on the market as "Montana-Texans," those fed in Wyoming are called

"Wyoming-Texans," thus indicating in few words the source of such cattle. All Texas and western range cattle are branded, and are sometimes spoken of as "branded cattle." As a rule, branded cattle sell at a discount because of the damage to the hide. In cases of brands on the body, the damage to the hide is estimated anywhere from five to fifteen cents per cwt., according to size and location, and in extreme cases

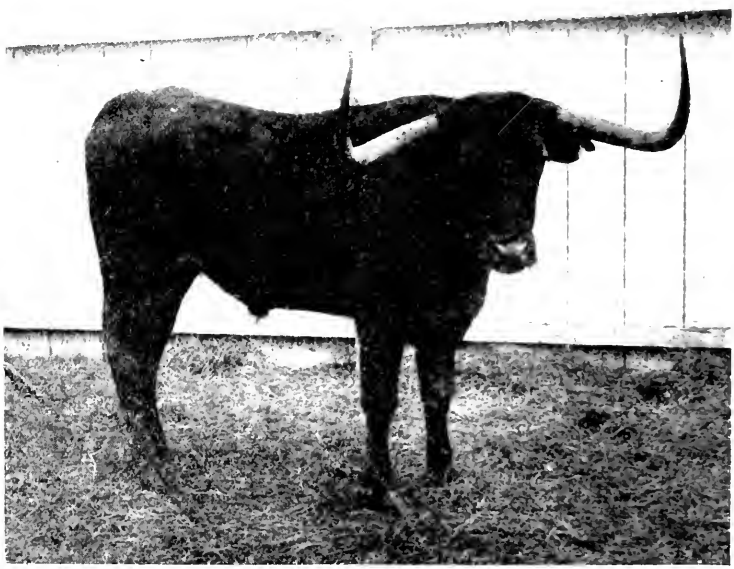


Fig. 15. Old-time Texas Long-Horn.

Formerly a prominent feature on the large cattle markets.

where there is a big, sprawling side brand, covering a large part of the surface, the discount will be very much higher, as it practically spoils half the hide.

The range country furnishes grass from the middle of July until the middle of November, and cattle coming to market from the grass of western ranges are known upon the market as "grass westerns." "Fed westerns" are cattle that

were shipped to Nebraska, Iowa, or some other cornbelt state and fattened on grain before reaching the market. The best fed westerns are in every way equal to the best native steers and sell at the same prices. When grass gives out on western ranges, the cattle are sent to market. Texas cattle begin to appear in May and make a heavy run from that time until October, while other branded cattle from the West make a

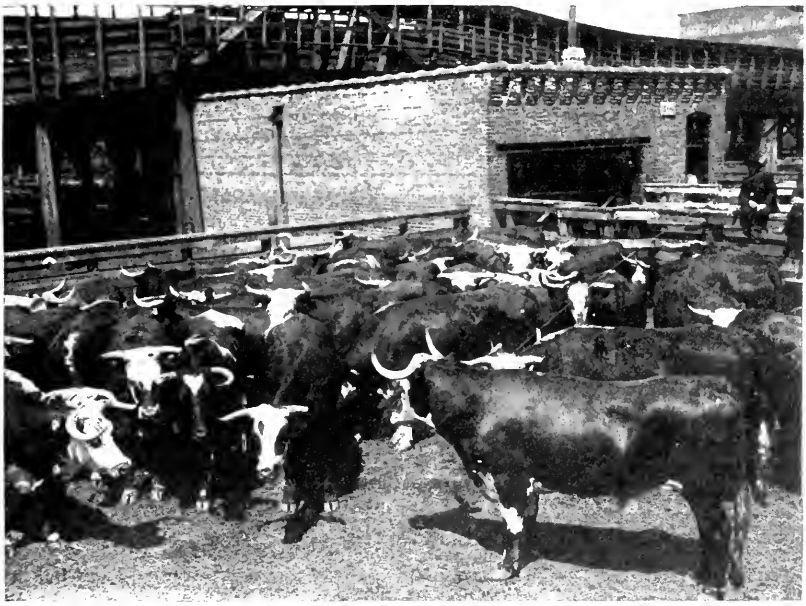


Fig. 16. Modern Western Range Cattle.

These cattle were sired by purebred bulls, and were fattened on grass. In the background appears a scales-house where cattle are weighed to the buyer when sold.

heavy run from August 1 to December 1. During the five months from November until May, very few such cattle reach Chicago.

The heavy immigration of settlers to the West and the cutting up of ranches into small farms is constantly decreasing the open range country used by stockmen. In the future the range-stock industry will be confined to areas too rough for cultivation, or too arid for successful crop growing.

During the summer season, many stockmen will secure grazing permits in the forest reserves. Whenever possible, enough feed will be raised to carry the stock safely through winter. Herds will be smaller and cattle better bred in order to make profits under the new conditions.

Butcher Stock.

Butcher stock and cutters and canners may be looked upon as by-products of the cattle-feeding industry. Butcher stock has the same relation to beef cattle which skim milk

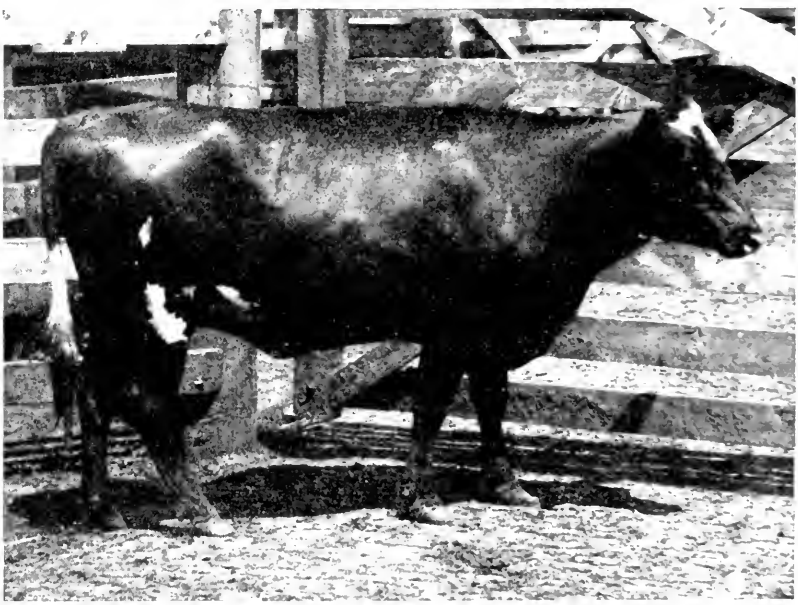


Fig. 17. Good to Choice Heifer.

has to cream. The bulk of butcher stock is made up of fat cows, heifers, and bulls. They dress out from 50 to 61 per cent. of carcass and are used to supply the trade in small towns, and the medium class of trade in cities. The grades within this class are: Prime, choice, good, and medium heifers; prime, choice, good, and medium cows; and choice, good, and medium bulls.

Heifers.—The same conformation, quality, and condition are demanded in prime heifers that have already been noted

as characteristic of prime steers. The only noteworthy difference is that of sex. Choice, good, and medium heifers are similar to steers of the same grades.

Cows.—The prime grade includes a very small number of strictly fancy, well-bred cows, in prime condition. Choice cows are prime in condition, but are somewhat deficient in quality. Good cows lack in both condition and quality, but are fat enough to be reasonably good killers. Medium cows are poor in form, low in condition, and deficient in quality. This is the lowest grade suitable for block beef.

Bulls and stags.—There are very few choice bulls; the supply is made up of good beef bulls which have become too

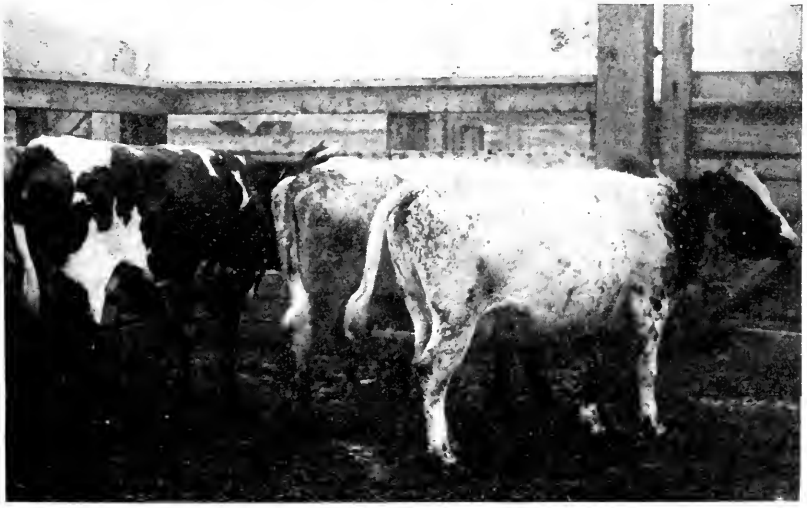


Fig. 18. Good Cutters.

aged for further use as breeders. Bulls of the good grade lack in quality and condition. Medium bulls are thin, long legged, and coarse, and are just good enough to escape bologna or the tin can. Very few stags come to market. They are classed and graded the same as bulls.

Cutters and Canners.

Cutters carry sufficient flesh to permit of the loin or rib, or both, being used for block purposes, the remainder of the carcass being canned. The cutter and canner class is made

up mostly of old thin cows that are very paunchy, indicating a high percentage of offal when dressed. Many of them are cast-off dairy cows which are sent to market without any attempt being made to fatten them. They dress from 35 to 55 per cent. The lowest grade of canners furnishes a sort of comic supplement to a cattle market; marketmen refer to them as "Dairy Maids," "Nellies," "Hat Racks," "Skins," "Dogs," and "Sea Horses," thus showing their lack of appreciation for such cattle.

Canners include thin cows, inferior steers, heifers, bulls, and stags, and in fact anything of a low, inferior grade that is too lacking in flesh to permit of even a part of the carcass

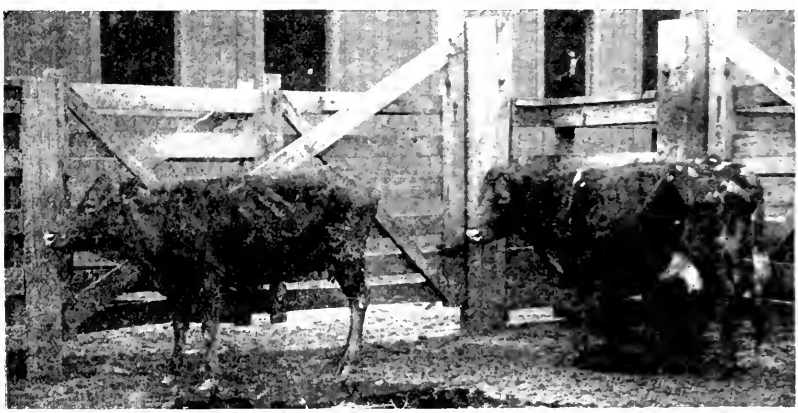


Fig. 19. Common or Inferior Canner Cows.

being sold over the butcher's block. They are the very lowest grade of cattle coming to market.

The grades within the cutter and canner class are good, medium, and common cutters; good, medium, and common canners; and bologna bulls.

Stockers and Feeders.

The man who makes a business of breeding or feeding cattle for the market is primarily interested in two classes of cattle which should receive his most careful study. These two classes are beef cattle of the better grades, and stockers and feeders,—the beginning and the end of the feeding process.

Stockers and feeders include calves, yearlings, two-year-olds, and older cattle. The difference between a stocker and a feeder is that the former is usually a younger and thinner steer or heifer, used mostly for grazing purposes and possibly fed out after being grazed for a time, while a feeder is usually a steer, older and in higher flesh than the stocker, and suitable for placing in the feed-lot immediately and feeding upon a grain ration. It is seldom that a steer weighing less than 600 pounds is placed on feed, and the common practice is to buy steers for feeders that weigh from 900 to 1,000 pounds, or even heavier. Such steers are eighteen months old, or older. Heifers are not commonly classed as feeders.

Profits in cattle feeding are largely dependent on intelligent buying and selling, and the feeder must be an expert judge of a thin animal, as well as a good judge of the finished product. One is as inportant as the other, and lack of ability to select the right kind of steers for feeding is alone sufficient to cause failure in the business. The cattle feeder must have a good knowledge of the values of the various grades of feeders, and must use judgment as to whether or not to buy, and if he buys it is again a matter of judgment as to which grade of feeders may be purchased, fed, and sold with the greatest profit. The actual buying, however, is usually put in the hands of a commission firm; such firms also freely and intelligently advise the purchaser concerning the matters here discussed. The grades of stockers and feeders are: Fancy selected, choice, good, medium, and common feeders; feeder bulls; fancy selected, choice, good, medium, and common yearling stockers; good, medium, and common stock heifers, and stock and feeding cows.

Fancy selected feeders.—Very few of the fancy grade reach the market, as breeders fortunate enough to own thin steers of such quality usually hold them until finished as prime steers, or sell them direct to neighboring feeders at good strong prices. Fancy selected feeders must not only possess the characteristics of choice feeders, as described further on, but must be uniform in color, and show unmistakable signs of good breeding. They are practically above criticism.

Choice feeders.—Steers of this grade will, under proper management, develop into choice and prime fat steers. They possess the ability to make economical gains in flesh. We look for these tendencies in the form, quality, constitution, age, breeding, and disposition.

1. Form.—The form should be as nearly identical as possible with the description given for the ideal fat steer. Allowances must of course be made for the absence of flesh

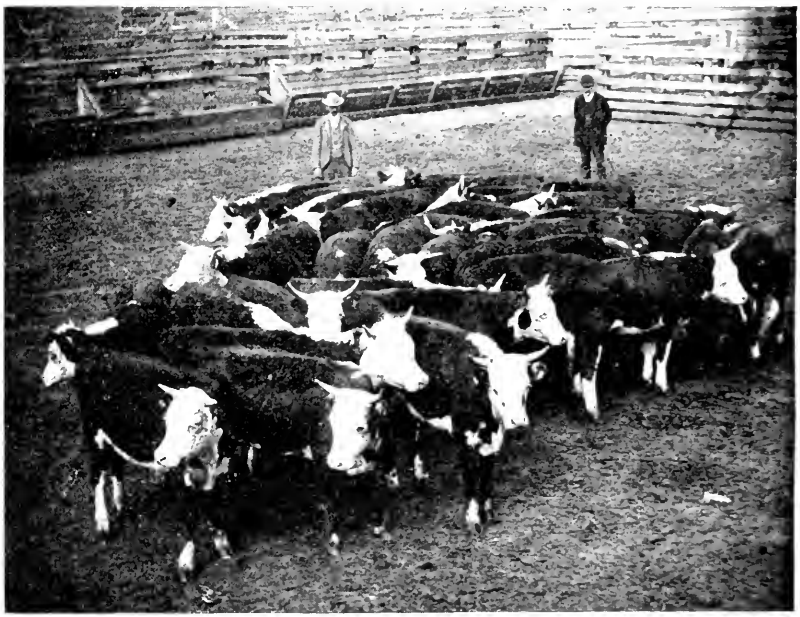


Fig. 20. Fancy Selected Feeders.

and fat in the thin animal, for we cannot expect a thin animal to appear extremely blocky or low set. Yet even in thin condition, the steer should be low set, deep, broad, and compact, such conformation insuring the desired earliness of maturity. Broad, flat backs and loins, and level rumps make possible a maximum production of high-priced cuts, and are indicative of superior form in the feeder. One of the characteristic points of high-grade feeders is a straight top line and straight underline, the two being nearly parallel. To insure feeding capacity, the mouth and muzzle should be broad, the barrel

should be deep, and the flanks should be well let down. If there is much paunchiness, it is sharply discriminated against, as it rarely disappears during the fattening. Although low in flesh, the feeder should present a fairly smooth outline; at least, there should be nothing in his form that will prevent smoothness being secured when he is fattened. It should be remembered that the proportions of the head and neck correspond with the type of body, and in making selections of young thin cattle these are fairly dependable indicators of the turn the form will take during development and finishing.

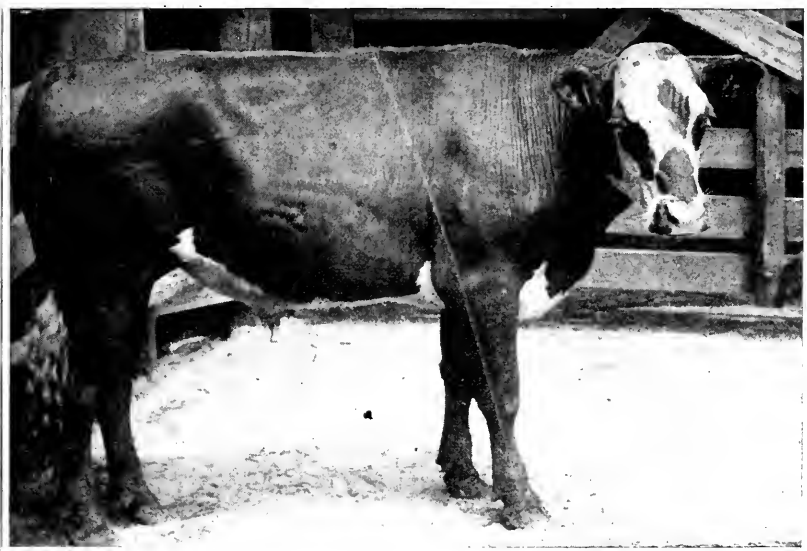


Fig. 21. Choice Feeder.

The head demands far more attention in the feeder than in the finished steer. We look for what is termed the "feeder's head," that is, a head of much width between the eyes, short and clean-cut from eyes to muzzle, very broad at the muzzle, but not coarse, large of nostril, and strongly muscled and well developed in cheeks and jaws. The eye should be large, prominent, bright, clear, and placid. Polled or dehorned cattle are preferred by feeders, although this feature does not affect the grading of the animal. More hornless cattle

can be put in the feed-lot or car, and they make more rapid gains on feed because of less commotion and less difficulty in getting up to the feed-racks. Hornless cattle shrink less in shipment, the carcasses show fewer bruises, and the hides are more valuable. Being in greater demand, they sell at slightly higher prices.

2. **Quality.**—The indications of quality in beef cattle have been discussed. Quality and good breeding are usually found in company, and good breeding surely "tells" in the feed-lot.

3. **Constitution.**—A wide, deep chest, full heart-girth, and deep, broad body are evidences of a strong constitution. Avoid that steer which has quality carried to the point of delicacy, as only vigorous, rugged cattle make big gains on feed. When choosing between two steers, one of which is too refined in head, hide, and bone, and the other a trifle too rugged, or what might be termed slightly on the coarse order, it will usually be wisest to select the more rugged steer; he will usually consume more feed, gain more consistently, and make his gains at less cost than will the over-refined animal.

4. **Age.**—Form, quality, and constitution are the fundamental points determining the value of the feeding steer, but there are some other points worthy of consideration. Attention should be given to the age, and to the weight for age. A young, thrifty steer, well developed for his age, is far more profitable than a stunted animal. Whether young steers or matured steers shall be fed depends largely upon the length of the feeding period. If it is desired to "short-feed" them or "warm them up" during a 60- or 90-day feeding period, using a great deal of roughage and proportionately less grain, a plainer sort of two- or three-year-old steers will be more desirable. For the "long feed" of 120 to 180 days, young steers of good beef breeding are preferred.

5. **Breeding.**—Steers of good beef breeding are much preferred over those which have more or less of a scrub or dairy ancestry. We look for evidences of beef breeding in the form and color of the animals. The beef-bred animal

is more rectangular in build, more compact and blocky, and lower set than the dairy-bred individual. The dairy-bred steer stands high off the ground, has a long, narrow head, cuts up in the flank, is split up in the twist, cat-hammed, high and short in the rump, and rough in the conformation over that part. His bone is usually too fine, and his hide is too thin and "papery" in texture. Red, roan, and black colors

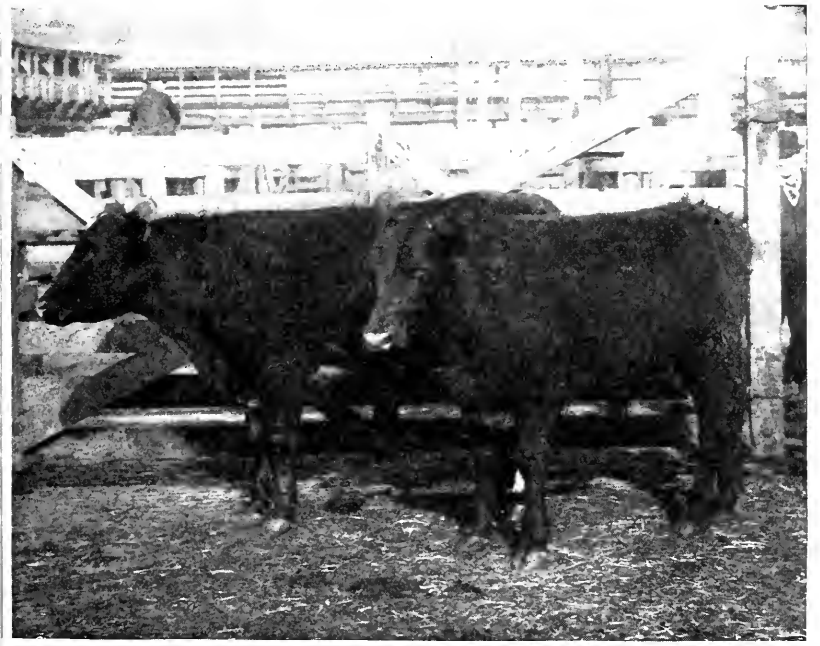


Fig. 22. Good Feeders.

are sometimes accepted as proofs of good breeding, but many scrub animals masquerade under these colors. The Shorthorn and Hereford red and the Angus and Galloway black are frequently found in animals carrying a very small percentage of the blood of these breeds; the same is true of the polled head of the Aberdeen-Angus, Galloway, and Polled Durham. Other things being equal, the colors of the beef breeds are preferred in feeder steers, and most certainly the fawn color, or spotted white and fawn of the Jersey and Guernsey, or the black and white markings of the Holstein

are evidence of dairy breeding and are to be avoided if possible. As to which of the beef breeds should be given preference when selecting feeders, that is almost entirely a matter of personal fancy. They are all good and there is no best. There are differences, to be sure, but none great enough to claim attention here.

6. Disposition.—Nervous, irritable, restless cattle are profit-losers on feed. In many instances, with proper handling, such steers quiet down a great deal as the feeding period progresses, but in many other instances this is not true. The

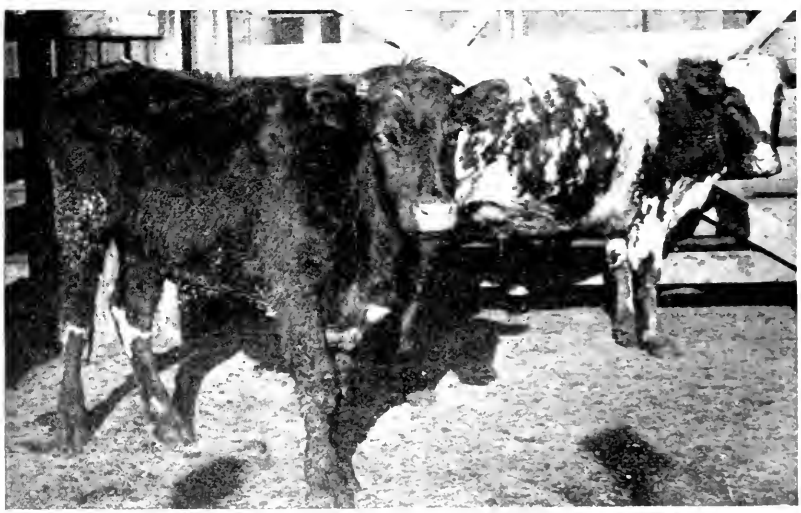


Fig. 23. Medium Feeders.

eye and the carriage of the head and ears are indications of the disposition. A high-headed, wild-eyed steer, with ears in motion to catch the slightest sound, stampedes on the least provocation. The poll of the head should be carried on a line with the withers, and the eyes should be placid in expression, indicating a quiet, contented feeder that will make gains in proportion to the feed he consumes, instead of wasting his energy in nervousness and frightened antics.

7. **Uniformity** in size and color adds much to the attractiveness of a load of cattle, and in buying feeders this point is worthy of attention. They look better in the feed-lot,

and an even load of steers attracts more attention on the market than does a heterogeneous mixture of all sorts.

Good feeders.—These possess in less degree the qualities which characterize choice and fancy selected feeders. They are not so thrifty, have not as good conformations, and carry a smaller percentage of good breeding. They are easily criticized, for they are too long of leg, too narrow across

Fig. 24. Common or Inferior Feeder.

the back, and either too fine or too heavy in bone. Good feeders will finish into good fat steers, or perhaps may make the choice grade.

Medium feeders.—These are very much lacking in form, quality, and constitution, and very seldom grade higher than medium when fattened. Many of them are off-colored and spotted and bear little promise of accomplishing anything

noteworthy on feed. Marketmen refer to such cattle as "doggy."

Common feeders.—These are common in quality, conformation, and condition. It seldom pays to feed them. Dairy-type steers classify here.

Feeder bulls.—These are young bulls of good beef type. Both the supply and the demand are limited.

Stockers.—Thin yearling steers are not in much demand as feeders so long as the supply of two-year-olds is large

Fig. 25. Fancy Selected Stocker Calves.

enough to satisfy feeder demands. The yearlings are mostly available for stocker purposes and are quoted in market reports as "yearling stockers." They are such cattle as will, after a summer on grass and good wintering, be suitable to put on grain feed. Most of the stocker trade, however, is in heifers which when sent to the country are used for grazing and for breeding purposes. The better ones have considerable beef blood and good square frames. They are too thin to classify as butcher stock, and are too good in form and quality to sell at the low prices paid for cutters and canners. Stockers are graded on the same basis as feeders.

Stock and feeding cows.—A rather common practice is to buy thin cows showing evidences of beef breeding, turn

them on pasture and breed them, rough them through the winter, and the next season, after their calves are weaned, fatten them off for market, retaining the calves for feeding purposes. Such cows are called stock and feeding cows.

Veal Calves.

The most important factors determining the value of a veal calf are age, condition, and weight. Weight is not so important as age and flesh. To command the highest price,

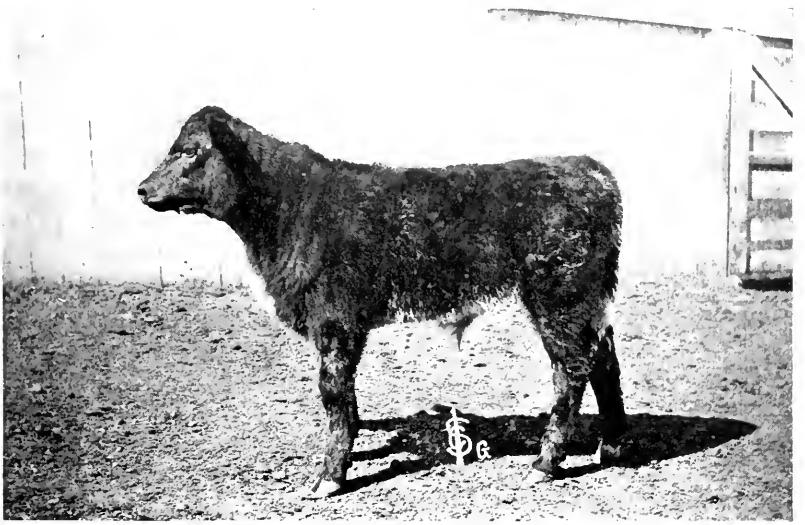


Fig. 26. Choice Veal Calf.

a young calf should carry high finish, weigh from 140 to 160 pounds, and be about eight weeks old. A strictly fat calf of 150 pounds at seven weeks of age is the sort that tops the market. Veal calves range in weight from 80 to 300 pounds, and in age from 5 to 12 weeks. The grades are choice, good, medium, and common. Following are the requirements of the various grades as to fatness, weight, and age:

Choice	well fatted	120-160 lbs.	6- 8 weeks
Good	fat	110-200 lbs.	6-10 weeks
Medium	medium fat	100-240 lbs.	5-12 weeks
Common	thin	80-300 lbs.	wide range

Cattle Prices at Chicago.

Chicago prices during 1914.—The average price for fat steers on the Chicago market during 1914 at $8.65 stood as a new record in that market. Butcher stock reached a new record average at $6.55, and the same was true of westerns at $7.65, cutters and canners at $4.60, and stockers and feeders at $7.35. The lowest and highest prices paid at Chicago for the various classes of cattle in 1914 were as follows: Fat steers, $4.50-$13.00; distillers, $6.75-$10.50; Texas cattle, $6.00-$7.65; western range steers, $5.25-$10.00; western cows and heifers, $4.40-$8.45; fat native cows and heifers, $4.50-$10.30; native bulls, $4.00-$8.75; cutters and canners, $2.50-$5.35; stockers and feeders, $4.75-$8.50; calves, $4.00-$12.50.

Market values of the various classes.—In determining the comparative market values of the various market classes, averages for one year are not sufficient as a basis for comparison. The following table gives the yearly average prices at Chicago for the several market classes from 1905 to 1914, and also the averages for the entire ten-year period:

Year	Native Beef Cattle						Texas and Western		Fat cows and heifers	Cutters and canners	Stockers and feeders	Veal calves
	900-1050 lbs.	1050-1200 lbs.	1200-1350 lbs.	1350-1500 lbs.	1500-1900 lbs.	900-1900 lbs.	Texas	Western				
1905	$4.15	$4.55	$5.05	$5.50	$5.85	$5.05	$4.20	$3.80	$3.65	$1.90	$3.60	$ 5.75
1906	4.55	5.05	5.30	5.85	6.20	5.30	4.45	4.40	3.70	2.05	3.85	6.25
1907	4.55	5.40	5.80	6.20	6.50	5.80	4.85	4.50	3.85	2.15	4.20	6.40
1908	5.25	5.55	6.00	6.60	6.95	6.10	4.80	4.80	4.10	2.50	4.25	6.50
1909	5.40	5.90	6.30	6.90	7.30	6.35	5.40	5.25	4.25	2.75	4.50	7.10
1910	5.90	6.40	6.95	7.35	7.70	6.80	5.60	5.40	4.60	3.10	4.85	8.10
1911	5.65	6.00	6.50	6.75	7.00	6.40	5.35	6.65	4.35	2.85	4.75	7.60
1912	7.10	7.35	8.10	8.80	9.60	7.75	6.75	7.60	5.25	3.40	5.70	8.75
1913	8.00	8.10	8.30	8.65	8.85	8.25	6.75	7.40	6.10	4.25	7.05	10.10
1914	8.10	8.30	8.70	8.95	9.75	8.65	6.50	7.65	6.55	4.60	7.35	9.90
10-yr. ave.	5.85	6.25	6.70	7.15	7.55	6.65	5.45	5.65	4.65	2.95	5.00	7.65

From the standpoint of averages, it will be observed that the price of a fat steer bears a constant relation to his weight, the heavier the steer, the higher the price per cwt. This is due to the fact that as a steer becomes older he fattens more easily; and in dealing with groups of very large numbers

of fat steers of different weights, all factors determining value are equalized except the factor of fatness. Between the average prices of 975-pound and 1,125-pound fat steers, there is a difference of 40 cents per cwt.; between 1,125-pound and 1,275-pound steers, the difference is 45 cents; between 1,275 and 1,425 pounds, it is 45 cents; and between 1,425 and 1,600 pounds, it is 40 cents. The sum of all these differences is $1.70, which is the difference between the average prices of the lightest and heaviest groups of fat steers. All fat steers together sell $1.10 higher than Texas and western range cattle, and $2.00 higher than butcher stock. Between stockers and feeders and fat steers, there exists a margin of $1.65, based on the Chicago figures. Butcher stock sell $1.70 higher than cutters and canners. Veal calves bring the highest price of any class, exceeding native beef cattle by $1.00.

CHAPTER VII.

BREEDING FOR THE MARKET.

Market cattle are bred on the farms of the East and Central West, and also upon the large ranches of the West and Southwest. During recent years an unusually large percentage of western cattle coming to market have been cows, heifers, and bulls, which is one evidence of the continual narrowing of the range country as the West becomes more thickly settled. If beef production is to continue in its present proportions, larger crops of farm-bred calves must be produced.

The first live-stock census was taken in 1840, at which time the number of cattle, excluding calves, to each inhabitant was .88 of an animal. It was .81 of an animal in 1860, .79 in 1880, .92 in 1890, .69 in 1900, and .58 in 1910. By the use of better and better animals for breeding purposes, however, the average value of all our domestic animals has been constantly increased, so that loss in numbers has been partially equalized by increase in quality.

At the present time there is a world shortage of beef cattle; since 1900 the eleven chief cattle-producing countries have increased 19.9 per cent. in population, and only 2.18 per cent. in cattle. The national shortage is much more marked; the United States has decreased over 15,000,000 head in beef cattle since 1907, and at the same time has increased over 9,000,000 in population. In other words, since 1907 the beef cattle of the United States have decreased 30 per cent., while population has increased 9.5 per cent. During the same time, the ten range states have decreased from 22,659,000 head to 14,223,000 head, a decrease of 37 per cent. The range country is being settled and range cattle are bound to decrease still more in numbers. Thus the feeder cattle supply is certain to be even more limited than at present. There never was a better time for the cornbelt farmer to

get into beef production; the time is ripe for the man who wants to breed as well as feed cattle for the market.

Baby beef production has the following advantages: 1. There is money in the business at present and prospective prices. 2. It pays better than average market prices for farm crops. 3. It makes use of rough lands otherwise wasted. 4. It helps to maintain soil fertility. 5. Helps solve the labor problem. In Iowa during 1911-1912, 24 farms produced 816 calves and fed them out at a profit of $7.00 per head. The cost of keeping the cow a year, the cost of feeds at full market prices, and the interest on the investment were all figured in. In 1912-1913, 36 farms bred, fed, and sold 983 calves at an average weight of 876 pounds. The average age of these calves was 16 months. They sold at $8.60 per cwt., or $75.30 per head. The cost per head was $59.20; this left a profit of $16.10 per head. A comparison of crop yields during five years on ten beef cattle farms in ten counties in Iowa, and on ten grain farms in the same neighborhoods showed that the cattle farms averaged 14 bu. more corn per acre, 7 bu. more oats, and 1 ton more hay.

There were 56,592,000 cattle in the United States in 1914. Of this number, 20,737,000 were dairy cattle and the remaining 35,855,000 were reported as "other cattle." The average value of milch cows was given as $53.94, and of "other cattle," $31.13. The leading states in numbers of cattle other than dairy animals were as follows:

1.	Texas	5,173,000	6.	Missouri	1,386,000
2.	Iowa	2,555,000	7.	Illinois	1,216,000
3.	Nebraska	1,883,000	8.	Minnesota	1,173,000
4.	Kansas	1,565,000	9.	Wisconsin	1,158,000
5.	California	1,410,000	10.	Oklahoma	1,097,000

The distribution by geographical divisions was as follows:

North Atlantic	2,071,000
South Atlantic	2,890,000
North Central, East of Mississippi River	4,599,000
North Central, West of Mississippi River	9,942,000
South Central	9,222,000
Far Western	7,131,000
Total United States	35,855,000

When breeding for beef, the producer must use good cattle of the beef type. Attention must be given to the selection of both the cows and the bulls, and an effort must be made

to breed for market what the market wants and will pay for in amount sufficient to return a profit. In some years, feeders of cattle find it more profitable to buy rather a low grade of cattle for feeding purposes, although as a general rule, it pays best to feed high-class cattle that will sell at the top of the market, or near the top, when finished. Breeders of cattle are confronted with no such dilemma as to what to aim for in breeding; they should always try to breed the best. Breeding herds are not so easily or quickly changed to suit fluctuations in market demands as are cattle in the feeder's hands; hence, breeders abide by the general rule that greatest returns come from the production of the highest grade of cattle.

When the object of the breeder is to produce calves to be fed for the market, the cows in the herd are purebred only in very rare instances. Purebred cattle are not so numerous as to permit their widespread use, and it is impracticable to advise that purebred cows shall constitute the common herds of the country, nor would it be possible to bring about that condition for many years to come. By all means, however, the cows in such herds should be high grades of some one of the beef breeds.

At this point some definition of terms is necessary. A **purebred** animal is one whose sire and dam were members of the same breed, and its advantage lies in the fact that its ancestors were specially selected animals, all possessing certain desired characteristics insisted upon by the men who founded and developed that breed. As it is a rule of breeding that what goes into an animal through its ancestors will come out in its offspring, the superior advantage of the purebred animal is apparent. The terms "full-blooded" and "thoroughbred" are often erroneously used in place of the word purebred.

A **cross-bred** animal is one whose sire and dam were both purebred, but belonged to different breeds. A cross between a Shorthorn bull and a Hereford cow would, for example, produce a cross-bred calf. A **scrub** animal is one bearing no evidences of good breeding—one without any purebred ancestors, or, at most, very distant ones. Such animals are usually of indeterminate type and little value. When a

purebred is mated with a scrub, the offspring is called a **grade.** If this grade animal is in turn mated with a purebred of the same breed as its own purebred parent, or with one of some other breed, the result will still be a grade. When several crosses have been made upon scrub stock by sires from the same breed, the resulting offspring will possess 87.5 per cent. or more of purebred ancestry and may be referred to as **high grades.**

Returning to the point under discussion, cows in market beef breeding herds should be high-grades, preferably with all the purebred ancestors members of the same breed. From this breed also, a purebred bull should be selected to mate with the cows, thus insuring a uniform lot of calves for feeding. As the bull is at least half of the herd, more money and time should be expended in his purchase than in the purchase of a cow. No progress whatever will be made by using other than a purebred bull and continuing in the same breed when future herd-headers are selected. The grading-up process must be continued, and where this has been done through a number of generations, herds will be found that are, for all intents and purposes, purebred so far as production for the market is concerned.

As to what price the breeder is justified in paying for a bull, that will vary depending upon the conditions. Some very satisfactory bulls have been bought at very moderate prices. In grading up western range cattle, high-priced, prize-winning bulls have been purchased in a number of instances and the bull turned out on the range as his pedigree burned in the office stove. If a full quota of cows is at hand for breeding, not less than $100 should be invested in a bull, and more often it will be advisable to pay $200, $250, or more, rather than $100. A small increase in the value per head of one season's crop of calves by the use of the higher-priced bull, as compared with the cheap one, will return the difference in the price of the two animals. Furthermore, when the heifer calves by the higher-priced sire are gone over with a view to keeping out certain ones for use in the breeding herd, there will result a herd of higher average merit than otherwise, and improvement thereafter will be

doubly fast. The man who sees no further than first cost when purchasing a bull is surely doomed to failure. As to which breed of beef cattle to use for market production, that is a matter to be decided somewhat by the conditions, but it is largely a matter of personal preference. Each breed has its own special advantages, and there is no best breed of beef cattle.

The producer of feeding cattle secures his bulls from breeders who maintain strictly high-class herds of purebred and registered beef cattle. These are the sources of all that is good in beef cattle, their function being to produce bulls to be sold to grade up the common cattle of the country. Hence a knowledge of market requirements is very essential to the breeder of pedigreed beef cattle, for he is engaged, indirectly, but most certainly, in the production of cattle for the open market. Very many breeders have overlooked this consideration, and with them cattle are a mere hobby rather than an agent in the improvement of the quality of beef or in the cheapening of its cost to the ultimate consumer. The breeder of registered cattle who ignores the requirements of the open market will never be able to build up an active demand for his stock, because the mere fact that an animal is purebred and registered does not suffice. Purchasers insist that a thoroughly useful animal shall accompany the pedigree, and the inferior animal, no matter how glowing his family history, does not receive serious attention or approval.

Fancy, purebred, registered beef cows and bulls frequently sell for $1,000, and wonder is sometimes expressed that a bull or cow can command such a price. Only when it is understood that the sons and daughters of these high-priced animals will not be sold to the butcher, but will be used as breeding animals in herds that produce cattle for the butcher, is it realized that such prices do not necessarily represent a foolish waste of money. It may be several years before many descendants of such an animal reach the market, they being multiplied in the meantime, but when the market finally feels the good influence of such an animal, the benefits are lasting and society in general is repaid many times the price of the original bull or cow.

In selecting beef animals for breeding purposes, the breeder must not only emphasize those points which are important to the feeder and butcher, but must keep in mind his own interests as well. The features which are of particular interest to the breeder are: 1. The possession of a good constitution. 2. Deep natural flesh. 3. Quick maturity. The first of these is also of much importance to the feeder, the second interests all parties concerned with beef cattle, and the third interests both the breeder and feeder. Constitution is of the greatest importance, for it guarantees thrift and vigorous reproduction. It is the cornerstone of the successful herd. By deep natural flesh is meant a full muscular development such as will expand into a maximum fleshing when the animal is fattened. Slow maturity means loss to the breeder, and as cattle vary a great deal in the time required to arrive at maturity, the breeder should select growthy, quick-maturing animals. In selecting aged animals, the only means of estimating quickness of maturity is by the form—the blocky, compact, and low-set type being the quickest to mature. In the case of young animals, the size and weight may be compared with the age and a conclusion reached as to the growthiness and maturity. When cattle intended for breeders are in good condition, the standards for weights at various ages are as follows:

Months	*Weights of bulls*	*Weights of heifers and cows*
6	500	450
12	925	850
18	1350	1150
24	1725	1400
30	1900	1600
36	2000	1650

The beef bull.—In general appearance the beef bull is identical with the steer, being wide, deep, compact, and low set. When in use as breeders, bulls are seldom kept in high condition, hence in studying the form certain allowances should be made for lack of fatness, as this has much to do with the appearance of blockiness and massiveness presented by the animal. The bull should have plenty of size and we should not expect the same degree of refinement in bone that is desired in the steer, yet quality should be easily ap-

parent. The hide should roll up mellow and loose in the hand, showing medium thickness, and the hair should be soft and fine. Even when in a medium-fat condition, the fleshing should be abundant and smooth. The head should be clean-cut, wide, and short, but larger than the steer's, with heavier horns, and a more burly appearance generally. The eye shows more animation or spirit, and the countenance has a more resolute expression. Such a head is indicative of masculinity which is insisted upon by all breeders, it being an

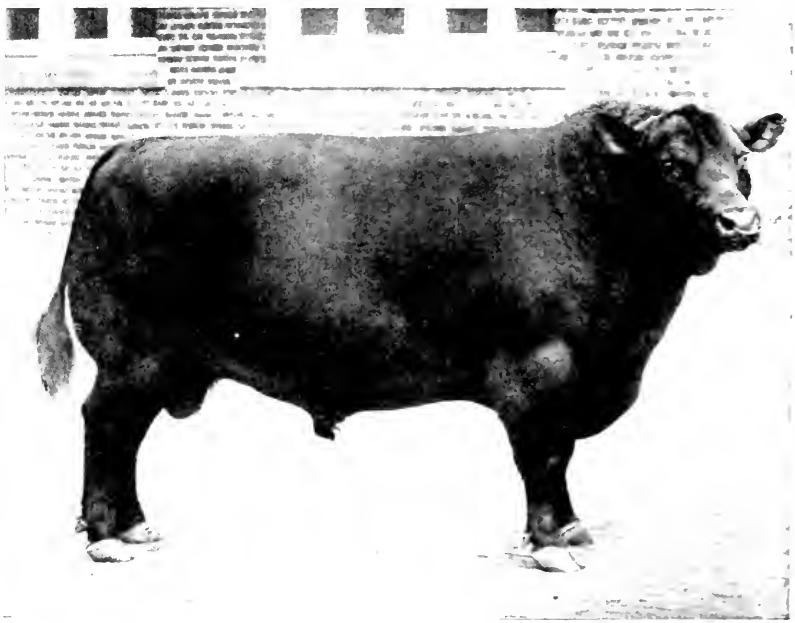


Fig. 27. Correct Type in the Beef Sire.

Erwin C., Champion Aberdeen-Angus bull at the 1913 International, owned by Mr. W. A. McHenry of Dennison, Iowa.

evidence of potency, or breeding capacity. The bull at maturity should show a powerfully muscled neck with a pronounced arch or crest, this also indicating masculinity. The crest should come forward close to the head, and the neck should be short. Masculinity is again shown in the shoulders by a heavier, more massive development than is found in the steer, yet this does not excuse a rough, prominent shoulder such as would be troublesome in the offspring when they are fed for market.

The entire front of the bull is well developed and massive, a condition which is inherited by domesticated bulls from their wild ancestors. In the wild state, a bull became the head of the herd only by right of conquest, and his burly head, heavy horns, muscular neck, and massive front were needed to defeat his male rivals, and to protect the herd from its enemies after he had gained leadership. It was a survival of the fittest, which is nature's method of improving the wild animals. Under domestication, the masculine characters have not the same values as in the wild state, yet they are none the less valuable, because they indicate a rugged, vigorous, and potent animal—qualities highly prized by any breeder. A wide and deep chest with a full heart-girth insures a good constitution. The middle is identical in form with the middle of the steer, but more emphasis is placed upon straightness and strength of back. The hips should be well laid in, and the hindquarters should be long, level, wide, and heavily fleshed. Great variation will be found in the manner in which bulls walk, some doing it awkwardly and clumsily, with the back humped to a marked degree, and with the legs sprawling; others are active in their movements, keeping their legs under them, and carrying themselves with little apparent effort, the latter of course being much preferred. Style has market value in a bull as in a steer, and between an animal that stands and walks gracefully, and one that slouches, other things being equal, the former will sell much more readily if they are priced the same, and his calves will more quickly attract buyers when they reach the market. Before purchasing a bull, the cows in the herd should be carefully studied and their weaknesses noted, so that a bull may be selected that is strong in the points where the cows show weakness.

The beef breeding cow or heifer.—Cows reach maturity quicker than bulls, but do not attain as much size or weight. They show more refinement at all points than do males, but in form and fleshing are identical with all good beef animals regardless of sex. In selecting cows, emphasis is placed upon constitution, deep natural flesh, quick maturity, and feminine character. The head shows marked refinement, and there

is a calm expression of the eye, showing a more retiring disposition than the bull. As compared with steers, the horns are less developed, and the neck is not so thick and perhaps not quite so short. The shoulders are well laid in and smooth, and throughout the forequarters there is an absence of the great strength and massiveness found in the bull. The refinement of the cow's head, neck, and shoulders is an evidence of femininity, which, like masculinity in the male, is evidence of breeding capacity. Masculine-appearing cows are seldom regular breeders or good mothers. A straight, strong back and wide, deep middle are as desirable in the cow as in the bull or steer, indeed even more so, as a capacious middle provides ample room for carrying the calf. Cows are perhaps a little longer in the middle, a little less compact in other words, than steers and bulls.

The hips are notably different, showing more width and prominence, and this feature is often so pronounced as to cause criticism. While a wider hip is accepted in cows than in other beef animals, nevertheless care should be taken to guard against undue prominence. Cows are also usually shorter and rougher in the rump than bulls, but the rump should be as long, level, wide, and smoothly fleshed as possible. So far as condition is concerned, it must be remembered that the breeding cow is more valuable on account of the progeny she produces than on account of her own excellence as an animal suitable for slaughter, hence we do not seriously fault her if she lacks in fatness, provided her constitution, form, and quality are good. However, the beef cow must possess the ability to lay on heavy flesh when put on heavy feed, for "like produces like," and if the cow will not take on flesh readily, then we cannot expect her calves to be profitable in the feed-lot. It is on this account that beef breeding bulls and cows are shown in heavy flesh in the show ring, thus indicating their capacity as beef producers. Beef cows are sometimes made so fat for showing that their usefulness as breeders is injured by a heavy deposit of fat about the generative organs. The practice has, therefore, been severely criticized, yet the danger is not great if the feeding is carefully managed, and the advantages so far outweigh the dis-

advantages that the showing of breeding animals in high condition seems destined to continue. In the show ring, little or no attention is paid to the udder of the beef cow, but the man who breeds cattle for the market cannot ignore the beef cow's milk-producing qualities. The udder should be of good size and shape, with well-placed teats, and the cow should be able to furnish ample milk for her calf during at least the first six months of lactation.

Fig. 28. Correct Type in the Beef Cow.
Fair Start 2d, a famous Shorthorn show cow, owned by Mr. Geo. J. Sayer of McHenry, Ill.

Value of records.—The possibilities for better agriculture through the application of business methods to farming are very great, and this is especially true of live-stock farming. The feeder ought to weigh his cattle regularly, and keep careful and complete records of the weights and of all items of expense incurred in finishing and marketing, so that he may know whether his cattle return him a profit or were fed at a loss. In either case, the records are available for study, and when the next lot is fed, comparisons may be made and

benefits derived from past experiences. This is all the more important in the case of feeders who breed their own calves, for then such records are doubly valuable as they greatly assist in determining the producing qualities of the various animals in the breeding herd. If the breeder has records showing the gains made, the costs of the gains, the market prices received, and the dressing percentages of various calves from various cows and by various bulls, he has the best possible measure of the worth of his herd bull and his breeding cows. If such records are complete they permit comparisons of one cow with another and one bull with another, thus indicating what animals should be retained as breeders and what ones discarded. If the breeder has a chance to see the carcasses yielded by fat cattle of his own breeding, he should most certainly avail himself of it and talk with some well-qualified butcher regarding their merits and faults. By such progressive methods will the breeder forge ahead and obtain the maximum profit and satisfaction from his business.

In conclusion, there is good opportunity for profit in beef production, and the soil needs the fertility which comes from the keeping of live stock. The factors necessary to insure success in beef production are (1) putting more land in blue-grass pasture, (2) better care of pastures, (3) utilization of corn stalks through the use of a silo—build a silo, (4) the growing and feeding of alfalfa, (5) keeping the best heifer calves for breeding purposes, (6) buying only good, purebred, beef bulls to mate with them, and (7) staying by beef production year in and year out, making it a permanent part of farming operations.

CHAPTER VIII.

DAIRY TYPE.

Dairy animals that are correct in type present a marked contrast to beef animals. The body and back are longer and much narrower, the thighs are thin, the neck longer and more slender, and in all parts the animal is lean and angular, whereas the beef animal is thick-fleshed and smooth. The dairy animal should present a muscular appearance, without

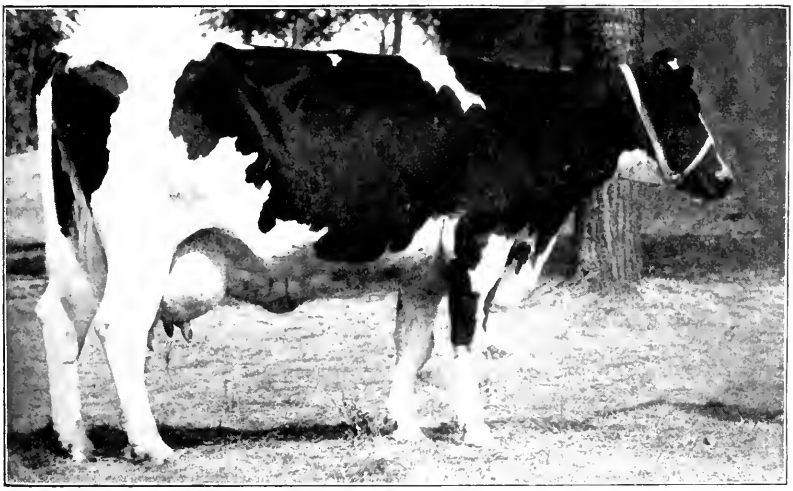


Fig. 29. A Dairy Cow with Utility Points Emphasized.

Holstein cow, Chloe Artis Jewel. Correct form, strong constitution, large feeding capacity, good quality, good dairy temperament, and exceptional mammary development are all evident in this cow. Note especially her wonderful mammary veins. Owned by Mr. C. A. Nelson of Waverly, Ia.

being at all beefy, but should not be so low in flesh as to present an emaciated appearance. Both males and females are rather sharp at the withers, deep ribbed, fairly short of leg, and are well divided between the hind legs. There should be no bulge to the thigh, and no tendency toward the de-

velopment of what is called the twist in beef cattle. There is a limit to an animal's feeding and digestive capacity, hence one animal cannot produce both beef and milk in maximum quantities. Breeders of dairy cattle want the dairy cow to do one thing only; they discriminate against beefiness just as sharply as they favor evidences of large milking capacity.

The Dairy Cow.

Dairy cows may be judged by two distinct methods. One method consists of keeping records of the cow's production, including the duration of the lactation periods, the pounds of milk given at each milking, and the results of the Babcock tests for butter-fat. Records may also be kept of the quantities of feed consumed and the cost of the feedstuffs used, so that at the end of each year an accounting may be made with each cow, and her profitableness or unprofitableness accurately determined. This method gets right at the cow's producing capacity and removes all doubt concerning her right to a place in a producing herd. It is also much used in estimating a cow's value for breeding purposes. This method may be called judging by performance.

Breeders of dairy cattle have an advantage over breeders of beef cattle, it being difficult for the latter to obtain complete records of performance. A slaughter test fully reveals a beef animal's capacity as a meat producer, and records of the cost of feed and labor may be as easily kept as for dairy animals, but after the beef animal has demonstrated its value on the block it is no longer available for breeding purposes. However, calves by a certain bull or from a certain cow may be slaughtered and records made which will help to reveal the worth of that particular bull or cow; but this is much more troublesome and expensive than the testing of dairy cows, and the resulting records are more meager and less significant. Beef producers must rely upon the hand and eye in valuing their cattle, and upon such records as the gains made, costs of gains, prices received for animals sent to market, and the dressing percentages.

The other method of judging dairy cows consists of a detailed study of the animal, and an examination for certain

characteristics which are evidences of milk-producing capacity. If the fifty highest-producing dairy cows in the United States were assembled so that comparisons might easily be made, considerable variation would be found among them in form, quality, udder, and other points. Yet through all these cows would run certain well-defined characteristics which dairymen have come to know are associated with heavy production.

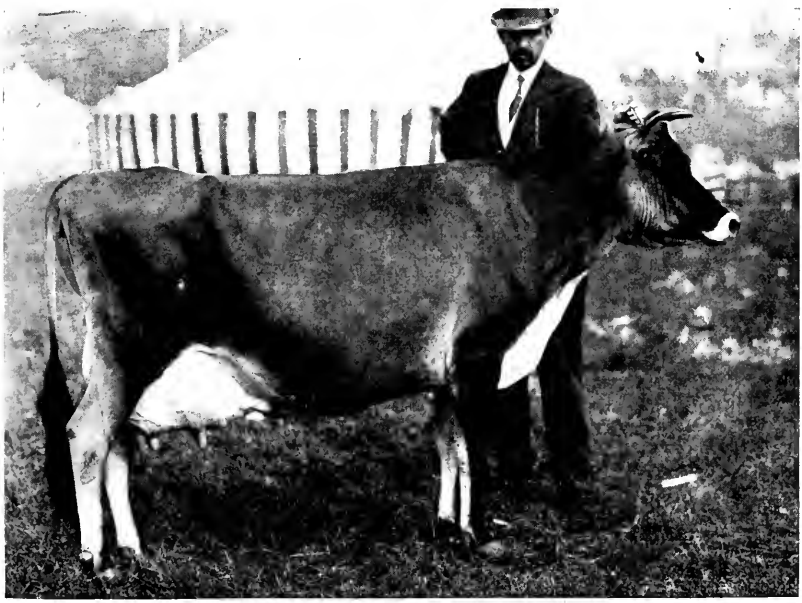


Fig. 30. A Combination of Beauty and Utility.

Jersey cow, Bosnian's Anna, Champion at the National Dairy Show. Her chiseled, feminine head, straight top line, deep rib, nicely balanced udder, good teats, and large veins are all noteworthy. She is especially strong in temperament and quality. Note also the correlation between straightness of rump and levelness of udder. Owned by Mr. C. I. Hudson of East Norwich, L. I., N. Y.

These characteristics may be causes of the heavy yield, or merely incidental correlates, but in either case they are evidences of productive capacity, and are valuable aids in judging dairy cows. Many dairymen keep no records of the production in their herds, and rely solely upon an examination of the individuality when additional cows are purchased. There are other men who ridicule the idea of judging a cow

by any other means than records of her performance; they will tell you of cows which score high but are poor yielders, and of other cows which score low but are big producers. However, such instances are exceptional and should not dislodge one's faith in the value of studying the individuality of dairy cows. No doubt it is wrong to rely solely upon either method of judging, for the two methods may be combined to the advantage of each, and in this way the best estimate of the value of a dairy cow is made.

The **form** of the high-class dairy cow is that of a triple-wedge. One wedge is apparent from a side view; the cow is much deeper behind than in front, so that if the top line and underline were continued on forward they would meet at a point not far in front of the animal. The second wedge is formed by a widening from breast to hindquarters, so that the side lines rapidly converge if they are carried out in front of the cow. These two wedges are sometimes secured, in part at least, by a lack of width and depth in the chest, whereas they should result solely because of much width and depth of barrel, thus giving the needed digestive capacity. Although the wedge form is characteristic of the dairy cow, it is not valuable in itself, and the mere fact that a cow has it is not sufficient. The examination should go deeper; the wedges should be analyzed and their causes determined. The third wedge is formed by the shoulders and withers; the withers constitute the point of the wedge, and the shoulders widen out below to provide the necessary chest capacity. This wedge insures against coarseness at the withers and heavy fleshing on the shoulders. The general form of the cow is very angular throughout, due to a well-developed frame and the presence of but little flesh to give smoothness to the parts. Some allowance, however, must be made for sex and age; we naturally expect more fleshing in the bull than in the cow in milk, and the same is true of young heifers before their first calving, and also of dry cows. Some dairymen make an effort to fatten dry cows, for the added body fat is resorbed and converted into butter-fat when the cow again comes in milk, thus temporarily raising the percentage of butter-fat above the normal. These features,

however, do not excuse any persistent beefy tendency in dairy animals, it being distinctly objectionable.

The **head** of the dairy cow should be lean, and have a broad muzzle, large nostrils, and a dished face. Compared with the head of the beef animal, there is less width and more length, the proportions of the head being described as medium long and medium broad. The eyes should be prominent, bright, calm, and wide apart, and the forehead should be fairly wide. The jaws should be strong, and the cheeks well muscled. The ears should be fine in texture, and of medium size. The horns should be fine and have a curve that adds to, rather than detracts from, the appearance. In Guernsey cattle, a yellowish secretion of the skin inside of the ear, and a waxy color of the horn are often regarded as evidence that the butter will have a rich, golden color. The head should have a distinctly feminine expression, and in all its features should be clean-cut and sharply defined. Such a head has a chiseled appearance indicative of quality and good breeding.

The **neck** is long and thin, but muscular. The upper edge has a slight concave curve, and the lower border has a thin fold or edge of skin, called the "dewlap," extending upwards from the brisket. If the neck is short and thick, or has much depth, so as to make it appear heavy, there is a lack of true dairy type. The throat should be neat and trim, rather than full. Naturally we do not want the neck and shoulders to blend smoothly as in beef cattle, for this results from heavy fleshing.

The **brisket** of the dairy cow is much narrower and sharper than in beef cattle, and does not carry forward so prominently, the difference being mainly due to the heavy fleshing of the beef animal.

The **shoulders** should be light, that is, free from heavy fleshing, and the tops of the shoulder blades and the spines of the vertebrae form rather sharp and refined **withers.** The shoulders will not appear smooth, but they should not be rough and coarse. A rather open, loosely connected shoulder is associated with the loose-jointed conformation desired in the dairy animal, and is a feature found in many of the record-holding cows.

The **front legs** should be fairly short, should come down straight, and the toes should point straight ahead. The pasterns should be strong. There should be no coarseness of shanks or joints. Very often the knees come quite close together, the leg being crooked, and the toes turning out, but this is a faulty position and often indicates a narrow chest and lack of constitution.

The **chest** gets its capacity from depth more than from width. However, the fore-rib should have at least a medium degree of arch; breeders of Holstein-Friesian cattle place much emphasis upon a pronounced arch of rib. The fore-rib should carry down deep to give plenty of room for the heart and lungs. Beef cattle should fill up full and smooth with flesh behind the shoulder, but dairy cattle typically show some slight depression just behind the shoulder, although the heart-girth must be very large to insure a strong constitution. The distance between the front legs is a fairly accurate measure of the width of the chest floor, which should not be cramped, but ample, with the front flanks well filled out. In making a large flow of milk, the heart has to pump great quantities of blood which the lungs must purify, thus demanding that the dairy cow have an excellent constitution.

The **back** should be straight and strong, and have moderate width, and a fair degree of length. Dairy cattle seem put together somewhat loosely; it is not desired that they should be closely coupled or short in the back. A sway-back is sometimes said to indicate true dairy type, but there is no good argument in support of this view; it is logical that cows with big middles should have straight, strong tops. Some dairymen also desire that the backbone shall stand up prominently along the back, loin, and rump, and terminate in a long tail. The argument is that a well-developed backbone encloses a large spinal cord, and as a large nerve branches off at the last dorsal vertebra and goes to the udder to control operations there, a large spinal column is accepted as evidence of proper development of the nervous system, which, in turn, is supposed to signify increased efficiency on the part of the cow as a milk machine. Whether the size of the brain, spinal cord, and branching nerves, rather

than their quality and texture, determines the efficiency of the nervous system may be questioned, and as for the course of reasoning showing the relation between the size of backbone and quantity of milk yield, the reader may take it for what he deems it worth and form his own conclusions. In any event, there are many other ways of estimating a cow's value, the reliability of which are better substantiated. How-

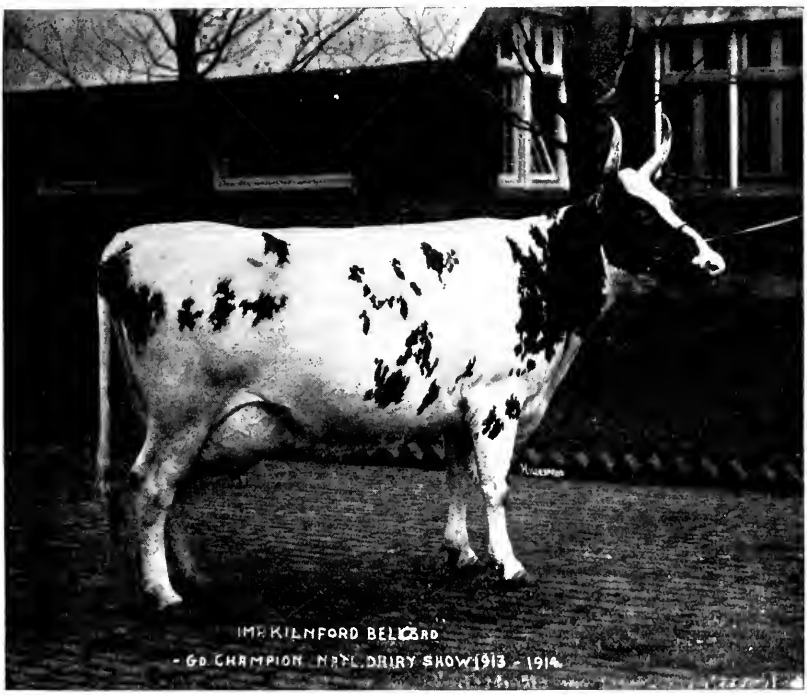


Fig. 31. Excellent Type in the Dairy Cow.

Ayrshire cow, Kilnford Bell 3d., Champion at the National Dairy Show in 1913 and 1914. Note the beautiful head of this cow, and her large shapely udder. Her conformation indicates strength and vigor without coarseness. Owned by Mr. Adam Seitz of Waukesha, Wis.

ever, a prominent backbone is valuable as an evidence of true dairy temperament, or freedom from beefiness.

The **loin** should be rather long, should carry up level and strong, and show a fair degree of width.

The **barrel** ought to be very deep and wide, and this is secured when the ribs are very long and reasonably well

arched. There will be no such degree of rotundity as is found in beef cattle; there should be a well-developed paunch with a capacity for lots of feed. A flat-sided conformation means a restricted capacity for food. The ribs do not lie close together along the side as in beef cattle, and there is more space between the last rib and the hip. Of all the points discussed thus far, two are of vast importance; these are constitution and digestive capacity. The dairy cow is a milk machine and should be studied and operated as such. When looked upon in this mechanical fashion, it is much easier to put emphasis where it belongs and so arrive more quickly at the true worth of the animal. Milk is manufactured in the udder from nutriment derived from the food consumed, and if the cow has the true dairy temperament and does not tend to take on flesh, the quantity of her milk yield will be in direct relation to the quantity and quality of the feed consumed. A heavy milk flow therefore necessitates full development of the organs of digestion, respiration, and circulation, the external evidences of which are a large heart-girth, a large barrel-girth, and a rather lengthy middle.

The **hips** are very prominent, and should be as wide as possible. Narrowness across the hips is often associated with a lack of width in barrel, and when the hips and rump are narrow, the hind legs often set close together, leaving little space for the udder.

The **rump** should be wide and level to insure against difficulty in calving, and should not rise strongly at the tail-head as that conformation usually goes with the sway-back. A level rump is usually associated with a level udder. Length of rump is also very desirable; it gives symmetry to the form, and provides room for a long udder-attachment below. A narrow, peaked rump is liable to cause trouble at calving time, and, as pointed out, it brings the hind legs too close together. At the end of the rump on either side of the tail are the pin-bones. They should be wide apart, for reasons similar to those just mentioned. From the point of the hip to the end of the rump there should be a well-marked hollow, insuring against beefiness of rump.

The **tail** performs a part in milk production by protecting from the annoyance of flies. The fleshy part of the tail

should extend to the point of the hock and the brush should be heavy and long. The root of the tail should be carried on a line with the rump, showing no undue prominence or roughness.

The **thighs** should be muscular, but not fleshy. From a rear view they should be fine and there should be no fleshing between the legs to take up the space that should be filled by the udder. It is desirable that the thighs be long, and that the conformation inside the thigh be incurving. Wide variations in rumps and thighs will be found in dairy animals, ranging from decided beefiness to the trim, clean-cut conformation shown by the best dairy cows.

The **hind legs** should be placed well apart, and they should come down straight. If the toes point outward and the hocks come close together, the conformation is weak and there is not sufficient room for the udder.

The **udder** of the dairy cow comes in for special attention, ranking in importance with the chest and barrel, the three being fundamental in the make-up of a successful dairy cow. The udder's size, texture, shape, and teats should be carefully studied.

Size of udder.—The udder should be large in circumference, carrying well forward along the belly, and extending by a graceful curve high up between the hind legs. When a side view of the cow is taken as she stands in natural position, the udder should carry out far in front of the hind legs, and the swell of the rear quarters of the udder should be plainly evident back of the limb. A measurement of nearly six feet around the udder has been reported, just two inches less than the cow's heart-girth. The udders of heifers are often deceptive, having much greater capacity than the exterior indicates. This is because the udder is held snugly against the abdominal wall; but with increase in age and yield of milk, the added weight produces some relaxation of the supporting tissues, and the udder becomes more pendulous and prominent.

Texture of udder.—Two sorts of tissue mainly compose the udder—glandular tissue and connective tissue. The for-

mer is the seat of secretory activity, and the latter serves the purpose of a framework or support. More or less fatty tissue is also present. Naturally, it is very important that there be a large proportion of glandular tissue and a relatively small amount of connective tissue. This is determined by examining the udder with the hands for mellowness, which indicates that the udder is largely glandular; or still better by having the cow milked, when the udder should show much decrease in size, and the skin covering it should shrivel. When the udder is composed largely of connective tissue, it feels firm and is referred to as "meaty;" and when it is milked out, the yield of milk is small and the udder shows little or no decrease in size. Unfortunately, meaty udders usually excel in shape and appearance, while the most glandular ones have not sufficient connective tissue to properly support them, the heavy weight causing them to hang down rather loosely to form what is called a "pendant" udder. Many large producers have such udders, whereas it is a fact that the type of udder that wins in the show ring is often lacking in milk capacity. The skin and hair covering the udder should be very soft and fine. Texture of udder is one of the most important considerations in judging dairy cows.

Shape of udder.—All sorts of sizes, textures, and shapes are presented. The most desirable shape is an evenly balanced udder, with all four quarters fully developed, and having a flat floor, instead of being cut up between the halves and quarters. There is a natural tendency for the rear quarters to develop much more than the front quarters, the latter often terminating abruptly, but the most desirable shape is one extending well forward to make what is termed a square udder. Udders which carry neither forward nor backward, but are small and tapering from base to teats, without any fullness, are termed "funnel-shaped" udders. Undoubtedly there is considerable correlation between shape of rump and shape of udder. A long rump goes with a long udder, a wide rump with a wide udder, and a level rump is associated with a level udder in contrast to the tipped-up form of udder so often associated with a drooping rump. Shape and balance of udder are important, but subsidiary to size and texture.

The teats and their placement.—The teats should be cylindrical, perpendicular, hang on the same level, and be placed at least six inches apart each way, so as to be easily grasped in the hand. They should be three or four inches long and of a size to make milking easy, but not too large, for udders with very large teats are usually cut up between the halves and quarters, and this occurs at the expense of glandular tissue. When dairy cows are judged, a small amount of milk is drawn from each teat to make certain that the teat is unobstructed and free from defects not evident to the eye. Leaky teats are due to weakness of the muscles of the teat, this being an undesirable trait rather commonly met with, especially in heavy milkers just before milking time. Some udders have not only four large teats, but also one or more small or rudimentary ones. A small amount of milk may sometimes be drawn from them, as they usually spring from rudimentary glands. It is preferred that the udder have four full-sized teats, and four only.

In conclusion it may be said that the udder, first of all, should be large; second, it should be mellow and glandular; third, it should be well-balanced and of good shape; fourth, the teats should be of medium size and placed well apart.

The **milk-veins** are large veins passing forward from the udder along the belly just beneath the skin, and disappearing through openings in the body-wall known as milk-wells. The position of the milk-wells varies; some are near the fore flanks, and some midway between the udder and the front legs. As will be explained more fully later, nutriment derived from the food is carried to the udder by the blood and is there utilized in the manufacture of milk. After the udder has absorbed those elements necessary in making milk, the blood returns to the heart through the milk-veins. It is evident that the size and development of these veins is a good index to the cow's milking capacity, hence they are highly useful in judging dairy cows. The milk-veins of young heifers are small in diameter and are straight. As the heifer develops and her milk flow increases, the veins show increase in diameter, sometimes to an inch or more, become crooked or tortuous, and extend forward toward the fore flanks. The degree of tortu-

ousness varies according to the vein's diameter, small veins being nearly straight and large ones very crooked indeed. There will be at least two milk-veins, one on each side of the belly, and sometimes there will be three, the third one having a position on the middle of the abdomen between the two side veins. They sometimes show more or less branching, each branch passing forward and disappearing through its own milk-well. Although diameter of veins is probably most important, length

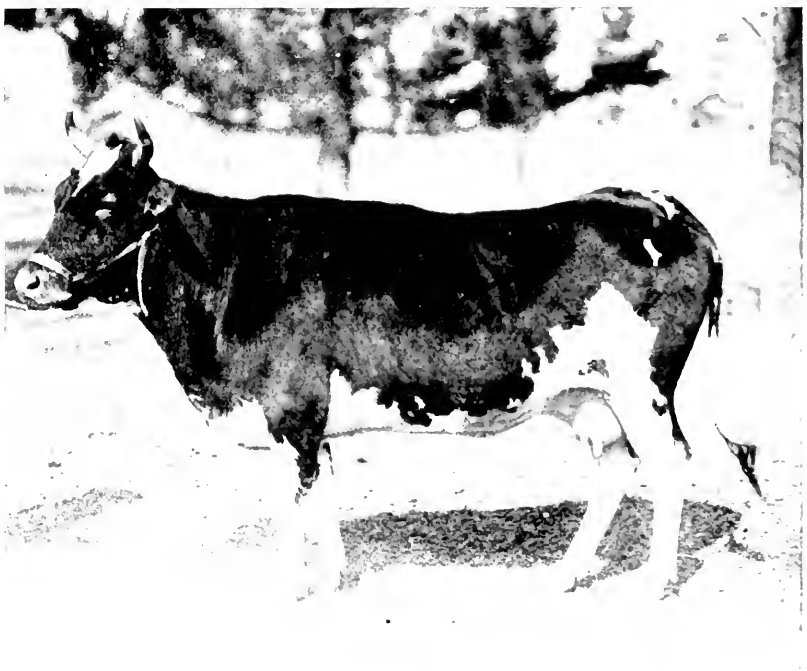


Fig. 32. An Inferior Dairy Cow.

Note the staggy head, coarse neck, uneven top line, small barrel, coarse sloping rump, beefy thighs, and small funnel-shaped udder. Her wedge from the side view points the wrong way.

and extension of veins are also regarded as important, indicating an increased venous development and capacity for a larger flow of blood, due to the added number of milk-wells which make easy the work of handling a large circulation. Nearly all phenomenal producers have veins not only of large diameter and decided tortuousness, but also of many branches and

forward extensions. Small veins, called udder veins, occur on some udders, their presence being further evidence of a well-developed mammary circulation.

The **milk-wells** vary in size to correspond with the veins, and are taken into account in judging. They should be large and easily indented when the finger is applied to them. They are especially valuable in estimating the milking qualities of dry cows, for while the udder and milk-veins are much decreased in size during the dry period, the wells maintain their usual diameter.

The **quality** of dairy cows is shown in the hide, hair, ear, horn, head, and bone, the same as in beef cattle. The dairy cow has a thinner skin than the beef cow, and it should also possess a maximum of mellowness and unctuousness or oiliness. An oily hide is something of an evidence of milk rich in fat; and an abundant yellowish secretion about the udder, inside the thighs, around the eyes, inside the ears, at the root of the tail, and below any spots of light-colored hair indicates a rich butter color. Opinions differ on the question of quality in dairy cattle. Some breeders aim at a very rugged type having great constitution, rather large bone, and a medium thick hide. This type is exemplified by many Holstein-Friesians and by the St. Lambert family of Jerseys. Other breeders attempt to obtain extreme quality, even though it results in some delicacy of constitution. Perhaps this type is best illustrated by what is know as the "Island-type" of Jersey, which is the type developed in the native home of the breed on the Island of Jersey, and also fostered by many breeders of Jersey cattle in the United States. Perhaps the average dairyman will be wise to steer a course midway between the two extremes, insisting upon constitution first and then upon as much quality as may be had without delicacy.

The **temperament** is of much importance. Temperament is a term used to express the differences in the mental and physical constitutions of individuals. Temperaments are of two kinds—sanguine and lymphatic. The sanguine temperament is characterized by a strong, frequent pulse, firm flesh, soft and light hair, active movements, and sensitiveness. The lymphatic temperament is featured by a rather sluggish cir-

culation, fleshiness, thicker skin and coarser hair, slow movements, and quietness. The sanguine temperament is possessed in marked degree by the best dairy cattle, while beef cattle have the lymphatic temperament. The best evidence of true dairy temperament is a lean, angular appearance in all parts of the animal.

The **disposition** varies greatly in different individuals. An irritable, kicking, fence-jumping cow is not expected to make much of a record as a milk and butter-fat producer. She uses too much of her energy in performance that has no market value; the making of milk is a secondary matter with her. Such cows consume little feed and exhibit a fastidious appetite; in short, they are not useful cattle, there being too much waste of energy in nervousness and bad temper. In contrast to such cows is the cow that never moves faster than a walk and is gentle and pleasant to handle. She is a good feeder and is easily suited with her feed. She spends lots of time chewing her cud and is always busy making milk. She is a useful, profitable cow, provided she has the conformation which enables her to work successfully. The irritable cow has an uneasy and wild expression of the eye, and carries her head high. She is usually switching her tail whether it is fly-time or not. Proper disposition is indicated by a calm eye, and by a carriage of the poll of the head no higher or lower than the withers. If the head is carried high it indicates nervousness, while a head carried low indicates quietness carried to the extreme of sluggishness.

The **size** of dairy cows varies between wide limits. The holders of the world's records in milk and butter-fat production are large cows, which is a condition naturally to be expected, but does not signify that small cows are necessarily less profitable. The beef producer must keep up a certain degree of size in his cattle in order that the cuts of beef will have the size and weight desired, but with dairy cattle it is different. The dairyman cares not so much that his cows are large and hence large yielders, as that the yield be made economically; he studies the production in relation to the feed consumed. Small cows not only yield less, but eat less, and may be as profitable as large cows. The latter have an ad-

vantage in that they can profitably consume proportionately more roughage, and fewer of them need be kept to produce a given quantity of milk, requiring fewer stalls and slightly less labor. On the other hand, if the calves can be sold at a profit, as would be true of a purebred herd, the smaller cows will realize more profit from this source. The question of size is of minor importance and may be almost ignored so far as the production of market milk is concerned.

The Dairy Bull.

The Dairy Bull.—The features of dairy type as they apply to the dairy cow having been fully discussed, and the fundamental points of dairy type having been set forth in that connection, the requirements for the bull may be presented more quickly. In **form**, the bull should be rather long and moderately wide, with a deep rib, rather short leg, and rather angular body. His build should impress one with its strong constitution, barrel capacity, strength of back, and muscularity without beefiness. The **head** should be decidedly masculine in its proportions and expression, and have a wide muzzle, large nostrils, large, bright eyes with a courageous expression, and clean-cut features. In all breeds except the Ayrshire, the masculine head will have short, stubby horns. The **neck** should be strong and the crest heavily developed. The **brisket** shows more width, depth, and prominence than in the cow, in keeping with a masculine development of the forequarters. The shoulders are deeper and more heavily developed, but should not be beefy. The **withers** show more width than in the cow, yet tend to be fine and free from flesh. The **front legs** should be straight, rather short, and have fair width between. The **chest** should be moderately wide and very deep, so as to remove all suspicion of lack of chest capacity. The **back** should be moderately wide and fairly long, but carried up straight and strong. The top line of the dairy bull usually rises higher over the withers and neck than over the back and loin, and the first impression may be that the animal is sway-backed, but upon further study the observer often finds he has been misled by the rise over the withers and crest. No marked covering of flesh should

be found on the back, but the backbone should be plainly evident.

The **loin** should be long, level, and medium wide. The **barrel** should be deep and well developed, but need not show as much capacity as demanded in the cow. The **hips** are only moderately wide, the points being much less prominent than in the female. The **rump** should be long, level, and medium wide. The **thighs** may be slightly heavier than in the female,

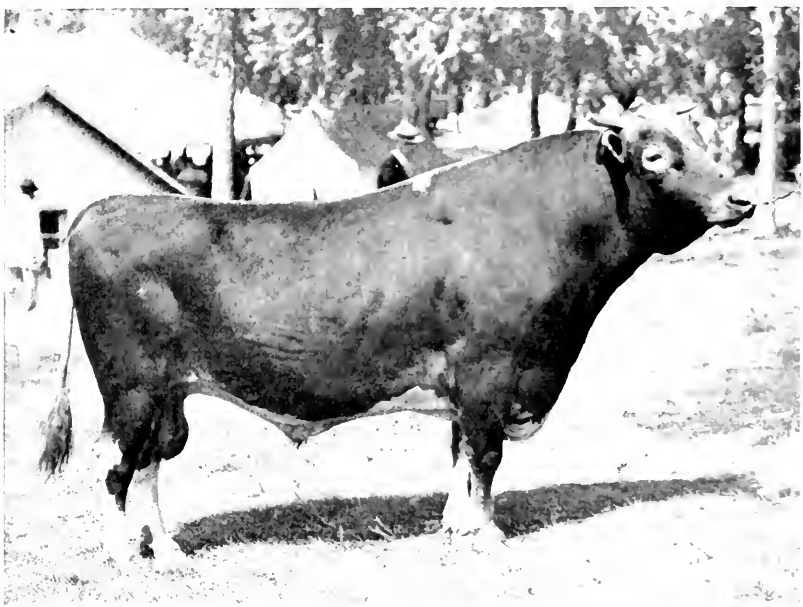


Fig. 33. **Excellent Type in the Dairy Bull.**
Guernsey bull, Holden 4th., a noted breeding and show bull. Masculinity, depth of body, quality, and freedom from beefiness are his outstanding good points. Owned by Wilcox & Stubbs of Des Moines, Ia.

but any considerable degree of thickness is sharply criticized. Some dairy bulls almost rival beef bulls in the amount of fleshing shown in the hindquarters, and such animals are distinctly not of true dairy type in conformation and temperament. A dairy bull should carry no more fleshing than is permissible in a dry cow or in a heifer before her first calving. The bull should be well divided between the hind legs, and should have rather flat, trim thighs. The **hind legs** should be

placed rather well apart, and should be straight and medium short. In common with the males of nearly all species of animals classed as mammals, the dairy bull has miniature teats called **rudimentaries.** These are located in front and on each side of the scrotum, there being two on a side. They vary in length from mere buttons to an inch or more. Some persons attach much significance to the rudimentaries, believing that their position and size indicate the shape and capacity of udder

Fig. 34. A Dairy Bull With Strength and Vigor.
Holstein-Friesian bull, King Homestead DeKol, Champion at many state fairs and at the Waterloo and National Dairy Shows in 1911. His masculinity, ruggedness, and length and depth of body are marked. Owned by Mr. John B. Irwin of Minneapolis, Minn.

which will be shown by the bull's daughters. It is not established that the rudimentaries really have such a significance, and many persons give them no attention in judging. Dairy bulls also have small veins on the belly corresponding to the large milk-veins of the dairy cow.

The **quality** of the bull is very important; it should be easily apparent in a loose, mellow hide, and a reasonable degree

of quality is also wanted in head and bone. Coarseness is an evidence of lack of good breeding. In **disposition,** dairy bulls are much less quiet and trustworthy than beef bulls, often being ill-natured and sometimes unruly. This does not subject them to criticism unless they become dangerous and difficult to handle, but is accepted as an evidence of masculinity. A study of cattle impresses one that dairy bulls and cows exhibit a wider sex difference than is shown between males and females of the beef breeds. As the making of milk is a female sexual character, perhaps selection and breeding for high milk production has tended to make dairy cows more feminine and dairy bulls more masculine.

The individuality of the dairy bull is certainly somewhat significant of his value, but it reveals less of the animal's ability to perform his function than does the cow's individuality when it is studied in relation to function. The bull is only valuable as a progenitor of heifer calves that will develop into heavy milkers. What points, therefore, in the individuality of the bull are evidence that he will sire deep-milking cows? It may as well be stated first as last that it is impossible to determine in any accurate manner from the bull's individuality what his breeding qualities, as they relate to milk flow, will be. There are far more reliable sources from which to form such an estimate and these will be discussed later. Nevertheless, it is important that the dairy bull show a rugged constitution, great digestive capacity, strength of conformation, and absence of beefiness, these being essential points desired in his female offspring. If he is faulty in any of these respects, we may reasonably suppose that his daughters will be similarly deficient. He should be masculine in order to insure potency. Having all these points of individuality, it is still a question as to what sort of performance may be expected from his daughters.

CHAPTER IX.

THE SECRETION OF MILK.

Milk is secreted by the mammary glands or udder of the female after the birth of young, the secretion continuing until the young are mature enough to live on ordinary food. All animals which have mammary glands are classed as mammals, and this group of animals presents wide variations in the number, position, capacity, shape, and prominence of the glands. The mammary glands are present in the male in rudimentary condition, although in abnormal cases in man and in lower animals, milk is secreted by males. Milk is easily digested and very nutritious, and no food for the young animal is equal to its mother's milk. The milk of a number of animals is valued for human food, including the cow, goat, and sheep. The highest development of the udder is found in the dairy cow, the extreme development having been largely secured by methods of breeding; the lactation period has become prolonged, and the daily yield and quality of milk have been much improved. Cows have been known to secrete over one hundred and thirty-five pounds of milk in a day, their own weight in less than two weeks, and over fifteen tons in a year.

Exterior of the cow's udder.—The cow's udder consists of four mammary glands, usually referred to as the "quarters," and sometimes there are one to four rudimentaries, all arranged in pairs on opposite sides of the median line of the body. The udder begins a few inches behind the umbilicus and continues backward and upward between the legs. The right and left sides are divided on the exterior by a well-defined line or groove, but the line of separation between the front and rear quarters is not so pronounced. The appearance of size depends partly upon the strength and shape of the abdominal wall; if the wall is loose, the udder is forced downward and backward and there is a seeming increase in size. This sometimes accounts for the apparently sudden development of a good udder after the second or third calving. The skin

covering the udder is very thin and elastic, and the hair is finer, softer, and shorter than on the rest of the body. The skin covering the teats bears little or no hair, and is often of a darker color than upon other parts.

Structure of the cow's udder.—When dissected, the right and left halves of the udder are found to be enveloped in strong, fibrous capsules. The fibers of the two capsules intermingle somewhat, and are prolonged upward to the median line of the body to form a ligamentous support and partition, the two halves thus being made distinct. The quarters on each side are not so distinctly separated, there being no such well-developed partition as between the halves, nor can the line of separation be seen unless the tissues are stained. Dr. A. W. Bitting of the Indiana Experiment Station injected different colored liquids through the teats and found that the liquids did not leave the quarter, his investigation showing that a rather distinct transverse partition exists. It follows that milk drawn from any teat must be produced in its quarter, although there is slight communication between the smaller ducts in the upper parts of the two quarters on a side. Between the quarters of the same half, the capsule sends off a rather incomplete transverse partition common to both, and there are numerous other reflections of the capsule inward from all sides to serve as a supporting framework for the gland tissue and to form the milk cisterns and ducts.

Structure of the teat.—The tissues of the capsule are prolonged downward, becoming greatly thickened, to form the walls of the teats. The teat is cylindrical or conical in shape, variable in length and diameter, and placed at the lowest portion of the gland. Its shape and size are independent of the size of the gland. It is very elastic and is covered with a tough, close-fitting, thin skin. Through its center runs a duct called the teat-canal, having a capacity, when distended, of from one to one and one-half ounces in moderate-sized teats. There are both circular and longitudinal muscle fibers, and at the lower end the circular fibers form an involuntary sphincter muscle, the function of which is to keep the teat-canal closed under ordinary pressure. At the upper end of the teat is another involuntary sphincter muscle, but it does not com-

pletely close the canal, and sometimes a third is found further above. The sphincters are sometimes so relaxed that very slight pressure is sufficient to open them, and the cow leaks her milk; of other cows the reverse is true, making them hard milkers.

The milk-cistern, ducts, and alveoli.—Above the teat is a large reservoir, called the milk-cistern, seldom holding more than half a pint. This cistern is divided into pockets of various sizes into which the large milk-ducts empty. At the point of entrance of these ducts are sphincter muscles, and while they cannot entirely close the openings, they may very nearly do so, and in this way the cow is enabled to "hold up her milk." These large ducts ramify to all parts of the gland and anastomose (intercommunicate) freely; and at the intersections are still other voluntary sphincter muscles. A strong effort on the part of the cow is required to close the larger ducts in the lower part of the udder, but a slight effort will close the smaller canals further up in the glands. Cows differ greatly in their control over these muscles and in their disposition to exert it. The most common causes of holding up milk are fright, the presence of strangers in the stable, lack of familiarity with surroundings, irregularity in the time or manner of feeding or milking, and sexual heat. With some cows it becomes a habit, much injuring the usefulness and milking capacity of the animal. The large ducts subdivide into smaller ducts, and these again into smaller ones, until they terminate in groups of small sac-like bodies known as the ultimate follicles, acini, or alveoli. The teat-canal, milk-cistern, and ducts are lined with columnar epithelium, but the function of these epithelial cells is not known.

The alveolus (plural, alveoli) is the sacculated distention found in groups of three to five on the end of the minute milk-ducts. It is the essential part of the gland. It is lined by a single layer of epithelial cells which are especially concerned in milk production. The alveolus is only 1-30 of an inch in diameter, and its cavity is from 1-250 to 1-100 of an inch in length and from 1-1300 to 1-800 of an inch in diameter. New ducts and alveoli may be formed up to about the fifth or sixth year, thereby increasing the producing capacity of the cow.

The entire gland may be compared to a large bunch of grapes; the main duct of the gland branches very much as the stem of the bunch of grapes branches; and just as the branches and sub-branches of the stem lead to the grapes, so the branches of the duct lead to the alveoli of the gland. If we pack the bunch of grapes in a small basket of sawdust, so that the sawdust fills up loosely the spaces between the individual grapes and the branches of the stem, we may develop our comparison further; the sawdust stands for the connective tissue in which the ducts and alveoli are embedded, and the basket stands for the capsule.

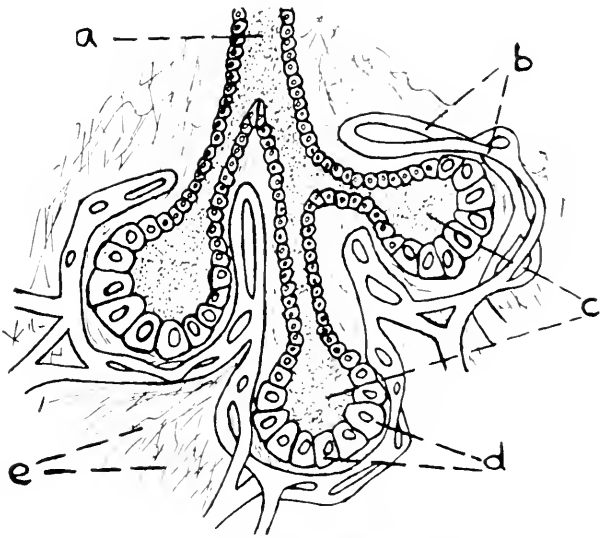


Fig. 35. Where Milk Is Made.

A group of alveoli. a, Duct; b, capillary network; c, alveoli; d, epithelial cells; e, fibrous tissue. (After Hough & Sedgwick.)

The arterial circulation.—The mammary glands are abundantly supplied with blood. The blood leaves the heart through the posterior aorta, common iliacs, and external iliac, which carry backward to the region of the hips. The external iliac there divides into two arteries, one of which, the prepubic, divides into the two pudic arteries, the external one of which passes down the thigh and gives off a branch, known as the mammary artery, which enters the top of the udder from the rear. The mammary artery has four large branches,

one for each quarter of the udder, and there is also a small branch for each rudimentary gland. The large branches subdivide within the gland tissue.

The venous circulation is more complex than the arterial. The blood is collected from the capillaries by from 14 to 17 large veins which empty into the mammary vein running parallel with the mammary artery at the top of the udder. The mammary vein is divided into two parts which encircle the top of the udder and connect in front and behind like a

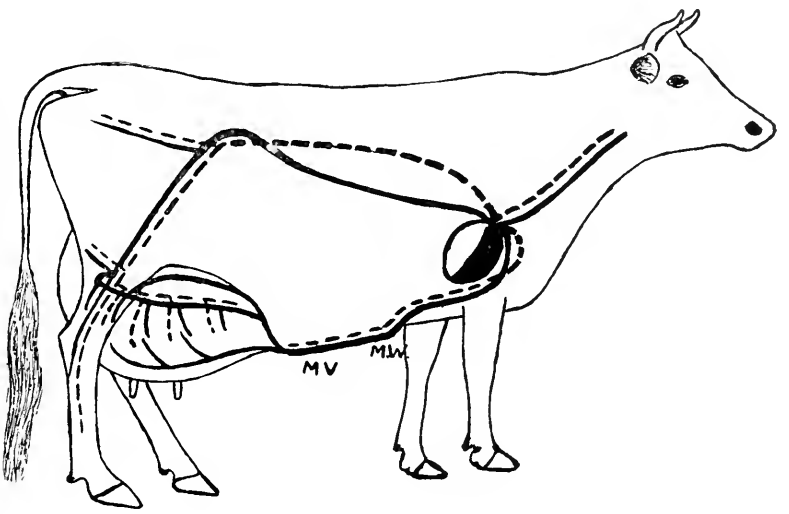


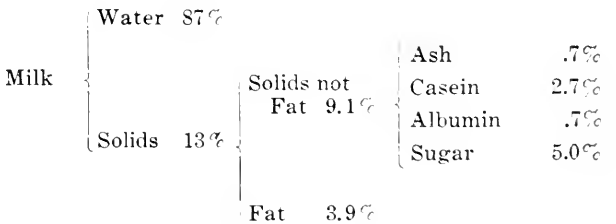
Fig. 36. Circulation To and From the Udder.

The broken lines represent the arteries which carry blood containing the nutritive material to the udder where it is manufactured into milk. The heavy black lines represent the veins which carry the blood back to the heart. Note that there is but one route from the heart to the udder, whereas there are two routes from the udder to the heart. M. V., milk vein; M. W., milk well. (After Bitting of the Indiana Experiment Station.)

rope tied around it. From this circuit of veins the blood returns to the heart by two routes. One route leads out to to the rear of the udder, then up to the region of the hips, and thence to the vena cava and the heart, the veins along the route being parallel to the arteries through which the blood came, and being similarly named. The other route is already familiar, leading out in front of the udder through the large subcutaneous abdominal veins (milk-veins) which pass

through the chest wall and become a part of the internal thoracic vein, reaching the heart by way of the anterior vena cava. The direction of the blood in the encircling veins at the top of the udder is determined by the valves in the vessels. The larger volume of blood passes through the milk-veins, thus bringing them into great prominence. During pregnancy, the pressure of the uterus tends to interfere with the circulation through the posterior vessels, and this tends to further increase the size of the milk-veins. Inasmuch as the blood may return to the heart posteriorly, it is possible to have a large milker with small milk-veins, but this is not likely to occur. Cows with large milk-veins are large producers, and cows with small milk-veins may be large producers.

Nature and composition of milk.—Cow's milk is an opaque, yellowish-white fluid devoid of odor except for a short time after its extraction. When fresh, it is slightly sweet and has a slightly alkaline reaction. Under the microscope, milk is found to be a fine emulsion of fat, a quart of milk being estimated to contain 2,000,000,000,000 fat globules, and the cow that gives two gallons of milk per day must therefore secrete at the rate of over 175,000,000 fat globules per second. The composition of milk varies a great deal; there are differences between breeds, differences between individuals, and differences in the milk from the same cow at different times. As lactation advances, the daily milk yield decreases, but the percentage of fat constantly increases as does the percentage of all solids. The specific gravity of average milk is 1.032 and its composition is as follows:



The results of various American experiments indicate that the average composition of the milk of the various breeds is as follows:

Breeds	*Solids*	*Fat*
	per ct.	per ct.
Jersey	14.70	5.35
Guernsey	14.71	5.16
Devon	14.50	4.60
Shorthorn	13.38	4.05
Ayrshire	12.61	3.66
Holstein-Friesian	11.85	3.42

The quantity of milk given by the different breeds is almost inversely proportional to the fat content, so that the total quantity of solids and fat is nearly the same for all dairy breeds. The highest average percentage of fat in a regular milking that has been reported is 10.7, and the cow did not give milk of this richness regularly. In a few cases, tests showing 9 per cent. have been made and it is only rarely that a cow averages 7 per cent.

Secretion of milk.—The udder is a true organ of secretion. Milk is not merely strained from the blood, but contains substances not found in the blood, these being formed in the gland itself. Surrounding the alveoli are capillaries, and through the walls of the capillaries the fluids of the blood pass freely into the cavity of the alveoli by osmosis. At the same time, the epithelial cells lining the alveoli are the seat of secretory activities which produce some of the most important constituents of the milk. Thus milk is formed partly from the osmosis of blood serum and white blood corpuscles directly into the cavity of the alveolus, and partly by a chemical elaboration by the epithelial cells. The water from the blood serum passes out of the alveolus, carrying with it some of the mineral constituents of the blood in solution, and a part of the albumin of the blood serum. During its passage from the capillaries to the cavity of the alveolus, by far the larger part of the albumin of the blood is changed by the epithelial cells to the casein of milk. These cells also secrete globules of fat, having an average diameter of about 0.0001 of an inch. Small amounts of fat may also be carried over directly by the blood and appear in the milk without change. Only minute quantities of sugar are found in the blood, hence milk-sugar is no doubt also elaborated by the secretory cells of the udder.

Milk secretion is not perfectly understood in all its details. In some of its phases, milk secretion is undoubtedly a continuous process, but the agitation of the udder at milking time seems to be very essential in completing the process of milk manufacture. Between milkings, the udder is engaged in certain important preliminary steps which make possible the rapid culmination of the act of secretion when the stimulus afforded by agitation is given. (The theory that milk secretion is largely the result of cell growth, division, and degeneration, is no longer held by leading physiologists.)

If an udder is cut open just before milking time, it is found that the milk-cisterns and ducts are distended with milk containing a very low per cent. of butter-fat. The quantity of this milk is only a small part of the total yield which the cow would give at a milking. Agitation of the udder is necessary to complete the process of secretion. Observation of a calf, lamb, or kitten when nursing shows that considerable agitation is a prominent feature of nature's method of milking. Under this stimulus the water of the blood rushes through the walls of the alveoli and carries the butter-fat, which has been manufactured by the epithelial cells, down into the milk-ducts and cisterns, and finally through the teats. Other products of secretion, namely casein and lactose (milk-sugar), are brought down also. The last milk drawn from the udder is the richest in fat; in one experiment, four successive samples taken during the course of milking tested 0.76, 2.60, 5.35, and 9.80 per cent. of fat respectively.

Experiments made at the Wisconsin Experiment Station in manipulating the udders of cows, after the regular milkings, resulted in bringing down considerable milk very rich in butter-fat. It was estimated that if the udders of the million cows in Wisconsin at that time were manipulated after the customary operation of milking, and if butter-fat is worth only twenty cents per pound, the value of the extra product would amount to $6.00 per head annually, or $6,000,000 for all the cows in the state.

Colostrum.—Because of more or less incompleteness of the various processes of secretion at the start of the lactation period, the first milk differs in composition from that after-

wards secreted, and is called colostrum. It is thick and viscous, contains less water than normal milk, five times as much albumin, twice as much ash, slightly more fat, and about one-half the usual percentage of sugar. It has a laxative effect on the calf, useful in properly starting the work of digestion. In about one week following birth, the yield of milk usually increases and becomes normal in composition.

Stimuli to secretion.—The cow has no control over the secretion of milk, it being involuntary. During the latter part of pregnancy, the embryo calf makes very rapid growth, and the blood supply to the placenta is much increased. At that time the cow does not ordinarily secrete milk, her excess of energy being given to the growth of the embryo. When the calf is born, the demand through the placenta ceases, and the large volume of blood is turned toward the udder. A short time previous to calving, the udder of the cow shows considerable increase in size, and by the time the calf is born the mammary glands are fulfilling their function nearly to their maximum capacity. In young heifers that have never had a calf, the udder contains a watery, saline fluid. Regular attempts at milking, or manipulation of the udder with the hands, or allowing a calf to suck, may stimulate the secretion of considerable normal milk in such young heifers. The same methods have been known to cause the secretion of a milk-like fluid by the rudimentary glands of males. Thorough milking furnishes a stimulus that causes prolongation of the lactation period, while incomplete removal of milk tends to check the secretion and shorten the milking period, and it may also cause serious inflammation. Frequent milkings tend to increase the flow of milk, but there is no special advantage in milking more often than twice a day unless the cow is a big producer and the udder becomes very much distended between milkings, as such distention acts as a check to further secretion. Regularity in milking is essential to best results, both in the amount secreted per day and in the length of the lactation period.

CHAPTER X.

VARIATIONS IN THE USEFULNESS OF DAIRY COWS.

The census of 1910 showed that the average cow kept for milk production averaged 3,113.2 pounds of milk per year. If this milk tested four per cent. fat, each cow produced 124.5 pounds of butter-fat. Adding 15 per cent. to estimate the butter, the average American dairy cow is found to have had 143.2 pounds of butter to her credit. Rather it was a discredit. Mr. H. B. Gurler, Ex-President of the National Dairy Show Association, estimates that at least 200 pounds of butter are necessary to pay for feed, labor, taxes, insurance, and interest on the investment in keeping one cow. As he says, "No one will become rich milking 200-pound cows." He further states that the 200-pound cow has a market value of about $30. The 250-pound cow gives 50 pounds for profit, or $10, which will pay 10 per cent. interest on $100. If the 200-pound cow is worth $30, the 250-pound cow is worth $130, the 400-pound cow is worth $430, and the few exceptional cows that have produced enough butter-fat in a year to make 1,000 pounds of butter are each worth $10,000. These figures might be further increased by including the values of the calves produced by the cows. As a matter of fact, however, cows yielding 200 pounds of butter or less are not worth anything as dairy cows, but only what they will bring for beef, and the 250-pound cow will not ordinarily bring $130, yet she will pay a reasonable per cent. of interest on that sum. These figures are only valuable as rough indications of the wide variations in the usefulness of dairy cows. It is estimated that one-fourth of the cows in the entire country kept for milk do not pay for the cost of keeping, and nearly one-fourth more fail to yield an annual profit.

The following tables are compiled from the results of the classic tests of purebred dairy cows at the Pan-American and Louisiana-Purchase expositions. These tables are pre-

sented to show variations in the profitableness of different individuals rather than of different breeds:

Pan-American Exposition, Buffalo, 1901; six-months test.

Breed and individual	Av. daily yield of milk	Per cent. of fat	Daily return over feed cost	Breed and individual	Av. daily yield of milk	Per cent. of fat	Daily return over feed cost
	Lbs.		Cents		Lbs.		Cents
Guernsey—				Shorthorn—			
Best cow	31.2	5.4	33.0	Best cow	38.3	3.7	23.9
Poorest cow	23.5	4.4	16.3	Poorest cow	33.6	3.4	16.0
Red Polled—				Polled Jersey—			
Best cow	34.2	4.5	28.9	Best Cow	22.3	5.6	23.8
Poorest cow	30.1	3.7	17.6	Poorest cow	13.7	4.3	8.6
Jersey—				Brown Swiss			
Best cow	25.8	5.6	27.9	Best cow	32.2	4.1	22.9
Poorest cow	30.3	4.0	21.4	Poorest cow	34.6	3.3	16.9
Holstein—				Fr. Canadian —			
Best cow	45.2	3.4	27.4	Best cow	30.0	4.0	22.6
Poorest cow	41.1	3.3	20.3	Poorest cow	21.4	3.7	12.7
Ayrshire—				Dutch Belted—			
Best cow	39.1	3.6	26.2	Best cow	29.5	4.2	21.1
Poorest cow	36.8	3.4	21.5	Poorest cow	21.8	3.1	6.4

Louisiana Purchase Exposition, St. Louis, 1904, 120-day test.

Breed and individual	Average daily yield per cow			Per cent. fat	Feed cost 100 lbs milk	Feed cost 1 lb. fat	Gain in live wt.	Daily return over feed cost
	Milk	Fat	Total solids					
	Lbs.	Lbs.	Lbs.		Cents	Cents	Lbs.	Cents
Jersey—								
Best cow	48.4	2.3	6.7	4.8	55.0	9.7	77	42.1
Poorest cow	38.8	1.6	5.1	4.1	65.0	13.2	85	22.3
Holstein-Friesian—								
Best cow	67.5	2.4	7.5	3.5	45.0	11.0	54	38.4
Poorest cow	47.1	1.5	5.1	3.2	61.0	16.5	147	15.0
Brown Swiss—								
Best cow	51.0	1.8	6.1	3.4	54.5	13.7	74	23.1
Poorest cow	38.5	1.5	5.1	3.8	69.5	15.5	147	16.5
Shorthorn—								
Best cow	43.4	1.7	5.5	4.0	54.5	11.7	139	27.1
Poorest cow	21.4	0.8	2.7	3.9	107.5	23.5	23.4	1.6

The tests at the two expositions cannot be compared, except in the most general sort of way, because different prices were charged for feed and credited for milk and butter-fat produced. All of the tests plainly show that greater

variations in economy of production exist within the various breeds than between the breeds. This is a point often forgotten by those who argue upon the comparative merits of breeds. At the Pan-American Exposition, the best Guernsey cow returned five times as much profit as the poorest Dutch Belted cow. At the Louisiana-Purchase Exposition, the best Jersey returned twenty-six times the profit returned by the poorest Shorthorn. In both tests it will be observed that in the majority of instances the best cow of a breed returned twice as much profit as the poorest cow of the same breed.

At the Louisiana-Purchase Exposition, a Holstein cow was the leader in total production of milk and butter-fat, and a Jersey led in economy of production. The following facts from the complete, detailed reports are of much value in showing the possibilities for profit from well-bred dairy cows of real dairy type. Although varying considerably in the quantity and quality of milk produced, it will be observed that they were nearly equal from the standpoint of net profits.

Name	Shadybrook Gerben	Loretta D.
Breed	Holstein	Jersey
Duration of test, days	120.	120.
Days in milk at beginning of test	12.	71.
Total pounds milk	8101.7	5802.7
Total pounds butter-fat	282.6	280.2
Total pounds butter	330.4	330.0
Average per cent. fat	3.48	4.82
Average per cent. total solids	11.13	13.83
Average pounds milk per day	67.5	48.4
Pounds milk to make 1 lb. butter	24.52	17.58
Average value milk per day, cents	86.15	83.11
Average value butter per day, cents	68.82	68.75
Average grain ration, pounds	22.1	17.5
Average hay and silage, pounds	64.2	36.9
Cost of ration per day, cents	30.47	26.65
Cost of feed in 100 lbs. milk, cents	45.	55.
Cost of feed in 1 lb. butter, cents	11.07	9.69
Average net profit milk per days, cents	55.68	56.45
Average net profit butter per day, cents	38.34	42.09
Pounds gain in weight during test	54.	77.

The highest records in milk and butter-fat production are useful in showing the possibilities in the breeding, feeding, and management of dairy cattle. Sometimes these records are made regardless of economy in production, no expense being spared to give the cow every opportunity to make a

high record; sometimes they have been secured at the expense of the cow's future usefulness, her constitution being undermined and her digestion permanently deranged by the forcing methods that are practiced. Hence the value of such records is sometimes overestimated.

Following are the leading records of the various dairy breeds, the world's records over all breeds being indicated by an asterisk (*).

Holsteins

*One day, 1913, Margie Newman	136.50 lbs. milk
*7 days, 1913, Riverside Sadie DeKol Burke	920.80 lbs. milk
*7 days, 1913, K. P. Pontiac Lass	35.34 lbs. fat
*30 days, 1913, Riverside Sadie DeKol Burke	3,735.60 lbs. milk
*30 days, 1913, K. P. Pontiac Lass	137.20 lbs. fat
*One year, 1914, Tilly Alcartra	30,452.60 lbs. milk
*One year, 1915, Finderne Holingenfayne	1,116.05 lbs. fat

Guernseys

One year, 1915, Murne Cowan	24,008.00 lbs. milk
One year, 1915, Murne Cowan	1,098.18 lbs. fat

Jerseys

One year, 1913, Eminent's Bess	18,782.87 lbs. milk
One year, 1914, Sophie 19th of Hood Farm	998.20 lbs. fat

Ayrshires

One year, 1913, Auchenbrain Brown Kate 4th	23,022.00 lbs. milk
One year, 1913, Auchenbrain Brown Kate 4th	917.60 lbs. fat

Brown Swiss

One year, 1913, College Bravura 2d	19,460.60 lbs. milk
One year, 1913, College Bravura 2d	798.16 lbs. fat

An Ayrshire cow, Crocus, is reported to have given over 45 tons of milk during her 17 years of life. Another Ayrshire cow, Annie Bert, is reported to have given over 45 tons of milk during twelve lactation periods. She also had a record of nearly 2 tons of butter. The University of Missouri had a Jersey cow, Hope of Ramapo, that in 17 years produced 78,585 pounds of milk, 4,147 pounds of butter, and 15 calves, thus bringing $1341.72 into the school treasury.

Cause of wide variation in milk production.—The Missouri Experiment Station recently completed an investigation of the cause of wide variation in quantity of milk and fat yielded by dairy cows and in the economy of their production. Two cows in the station herd showing striking difference in production were experimented with. They were registered Jerseys, sired by the same bull from dams distantly related,

and they had been raised under practically the same conditions. The following table gives the facts regarding these two cows during the first two milking periods prior to the investigation:

Name	Pedro's Ramaposa	Pedro's Elf
Date of birth	Sept. 4, 1902	May 11, 1903
Age at first calving	29 mo.	18 mo.
Pounds milk, first lactation period	4552	878
Pounds fat, first lactation period	238.8	44.1
Number of days in milk	337	131
Pounds milk, second lactation period	7174	3189
Pounds fat, second lactation period	377	114.8
Number of days in milk	365	232

During these two lactation periods, Pedro's Ramaposa produced 2.8 pounds of milk and 3.9 pounds of fat for each pound produced by Pedro's Elf. While the second milking period was in progress, an investigation was planned to determine the cause of this difference in efficiency as dairy cows. The cows were therefore bred so that the calves might be born as near the same time as possible; Pedro's Elf calved October 4, 1907, and Pedro's Ramaposa calved October 7.

Complete records were kept of the amount and composition of the feeds consumed. Each cow was fed a ration of the same composition at all times, but the amount was varied to suit the individual. As there was a possibility of the inferior cow using part of her feed for depositing fat on her body—a characteristic of inferior milking cows—each cow was fed such an amount as would keep her at a uniform body weight. Thus the feed consumed could be studied in relation to dairy qualities only. They were fed all they would consume, unless they began to lay on flesh and gain in weight. The refused feed was collected, analyzed, and deducted from the records. Complete records were kept of the milk produced and of its composition. The same man always milked both cows. In order to eliminate another disturbing factor from such an experiment, the cows were kept farrow; had they carried calves, it would have been impossible to have accurately measured the food requirements for milk production. A digestion trial was conducted when the cows were at their maximum production to ascertain whether any difference existed in the efficiency of digestion.

At the end of the milking period the cows were kept farrow and the same ration was fed as during the milking period; this was continued for 90 days, the feeding being so regulated in quantity as to maintain the cows at a uniform body weight. In this way the requirement for maintenance was determined for each cow. A maintenance ration is one that will maintain a resting animal at a uniform body weight; such a ration keeps up the body heat, makes repairs in the tissues, and furnishes energy for the working of the heart, lungs, digestive and other organs, and for slight movements of the body. If the dairy cow is pregnant, she requires enough feed above maintenance to furnish nourishment for the foetus. Still more feed in excess of maintenance is necessary if she is giving milk as well as carrying a calf. Cows vary somewhat in their maintenance requirements, hence two cows consuming the same amounts of feed may have different proportions of their feed available for milk production. For instance, a restless cow has a greater maintenance requirement than a quiet one; when standing up, more feed is required for maintenance than when lying down. Many other factors affect the requirement for maintenance. It is therefore apparent that an investigation into the cause of differences in the economy of production is not complete unless the requirement for maintenance is determined. This the Missouri Station did by finding how much feed was necessary to maintain each cow at a constant body weight while dry and farrow. Other experiments have shown that a well-fed dairy cow uses about 43 per cent. of her food for maintenance, 30 per cent. in the work of converting food into milk, and about 20 per cent. finally appears as milk. These percentages vary, depending on the nature of the feed and the individual, but a good dairy cow is more efficient as a machine than either the horse or the steam engine. In the Missouri experiment it was found that the higher-producing cow required slightly more feed for maintenance; hence, the wide variation in production could not be accounted for by a superiority of the high-producing cow in regard to maintenance.

During the year of the investigation, Pedro's Ramaposa produced 8,522 pounds of milk and 469.9 pounds of fat. Pedro's Elf produced 3,188 pounds of milk and 169.3 pounds

of fat. The former produced 2.67 pounds of milk and 2.77 pounds of fat for each pound produced by the latter. The digestion trial showed practically identical results, the coefficient of digestion being 64.39 per cent. for the best cow and 64.99 for the poorest cow. Pedro's Ramaposa consumed 1.75 pounds of feed for each pound used by the other cow, and the real cause of the difference in production was found to be the amount of feed consumed above maintenance. The maintenance requirement being practically the same, Ramaposa had 65 per cent. of the total food consumed available for milk production, and Elf had only 44.2 per cent. thus available.

It was observed that Ramaposa, when producing the maximum milk yield, was practically to the limit of her capacity for handling food. Her maximum capacity for food seemed to coincide closely with the amount necessary to maintain her at uniform weight. Elf consumed all her feed, and would have taken slightly more had it been offered, although she never showed lack of food. Ramaposa had much the stronger appetite; she ate rapidly, swallowed the grain with much less chewing, and always showed by her impatience to get her feed a much keener appetite than did the latter. Both cows remained in excellent physical condition throughout the investigation.

After deducting the maintenance requirement, one cow produced milk as economically as the other. The ratio between the food available for milk production and the milk produced was practically the same for each cow. The experiment showed that cows vary but little in the maintenance requirement, or in their ability to digest food. A superior dairy cow is one with a large capacity for food and one that is not disposed to take on fat, but uses the food above maintenance for milk production. This once more emphasizes the importance of a large, well-developed barrel and its significance in judging dairy cows.

Effect of feed on quantity and composition of milk.—The general statement may be made that the quantity of milk is dependent upon the amount of feed and upon the inherent milk-giving qualities of the cow. Feed therefore has an effect

on the quantity of the milk yield. The composition of the milk cannot be permanently changed by any known method of feeding; the composition is regulated by the udder of the cow, each cow having her own characteristic quality of milk. By fattening dry cows, the fat content of the milk is temporarily raised when the cows freshen. It is known that cows fed cottonseed meal yield butter that is hard and tallowy, with a high melting point, while linseed meal produces a soft butter with a low melting point. In spite of these and other minor exceptions, it may be said that improvement in the composition of milk is a breeding, rather than a feeding, problem. The feeder can only supply feed in such amount as will permit the cow to give a maximum flow of milk. But as we have seen, two cows may produce far different quantities of milk when given the best of care, so that increase in the quantity of milk is also a problem for the breeder. Cows are born with certain inherent tendencies; feeding can only assist these inherent tendencies to reveal themselves, but cannot permanently alter them.

CHAPTER XI.

BREEDING FOR MILK PRODUCTION.

In 1915, there were 21,262,000 dairy cows on farms in the United States, and they were valued at $55.33 per head. If put in single file, allowing ten feet of space for each animal, they would make a line over 40,000 miles long, or would form a procession thirteen abreast from New York to San Francisco.

On January 1, 1915, the leading states in numbers of dairy cows, and their average prices per head, were as follows:

1. Wisconsin	1,626,000	$59.50	6. Illinois	1,007,000	$59.50
2. New York	1,509,000	61.00	7. Pennsylvania	943,000	59.50
3. Iowa	1,377,000	57.00	8. Ohio	895,000	60.00
4. Minnesota	1,186,000	53.50	9. Michigan	814,000	60.50
5. Texas	1,086,000	47.50	10. Missouri	797,000	54.50

The distribution of dairy cows, by geographical divisions, on January 1, 1915, was as follows:

North Atlantic	3,416,000
South Atlantic	1,840,000
North Central, East of Mississippi River	4,988,000
North Central, West of Mississippi River	5,503,000
South Central	3,798,000
Far Western	1,717,000
Total, United States	21,262,000

No greater strides have been made in animal breeding during recent years than have been made by breeders of purebred dairy cattle. The methods used are very practical because they are based on accurate knowledge of the producing ability of the animals bred, such knowledge being secured by tests of the various cows in the herd. The dairyman engaged in the production of market milk or butter-fat has, in many instances, seen the benefits arising from keeping records and using them as a basis for improving his herd and has greatly benefited by adopting the methods used by the more progressive breeders of purebred dairy cattle. There is great need for the improvement of the average dairy cow of the country. The small number of purebred dairy cows makes it inadvis-

able to recommend that this improvement shall be accomplished by replacing the average cow with a purebred cow, and that all milk and butter-fat shall be produced by purebred cattle. However, this ideal is easily possible of close approximation by using purebred dairy bulls to grade up the ordinary dairy cows of the country. There is no good argument in behalf of keeping any except a purebred dairy bull at the head of any dairy herd. The necessity for using purebred sires to breed to common cows and the financial advantage of such a policy was pointed out in Chapter VII., in which the breeding of beef cattle for the market was discussed. The arguments there presented apply with equal force to the breeding of dairy cattle.

By going to the same breed each time a sire is selected, the dairyman soon acquires a herd of very high-grade cows, having only a very small percentage of scrub ancestry. Good grade dairy cows often rival their purebred cousins in production, and many have sold at prices considerably above $200. By using purebred sires, and by weeding out the poor producers and retaining the high-producing cows and their heifer calves, an inferior herd may be revolutionized and made to yield a profit. In this way the dairyman is enabled to raise his standards higher and higher, each year eliminating from his herd those cows which fail to reach the mark. Eventually a herd is built up in which every cow returns a large profit on the feed and care invested in her during the year.

Selection of the dairy bull.—If an array of some fifteen or twenty dairy bulls are brought before a judge recognized as competent, and he is asked to pick out the bull that will sire the heaviest-producing cows, he will be unable to do so with any degree of certainty by studying their individualities. He may easily eliminate some of them because of lack of constitution, weak masculinity, or because they show a decided tendency towards fleshiness. Having such faults, he is reasonably certain that they will not prove sure breeders, or that their heifer calves will not develop into heavy producers. Having eliminated certain ones, there will probably be several bulls remaining that have no serious faults in conformation, and among these it is mere guess-

work to attempt to select the most successful sire. Whereas the beef bull carries his evidence of merit upon his back, the true value of the dairy bull can only be judged by the kind of cows in his ancestry, the kind of cows he sires, or by both. The judging of dairy bulls in the show ring is much less conducive to good results in the improvement of cattle than is the judging of beef bulls.

As a general rule, when valuing a purebred animal, more emphasis should be placed upon individuality than upon pedigree; but the dairy bull is an exception. On a basis of 100 points given to the bull's selection, it is conservative to state that 40 points should be allotted to his individuality, and 60 points to the records of performance in his pedigree. All purebred dairy bulls have pedigrees, but in many cases no records were kept of the production of their female ancestors; in such cases the pedigree has no special significance, and little importance can be attached to it. When records of performance of the ancestors are available, the bull is said to have a "pedigree with performance," and to such a pedigree much attention should be given when selecting a bull.

If the bull is matured and has been long enough in service so that he has heifers in milk, they furnish the best evidence of the bull's value as a breeder. In this connection, however, the dams of the heifers must be studied, as the seeming success of the bull may be very largely due to the excellence of the cows with which he was mated. If the dams are inferior and the heifers are good, all the more credit is due the sire. Most of the trade in purebred dairy bulls is in bull calves, for only rarely will a successful bull, as shown by actual trial, be offered for sale.

The best indication of the future breeding value of a dairy bull calf is furnished by the milk and butter-fat records of his dam. If any of her female offspring have records of production, these also furnish valuable evidence. Next, the records of the cows sired by his sire should be studied, if such records are available. After that, the performance of the paternal and maternal grandams should be noted, together with the performance of their female offspring. The grandsires' lists of performers should be studied also, and, if possible, similar studies should be made of the great-grandams

and great-grandsires. The fundamental principle underlying breeding is that "like begets like," and if the bull has a heavy-producing ancestry, heavy-producing sisters, and the other female members of his family are heavy producers, we are certain that he has inherited true dairy qualities of a high order which he will transmit to his offspring.

As a fine example of a pedigree with performance, the pedigree of the Guernsey bull, May King of Ingleside 12558, is herewith presented. Such a bull commands too high a price to permit using him on grade cows, and the average dairyman seeking a sire cannot expect to obtain a bull with a pedigree equal to this one, although he may be able to secure a son or grandson of such a bull at the price he can afford to pay.

MAY KING OF INGLESIDE 12558.

Imp. King of the May 9001, A. R. 72.

Sire of	Milk	Butter-fat
Langwater Dorothy	16099 70	781 65
Langwater Hope	15078 80	773 59
Langwater Rosie	15083 00	724 23
Langwater Princess	12280 50	651 19
Lang. May Queen	11275 70	592 84
Langwater Daisy	10710 30	557 55
Lang. May Rose	9212 50	530 06
Langwater Felois	9445.90	529 81
Langwater Milkmaid	9550 20	510 05
Sister Sue of Lang.	10290 70	469 60
Hayes Queen May	7904 30	406 94

Also sire of seven A R. sons.

Dolly Bloom of Langwater 15452, A. R. 674.

Record: 12024 50 lbs. milk; 632.34 lbs. butter-fat.

Dam of:

Lang. Dolly Bloom	13250 80	714 60

Also dam of one A. R. son.

Imp. May Rose King 8336, A. R. 41.

Sire of	Milk	Butter-fat
Rosa Rubra	14329 15	788 89
Florham Daisy	14876 60	747 08
May Rose Queen	12548 30	667 19
Comely Rose	12861 15	641 79
Queen of the Roses	12223 25	604 94
Florham Pride	10860 60	591 85
Anton's May Rose	10778 70	591 55
Southern Rose	12774 10	583 00
May Rose of Kent	10779 65	556 56
Rutila's May Rose	9701 10	556 40
Queen of May Rose	11448 90	539 03
Pride of Place	10035 50	531 26

And seven other A. R. daughters.
Also sire of nine A. R. sons.

Imp. Itchen Daisy 3d. 15630, A. R. 100.

Record: 13636 80 lbs. milk; 714 10 lbs butter-fat. Sold for $4,000.

Dam of:

Florham Daisy	14876 60	748 08
Langwater Dairymaid	13747 50	670 12

Also dam of one A. R. son

Pocomoke 6075, A. R. 74.

Sire of:

Dolly Bloom of Lang.	12024 50	632 34
Nelly Jay	9576 10	477 27
Carrie Bell	7605 00	373 38

Also sire of three A. R. sons.

Dolly Bloom 12770, A. R. 40.

Record: 17297 51 lbs. milk; 836 21 lbs. butter-fat.

Dam of:

Dolly Dimple	18808 50	876 34
Dolly Bloom of Lang.	12024 50	632 34

Also dam of two A. R. sons

Itchen Jewel 1112 E. G. H. B.

3d prize, Bath and West, England. 1899.
2d. prize, Royal Counties, 1899.

Sire of:	Milk	Butter-fat
Royal Rose of Easton	9576 90	617 80

1st at Royal Show, 1902.

Claremont May Rose 8648 E. G. H. B.

2d. prize over Island, 1895.
1st prize over Island, 1896-7-8.
1st prize in England, 1897.
1st prize at nearly all English shows of 1890-91-92.
1st and Championship, 1902.
1st at London Dairy Show, 1901.
Dam of Imp. May Rose 4th—442 lbs. butter-fat.

May Day 1132 E. G. H. B.

1st prize Royal Counties Show, 1898.
1st Bath and West, 1899.
Sire of Suzerain, 3d. prize Bath and West, 1900.
H. C. Royal Counties, 1900.
C. Royal, 1900; 2d East Kent, 1901
Grandsire of Melanie of Goodnestone 3d—7415 60 lbs. milk; 387 76 lbs butter-fat

Daisy Gem 3341 E. G. H. B.

John R. Gentry 4655.

Half brother to Glenwood Boy of Haddon, A. R. 8, sire of Jedetta of Pinehurst—15109 10 lbs. milk; 778 80 lbs. butter-fat. Also sire of 25 other A R. daughters, and 14 A. R. sons.

Dosia 2d. 10072.

Divan 5846, A. R. 98.

Sire of:

Dolly Bloom	17297 51	836 21
Dolly Dillon	11867 30	532 21
Belle Wilson	8434 40	423 55

Also sire of two A. R. sons.

Questa 11385.

Dam of:

Dolly Bloom	17297 51	836 21
Dolly Bloom's Sister Ray	7887 20	390 96

Also dam of two A. R. sons.

The following records made by the herd of Peder Pedersen & Son in the Benson Cow Testing Association, Cedar Falls, Iowa, in three consecutive years show what may be accomplished by the use of good sires, the keeping of records, weeding out the poor cows, and by proper feeding and management.

	Average milk per cow	*Average butter-fat per cow, lbs.*	*Net income per cow over cost of feed*
1911	5665 pounds	207.7	$22.12
	Largest net income cow in herd		54.22
1912	7060 pounds	251.9	53.96
	Largest net income cow in herd		106.30
1913	9697.47 pounds	341.98	75.00
	Two largest net income cows, each		144.00

This herd was made up of grades and a few purebred Holsteins, and the number of cows remained about the same during the three years reported. At the end of the first year it was found that 40 per cent. of the cows were unprofitable. They were sent to the butcher, and their places in the herd were taken by two-year-old heifers sired by a purebred sire out of common cows. At the end of the second year, 30 per cent. of the cows were "weeded out" and their places taken by two-year-old grade heifers, one purebred cow, and one purebred two-year-old heifer. The end of the third year's work showed that the average milk production had been increased over 71 per cent., the butter-fat 60 per cent., and the average net profit per cow increased from $22.12 to $75.00, or 239 per cent.

There is danger of over-emphasizing the importance of pedigrees when breeding any kind of live stock, and this is especially true if records of tests are included in the pedigrees, as is the case with many trotting horses and dairy cattle. Some breeders have selected and mated their animals solely upon the basis of records, without any consideration of individuality. Animal breeding is not successfully supervised when the owner decides upon matings from pedigrees spread out before him in his office or by the parlor lamp. If this is done, and individuality is neglected, defects of conformation may gain a foothold in his herd and eventually defeat his plans. For instance, two animals may be

selected for mating because of the excellence of their breeding; in other words, the mating looks good on paper; but weakness of constitution may be common to both of them, and if so, it is probable that their offspring will exhibit this defect in greater degree, so as to prevent the fulfillment of the offspring's inherited tendency to high production.

Enough attempts at selecting and mating animals purely on the basis of records have met with failure to show that such procedure is very liable to wreck the herd. The breeder must refuse to be carried away by performance to the extent of buying merely a pedigree. Choose several good individuals, and then let the pedigrees be the basis for the final choice. A meritorious individual should accompany the meritorious pedigree.

CHAPTER XII.

DUAL-PURPOSE CATTLE.

Dual-purpose cattle are all-purpose or general-purpose cattle. They occupy a position midway between the beef and the dairy types, the aim being to combine the good points of both beef and dairy cattle as nearly as possible. The dual-purpose cow, however, does not give as much milk as the dairy cow, nor does she make as much beef as the beef cow. At present the demand for dual-purpose cattle is comparatively limited, although it has been predicted that many farms will eventually adopt the dual-purpose type as the one most profitable. It is also believed that those who maintain beef breeding herds will in the future pay more attention to the milking qualities of their cows.

Perhaps no subject relating to cattle has aroused so much discussion as has the type, economic importance, and probable future of the dual-purpose cow. It has been argued that the day of general-purpose animals is past. It is said that this is a day of specialization in all things, and that better results and more profit are obtained from animals which do one thing and do it well, than are obtained from animals which do two or three things in a mediocre way. While it is true that the tendency in the live-stock world is more and more toward highly specialized types of animals, it is also true that there are good arguments in favor of a dual-purpose type of cattle. Of these arguments, the best one is that there is need of a farmer's cow; that is, a cow for the farmer who is neither a beef producer nor a dairyman, but who wants to produce enough meat and milk for his own use. Such a man wants a cow that gives a good flow of milk, and yet one that has a strong enough beef tendency to produce a calf that will feed out well and make a good carcass; in other words, this man wants a dual-purpose cow. There can be no doubting this argument for it was this demand which made the old-time Shorthorn the popular cow with farmers fifty or sixty years ago.

Another argument frequently advanced in behalf of dual-purpose cattle is that beef production on high-priced land must, in the future, come from a dual-purpose type of cattle. On western ranches where land is cheap, a calf is all the return a cow need give in order to make her profitable, but the cornbelt farmer on $100 and $200 land cannot conduct a business on the same basis as the western ranchman. It is argued that a farmer on high-priced land cannot afford to keep a cow that produces calves suitable for feeding into beef unless she pays for her board, in part at least, with a fair amount of butter-fat. It is argued that he can no more afford this than he can afford to keep mutton sheep which produce lambs, but no wool. The advocates of the dual-purpose cow claim that she will be the salvation of future beef production. However this may be, changes will come gradually and it seems probable that the beef-type animal is destined to continue popular for some years to come.

The methods of management where dual-purpose herds are kept vary considerably. Sometimes the production of beef is given most attention and the milking qualities of the cows are esteemed only as a source of feed for the calves. At the other extreme are herds managed as dairy herds, the beefiness of the cows making possible a good income from choice veal calves reared on skim milk and supplemental feeds. Perhaps neither of these plans represents true dual-purpose management. The dual-purpose cow is at her best when the plan calls for the sale of milk or butter-fat and the rearing of calves to be fed and marketed as fat steers and heifers, or sold into other hands for feeding. All of the cows may be milked, the butter-fat sold, and the skim milk fed to the calves; or half of the cows may be milked and the rest allowed to raise the calves. The writer knows of one successful herd of grade cows where the practice is to put four calves on one cow, the other three cows being milked. The development of the calves is somewhat restricted by this method, for they do not make as rapid growth nor present as good appearance as would be secured by more liberal feeding, but in this instance the financial return has justified the plan.

It is said that twenty years ago the growing of calves by hand was a lost art. It is considerable trouble to rear

calves on skim milk, but it is being done with good results on many farms. The skim milk should be supplemented by oats, bran, corn meal, hay, and good pasture until weaning time, and the calf should be wintered on grain, silage, and hay. When weaned and placed on regular rations, skim-milk calves usually advance rapidly and often overtake calves reared on whole milk to such an extent that they cannot be distinguished from the latter.

Fig. 37. The Dual-Purpose Type.

Milking Shorthorn cow, Pansy 2d., first prize at Carlisle, England, in 1914. Imported and owned by Mr. J. J. Hill, St. Paul, Minn.

Dual-purpose type.—Descriptions of the beef and dairy types having been given in detail, dual-purpose type may be described in a few words by comparisons. The true dual-purpose type of animal is distinguished from the beef animal by certain well-marked differences in form and appearance. The dual-purpose animal is not so wide as the beef animal, nor so smooth, and the fleshing is not so thick. The neck is longer, the withers are not so wide and rounding, the middle

is less blocky and compact, and the legs are longer. The udder receives considerable attention and should be large, mellow, and of good shape. The dual-purpose cow should bear indications of creditable performance at the pail.

Compared with the dairy type, the dual-purpose animal shows more squareness and fullness of forequarters, more width and compactness of body, more fleshing and smoothness. The spring of rib is more pronounced, the back is wider, the withers are thicker, the shoulder is heavier fleshed and smoother, and the thigh and twist are much more heavily fleshed. Dual-purpose cows that give a generous milk flow will carry less flesh during the milking period, but when dry they take on flesh readily. Their calves have a reasonably good fleshing when fed for market, especially if sired by a beef-type bull.

When dual-purpose cattle are brought into the ring at fairs and expositions, it is readily observable that marked variations in type exist, ranging from near the dairy type to the lower limits of beef type. What is regarded as a typical dual-purpose animal by one man will not always suit another, but will be criticised as leaning too much toward the beef type or the dairy type. Some men accept a beef cow with a larger udder than usual as a typical dual-purpose animal; others have in mind a dairy cow showing more beefiness than common. In the show rings of this country much dissatisfaction has arisen over the judging of dual-purpose cattle; some judges have apparently awarded the prizes upon the beef qualities of the animals shown, while other judges have leaned almost as much the other way. A judge at one show will select certain animals as prize winners, and at another show, with the same cattle on exhibition, an almost complete reversal will be made in the awards—hence the dissatisfaction. As time goes on, breeders are getting closer together in their ideals of a dual-purpose animal, although there can never be the uniformity of ideals which prevails among breeders of either beef or dairy cattle. This is true because beef and dairy types represent extremes, while the dual-purpose type is an average of these two, or represents the middle ground.

PART TWO.
SHEEP.

INTRODUCTION.

Sheep are useful to man because they produce mutton and wool. Two distinct kinds of sheep have been developed—mutton sheep and wool sheep, the latter being commonly called fine-wooled sheep. Mutton sheep naturally divide into two groups known as (1) long- or coarse-wooled sheep, and (2) medium- or middle-wooled sheep. The middle- and long-wooled groups are separated by other marked differences besides length of fleece; middle-wooled sheep are of medium size, usually have brown faces, have high quality of mutton, and active dispositions; the long-wooled breeds are large, white-faced, somewhat coarse in flesh, lay on much external fat, and are more indolent in their habits.

Fine-wooled sheep bear wool that is 2 to 4 inches long after twelve months' growth, middle-wooled fleeces vary in length of staple from 2½ to 5 inches, and the long-wooled fiber usually measures 6 to 10 inches. The fiber of the fine-wooled fleece is very fine and has a large number of waves or crimps to the inch, usually from 16 to 22. The long-wooled fiber is coarse and lashy, being rather straight and hairy in appearance. The fiber of the middle-wooled fleece occupies a position between the fine- and long-wooled fibers, being distinctly crimped and medium in fineness, but with fewer crimps per inch than the fiber of fine-wooled sheep. The breeds within each group show characteristic differences in length, crimp, and fineness of wool.

The breeds of long-wooled sheep are the Cotswold, Lincoln, and Leicester. The middle-wooled breeds are the Southdown, Shropshire, Oxford Down, Hampshire Down, Dorset Horn, Cheviot, and Tunis. The breeds of fine-wooled sheep are the American Merino, Delaine Merino, and Rambouillet.

Although variations in size, fleece, and color markings permit the division of all sheep into three groups, there are at

basis only two types of sheep—**mutton type**, and **fine-wooled type.** The mutton-type sheep is chiefly valued on account of its ability to make good mutton economically, although the wool-producing ability of the mutton-type sheep constitutes an important part of its value to the farmer. Some of the best mutton-producing breeds have failed to gain much popularity, mainly because of their deficiency as wool producers. It is not expected that one type of sheep will excel in both mutton and wool production, any more than one type of cattle is expected to excel in both beef and milk production, yet it is important that the mutton-type sheep grow a fleece of good density, length, weight, and quality. The fine-wooled type is mainly a wool proposition; the American Merino is of no more value for mutton than are dairy cattle for beef. The Delaine Merino and Rambouillet have better mutton qualities, although they are inferior to the mutton breeds in this respect. The Rambouillet might be styled a dual-purpose breed of sheep, as breeders give much attention to the form and fleshing.

CHAPTER XIII.

MUTTON TYPE.

Although the breeds of sheep classed as mutton breeds may be grouped into two distinct classes—long-wooled and middle-wooled—and although the breeds within each class differ considerably in color markings, fleece, and appearance, nevertheless all of them belong to the mutton type.

The **general appearance** of the mutton-type sheep is almost identical with the beef type of cattle. The mutton sheep should be markedly short legged, broad, deep, and symmetrical. The top line and underline should be straight and parallel, and the top should be broad and level from end to end. The side lines should be straight, and the middle wide and deep, yet neat and trim. Leggy and rangy conformations are as objectionable in mutton sheep as in beef cattle. There should be pronounced blockiness of conformation, combined with neatness, fullness, and great smoothness of outline.

The **head** should be short and broad, the mouth of ample width, the nostrils large, the face short, the eyes prominent and clear, the forehead broad and full, and the ears rather fine, short, neatly attached, and well carried. The mutton type does not have horns as a rule, the Dorset breed being the only exception. In other breeds, the head should be examined for scurs which are objectionable. The head should have a clean-cut appearance, indicative of quality and good breeding. Mature rams show a Roman profile and are strongly developed and wide between muzzle and eyes—an evidence of masculinity.

The **neck** should be short and plump, arched, clean-cut at the throat, and the blending with the shoulders should be full and smooth. The ram with proper degree of masculinity shows a well-developed crest, or scrag, similar to the crest of the beef bull.

The **shoulders** should be well laid in against the ribs, and nicely covered over with flesh, making the forequarters very even and smooth. The tops of the shoulders should come fairly well together and be rounded over with flesh.

The **breast** ought to be prominent, broad, and filled out plump with flesh. A wide breast is an evidence of strong constitution, and plumpness of this part is one of the indications of proper finish and fatness in the market sheep.

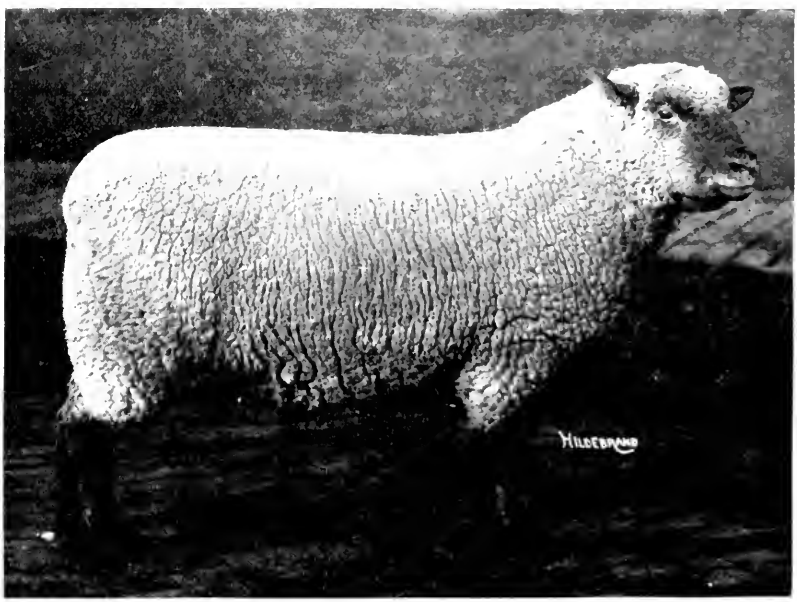


Fig. 38. Correct Type in the Mutton Sheep.

Grade Shropshire, Grand Champion wether at the 1913 International. Bred and exhibited by J. & D. J. Campbell of Woodville, Ont. Neat in form, excellent in quality, and thickly and firmly fleshed. His fatness, trim middle, and good quality insure a high dressing percentage. This sheep belongs to the middle-wooled class.

The **chest** should be very wide and deep, and have a full heart-girth. There should be considerable distance between the front legs, and also between the shoulders, and no depression of the side should exist just back of the shoulder. The front flanks should carry down deep and be well filled out.

The **front legs** should be short and straight, the shanks fine, and the joints not too large. The knees show some tendency to come together, but this should not be marked. Attention should be given to the pasterns which should carry up strong, and to the toes which should be well developed, strong, and point directly forward.

The **back** should be very wide, short, and straight, and should be thickly, smoothly, and firmly fleshed. When the hand is pressed down upon the back it should exhibit no dip or weakness, but carry up level and strong. In thin sheep the backbone is marked by a sharp ridge, but in well-fattened animals the flesh is thickened on either side of the middle line to such an extent that a groove is found down the middle of the back instead of a ridge.

The **ribs** must have a strong arch to give width to the back, and they should carry down deep to afford a large chest and good digestive capacity. They should be placed close together along the side, the last pair coming close to the hips. The covering of flesh on the ribs should be thick, smooth, and firm. The side should be straight and even, the belly should be straight and trim, and the hind flanks should be well let down.

The **loin** should be very wide and carry a deep fleshing.

The **hips** are desired to be of moderate width, the points being well laid in and smoothly covered over with flesh.

The **rump** ought to be long, level, and wide, the top line carrying out straight to the end of the body. The covering of flesh should be abundant, yet smooth and free from softness or bunches of gobby fat. One of the most common faults of mutton sheep is a poorly-shaped hindquarter, the rump frequently rounding off or drooping on top, and the sides cutting in to give a peaked conformation. Squareness and fullness should characterize the hindquarter.

The **thighs** and **twist** should be broad and plump as viewed from the rear, and the fleshing should carry well down toward the hocks, as in beef cattle. The leg of mutton, loin, and back constitute the valuable parts of the carcass, and they must carry a high degree of fleshing. Wide variations

in the development of thigh and twist will be found, although a maximum development is always demanded.

The **hocks** and **legs** should be strong and placed well apart. Crooked, weak hocks are rather common and are very undesirable. The legs should be short and straight, and show refinement of bone and joints. The hind pasterns are given particular attention in judging, for it is by no means uncommon to find them so broken down and weak as to impair the usefulness of the animal to a marked degree, especially if the animal is a breeding ram. They should carry up strong, so as to bring the weight full on the toes.

The **skin** should be of a bright pink color and free from dark-colored spots. The pink color is an indication of health and thrift, while a white or bluish color shows an unthrifty condition. Some breeds excel in this respect, and others characteristically show a rather dark skin color, in which case the dark color is not necessarily an evidence of unthriftiness.

The **quality** of the mutton-type sheep is shown by the fineness of the bone, fineness of the skin, fineness of the wool, and fineness and softness of the hair which covers the face and legs. These are important features in either breeding or fat sheep. The butcher likes quality because it insures high quality of meat, and indicates little waste when the sheep is killed and dressed.

The **condition,** or fatness, of a sheep may be determined by an examination of six points, these being the dock, middle of the back, the neck, the fore flank, the purse, and the breast. The covering over the back should be such that the backbone is not easily felt with the fingers. Sheep that have been over-fed, or improperly fed, often have rough patches of fat about the end of the rump, and soft fat at the fore flank in the form of a mass of blubber. Sheep that show much loose fat at the fore flank are referred to as "slipped," it being commonly, but erroneously, supposed that this condition is due to a very heavy formation of external fat along the back which becomes excessive and slips down the ribs to the fore flank. The butcher sharply discriminates against such an

excessively fat condition, and the breeder has found that slipped ewes are frequently barren.

The **style** which some mutton sheep possess has an importance similar to style in beef cattle. Furthermore, feeders testify that the lamb or wether with stylish appearance and sprightly gait is usually vigorous and a good feeder, style being to some extent an evidence of constitutional vigor and thrift. Style in the ram, including an active gait and bold presence, is an evidence of masculinity and breeding usefulness.

The **fleece** of the mutton-type sheep is of secondary importance, yet constitutes an important item of value. The value of the fleece depends upon its weight, quality, and uniformity. Weight of fleece depends upon covering, density, length of staple, and the amount of oil, or grease, called "yolk." The quality of fleece refers in a strict sense only to fineness of fiber, but in a general way may also include softness, soundness, luster, color, cleanness, purity, and freeness. These various factors of weight and quality will now be discussed.

The **covering** of wool has reference to the completeness of covering over all parts of the body. Some animals are very devoid of wool on the belly and around the armpits. The breeds differ widely in the extent to which the poll, ears, face, and legs are covered with wool, such features forming a prominent part of some breed types, and making easy the distinction of one breed from another. The tendency in recent years, especially with some breeds, has been to secure a more complete covering of wool, and thus produce a fleece of somewhat more weight. In all breeds, the under parts of the body, including the scrotum of the ram, should be well wooled.

A **dense** fleece is one that is compact, or has a large number of fibers growing on a square inch of skin. As much density is desired as is possible to attain.

The **length** of fiber varies greatly among the mutton breeds, so that it is difficult to fix requirements for length of fleece for the mutton type in general. However, a length of less than 3 inches for a year's growth should subject a

mutton-type animal to criticism. As a rule, the longest fleeces are the coarsest and most lacking in density; maximums of fineness, length, and density cannot be secured in one animal. The middle-wooled breeds vary in length of staple from 2½ to 5½ inches, while the long-wooled breeds vary from 6 to 10 inches.

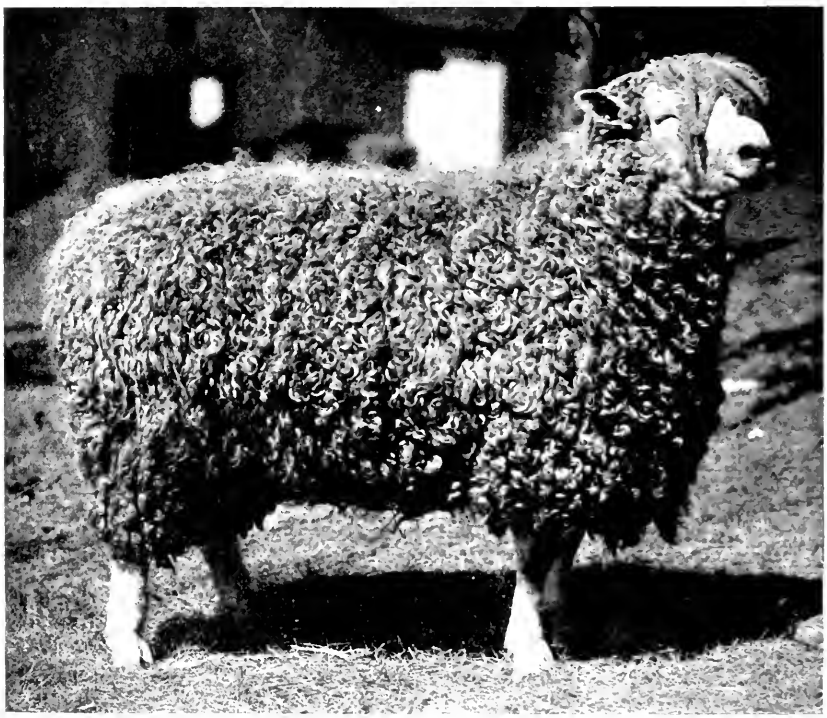


Fig. 39. Long-Wooled Sheep.

Lincoln ram, Champion at the Iowa State Fair. Owned by Mr. A. W. Arnold of Galesville, Wis.

The **yolk** is a variable feature and a highly important one. It is secreted by glands in the skin, and passes out over the fibers, giving them an oily coating that is valuable because it makes the wool soft, protects and preserves the fibers, and, by causing the fibers to lie even and regular, insures against matting, or "cotting," of the fleece. A plentiful supply of yolk also tends to prevent the entrance of dust, chaff,

and other foreign material into the fleece. Incidentally, the yolk adds weight to the wool, although an excessive amount of oil that merely adds weight to the fleece is not desirable. The yolk should be in a fluid condition and should be uniformly distributed throughout the fleece from skin to tip of fiber. It should not be so abundant as to collect in drops in the fleece, nor should any flakes of dried yolk be in evidence.

The **fineness** of fiber, from the earliest days of wool growing, has been esteemed one of the most important requirements of wool. It varies a great deal among the breeds of mutton sheep, and also among the individuals within a breed. It is not expected that the mutton type will produce a fiber with the high degree of fineness shown by the Merinos, yet as much fineness is wanted as may be had without sacrifice of weight or quantity of fleece. The crimp, or waved condition, of wool furnishes an easy and accurate measure of fineness. All wool is more or less crimped, and it is a fact that the finest wools are finely crimped, that is, have a large number of crimps per inch, while the coarsest wools are almost devoid of crimp, being lashy or broadly waved. The crimp of the middle-wooled fleece should be fine, pronounced, and uniform from skin to tip of fiber. A single fleece yields several sorts of wool, differing considerably in fineness. The finest wool grows on the belly, shoulders, and back; that next in fineness, on the neck, below the shoulders, and along the sides, while the coarsest wool is found on the thighs and lower parts of the legs. The fineness of fiber appears to vary with the fineness of texture of the skin itself, and it is also influenced by the quantity and kind of feed, and by heat and cold. Abundance of feed will increase not only the length, but also the coarseness of the fibers, while a continued scanty food supply, but not poor enough to injure the health of the animal, results in a very evident improvement in fineness of wool.

Wool that has **softness** is far more valuable than that which, as tested by twisting, bending, or handling, is stiff and hard. Softness depends upon fineness of fiber and amount of yolk. Ill health, exposure to rough weather, or lack of feed results in loss of softness.

The **soundness** of wool refers to its freedom from weak spots. Ill health continuing for a greater or less time causes the pores of the skin to contract, and, at the same time, the secretion or excretion of wool is lessened. If fibers of wool from such sheep are examined, they are found irregular in crimp, and the microscope reveals narrowness in those parts of the fiber produced during sickness. Yarn made from such wool will be lacking in strength.

Wool is said to have **luster** when the fibers glisten as though thinly varnished. This feature is especially prized in long-wooled sheep. A luster wool takes a dye more readily than does a dull, or lusterless, wool.

The **color** of the wool fiber should be a clear white. The occurrence of brown or black fibers mixed in the fleece subjects the animal to much criticism and furnishes grounds for disqualification in the show ring. Unless the fiber has perfect whiteness, a rich, brilliant dye cannot be secured by the manufacturer.

As regards **cleanness**, all sorts and conditions of fleeces are found, ranging from those above criticism, to those that are a mass of burs, sand, bits of straw, manure, and other rubbish—the whole fleece being matted together and constituting a product of no commercial value. Cleanness depends mostly upon the conditions under which the sheep are kept, although some fleeces, on account of their oiliness and density, tend to keep free from foreign material, while others, on account of their open, dry, fluffy character, offer no resistance to the entrance of foreign matter.

By **purity** of fleece is meant its freedom from hair, called "kemp," and from dead fibers. Unfavorable conditions of keep tend to cause a reversion of the fleece to the original covering worn by early sheep; that is, hair begins to appear in place of wool. Dead fibers and kemp do not absorb dyes, hence they injure the cloths into which they find their way.

The fleece is said to have **freeness** when the locks and fibers are not entangled, but part off readily from one another. When the fibers are tangled, or matted together, the fleece is said to be "cotted."

A fleece with **uniformity** is one having sameness in character throughout. Although there is a natural tendency for the wool on different parts to vary in density, length, and fineness, the aim of the breeder is to produce a fleece as nearly uniform throughout as possible.

Age from the teeth.—The teeth are a fairly reliable indication of the age of a sheep. The lamb has eight temporary incisors, or milk teeth. At 14 months of age, the middle pair of these is supplanted by a pair of larger, permanent incisors. At 2 years, the second pair of permanent incisors appears; at 3 years, there are three pairs; and at 4 years, all eight permanent incisors are in place. At five years, the teeth show more width between, and at six, the corner teeth may be broken out or the mouth may show signs of wear. Broken-mouthed sheep have their usefulness much impaired, and should not be kept unless for special reasons.

CHAPTER XIV.

THE MUTTON CARCASS AND THE PELT.

Mutton and lamb supply a wealthier class of consumers than beef, pork, or veal. Lamb is ordinarily considered something of a delicacy, while beef and pork are looked upon as staple articles of food. For this reason, the American meat industry was not much concerned with mutton and lamb until rather recent years, or since the country has become more prosperous and wealthy. The proper handling of mutton and lamb necessitates more careful and quick slaughtering than is required in the case of beef or pork, and good refrigeration facilities are also very essential. This is another reason why an extensive demand for mutton and lamb is a rather recent development of the meat business. Lamb is usually superior to mature mutton in flavor and general palatability, and the demand for lamb far exceeds the demand for mutton; the wholesale trade consists of two or three times as much lamb as mutton. During the past dozen years the wholesale trade in lamb and mutton has increased to such an extent as to have doubled during that period; this may be partly due to general prosperity and a larger housewife's allowance, and partly to an improvement in the quality of lamb and mutton through better methods of slaughtering and handling.

Slaughtering.—Sheep purchased by packers are driven to the packing plant and allowed to rest one day. They are then driven into a small shackling pen, and a shackle is placed around the hind leg. Two at a time, the sheep are raised by a large revolving wheel to a point overhead where the shackle automatically unhooks from the wheel and starts down a gently inclined rail. The animal moves to the "sticker," who quickly dispatches the sheep by a single thrust of a double-edged knife, one man killing 600 to 700 sheep per hour. After passing through many hands, the carcass reaches the cooler, the dressing requiring about twenty-six minutes.

Styles of dressing.—Illinois Bulletin No. 147 describes in detail the several styles of dressing sheep and lambs. Various styles of dressing are used, due to variations in demand and differences in the quality of the animals slaughtered. The market value is determined by the manner of dressing and the grade of the carcass. *Plain-* or *round-dressed* sheep and lambs have the pelt, head, and toes removed, and the fore legs are folded at the knee. They are opened only from the cod or bag to the breast, and are split half way through the breast-bone. A spread stick is placed inside the fore-ribs to properly shape the carcass. This is the method most commonly used in dressing sheep and the best grades of lambs. *Caul-dressed*

Fig. 40. Killing Sheep at Chicago.

carcasses are those with the ribs and flanks turned outward and fastened back with set sticks. The caul (a membrane investing the internal organs) is wrapped about the legs and laid over the inside of the carcass, thus improving the appearance, preventing drying out, and, in some cases, furnishing the fat necessary for proper cooking of the meat, especially with lambs. The lowest grades of sheep and most grades of lambs are caul dressed. The term *"pelt on"* has reference to lamb carcasses from which the pelt and head are not removed. This manner of dressing is generally confined to light lambs, especially to spring lambs. They are

opened the same as round lambs, and in some markets are dressed with back sets, and the caul is laid over the belly. Sheep and lambs dressed either plain, round, or pelt on, are quoted *"pluck in"* and *"pluck out."* The pluck consists of the heart, lungs, liver, windpipe, a portion of the diaphragm, or "skirt," and more or less adhering fat. It is either left attached to the carcass or removed, as indicated by these terms. Most lambs are sold pluck in, and sheep are usually sold pluck out. Government regulations now require that the toes be removed from all carcasses of sheep and lambs.

The offal.—In the most common manner of dressing, which is the plain- or round-dressed style, the sheep loses the following parts in the order named:—blood, head, pelt, internal organs, and toes. The pelt is the skin with the wool on, and it is a valuable product.

The dressing percentage.—From what has been said of slaughtering and dressing, it is apparent that in order to dress a high percentage of carcass, sheep must be (1) light in pelt, (2) fat, and (3) neat in form, or free from paunchiness. The dressing percentage of sheep is not so important as that of cattle, because the waste has a higher value than the waste from cattle, on account of the high value of the pelt. If a sheep is fat in condition, and neat and trim in form, it will tend to dress high, but the pelt should be as heavy as is consistent with the production of mutton of high quality. As a general rule, the choicest sheep and lambs, from a carcass standpoint, do not wear heavy pelts, although a heavy pelt in itself is valuable, as will be shown later, and between two sheep otherwise equal, the one with the heavier pelt will bring the higher price on the market, even though its heavier pelt lessens its dressing percentage to some extent. Sheep ordinarily dress from 50 to 60 per cent. Mutton carcasses usually weigh from 45 to 85 pounds, while most lamb carcasses weigh from 35 to 50 pounds.

The wholesale cuts.—The following diagram represents a side view of a carcass of lamb or mutton, the dotted lines indicating the location of the wholesale cuts.

The leg and loin together are called the saddle, and the combined hotel rack, chuck, and brisket are called the rack.

The saddle and rack are almost equal in weight. One rib is left on the loin. The hotel rack includes from 9 to 11 pairs of ribs, depending on how the carcass is divided between hotel rack and chuck. The chuck and brisket are usually sold to-

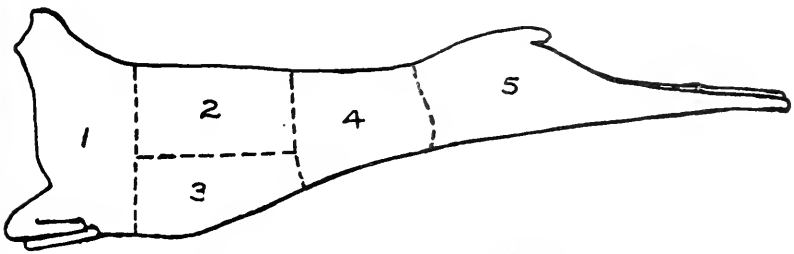


Fig. 41. Wholesale Cuts of Mutton.

1, Chuck; 2, short rack; 3, breast; 4, loin; 5, leg; 1 and 3, stew; 1, 2, and 3, rack; 4 and 5, saddle.

gether as one cut, called the stew. In average 45-pound carcasses of lamb and mutton, round dressed, and pluck out, the weights of the various wholesale cuts, their prices per pound, and total values are as given in the following table:

Wholesale cuts	Weights	Price per pound		Total value of cut	
		Lamb	Mutton	Lamb	Mutton
	Lbs.	Cents	Cents		
Leg	13.7	12.5	9	$1.71	$1.23
Loin	9.6	21	15	2.02	1.44
Hotel rack (10 ribs)	6.4	17.5	13	1.12	.83
Stew	15.3	8.5	6	1.30	.92
Saddle	23.3	16	11.5	3.73	2.67
Rack	21.7	11.1	8	2.42	1.75
Totals	45.0	13.6	9.8	$6.15	$4.42

High-priced and low-priced cuts.—The average price for the entire lamb carcass is 13.6 cents per pound, while the mutton carcass averages 9.8 cents per pound. As in the beef carcass, the back, loin, and hindquarter yield high-priced cuts, while the breast and belly, constituting the chuck and brisket cuts, are low in price because they lack thickness, the quantity of flesh elements being relatively small.

Qualifications of a good carcass.—The value of the carcass depends chiefly upon (1) form, (2) quality, (3) covering, (4) weight, and (5) maturity. These various factors will now be discussed.

1. Form.—The essential points of desired shape are good width in proportion to length, compactness, and smooth, even outlines. This implies a thick loin, broad back, well-fleshed ribs, a full, thick middle from shoulder to leg, plump, thick legs filled down well, and smoothly covered shoulders. The most common faults of form are long, slender legs, narrow backs, lack of development over ribs and loin, and too much paunch, or belly. Long necks in ewes, and heavy "bucky" necks, shoulders, and briskets in wethers are objectionable.

2. Covering.—It is essential that the carcass be smoothly and evenly covered with fat, because of its influence on the appearance of the dressed sheep, the quality of meat, and the shrinkage both in storage and in cooking. Only in the most highly finished sheep are the legs and shanks completely covered. The kidney fat should be well developed, but not excessive. A light kidney usually indicates lack of finish, while a very heavy one is evidence of overdone condition or uneven distribution of fat. The purse, udder, rump, flanks, and brisket are other points at which the amount of fat is plainly apparent, but it should not be excessive on any of these parts. The lowest grades have practically no outside fat, the amount of covering varying more or less directly with the grades of mutton from common to choice. The external and kidney fat should be firm, brittle, and white. As with beef, the English consumer desires fatter mutton than would suit the American trade.

3. Quality.—The term "quality" is here used somewhat broadly, to include not only refinement of bone and fineness of texture of flesh, but also color of lean and fat. The flesh should be firm and fine grained, without the stringy, coarse texture of aged or inferior mutton. The color of flesh varies from light pink in lambs to dull red in mature mutton, and is less variable than in beef. The fat should be clear and white. General quality is more important in mutton and lamb than in other branches of the meat trade, on account

of the custom of using the carcasses for display purposes in retail markets. The quality of "pelt on" lambs is judged partially by the pelt and head, which should show no signs of coarseness.

4. **Weight.**—This is of more importance in grading mutton than in grading beef, as it is often a strong indication as to whether a carcass is a lamb, yearling, or mature sheep. The extreme ranges in weights of carcasses are, lambs, 15 to 50 pounds; yearlings, 40 to 60 pounds; wethers, 40 to 120 pounds; bucks, 45 to 200 pounds; ewes, 50 to 200 pounds. The most desired weights for a lamb carcass are 40 to 45 pounds; for mutton carcasses, 50- to 65-pound weights are most desired. As with beef, heavy carcasses are demanded by hotels, restaurants, and dining cars.

5. **Maturity.**—As has been mentioned, the demand for lamb far exceeds the demand for mutton, and the price of lamb has been shown to be considerably higher. The packers' interpretation of the word "lamb" is broader than the ordinary understanding of the term, for both lambs and yearlings yield a "lamb" carcass. Mutton carcasses are those of wethers, ewes, bucks, and stags. The maturity of the carcass may be easily determined with a fair degree of accuracy from the bones; in lambs the brisket is soft and red, and the ribs and shank bones are colored with blood vessels; in mature sheep the bones are white and hard. However, the *break-joint* furnishes the best means of distinguishing lambs and yearlings from mature sheep. The break-joint or lamb-joint is a temporary cartilage which forms in the head of the shank (shin bone) immediately above the ankle. In dressing lambs, yearling wethers, and some yearling ewes, the foot can be broken off at this cartilage, giving the end of the shank a saw-tooth shape. In lambs the broken surface is smooth and moist, and in yearlings it is more porous and dry. The shanks of mature sheep will not "break," because the cartilage is knit or ossified, and the foot is taken off at the ankle instead, making a "round-joint." Shanks of female or ewe sheep outside the lamb class are, as a rule, too mature to break. Consequently, 80 to 90 per cent. of yearlings are

wethers, the remainder being ewes and a small proportion of bucks and stags. Yearlings substitute for lamb, and we see that they may easily do this because they possess the break-joint.

Grading carcasses.—Carcasses of sheep and lambs are classified and graded as follows:

Classes	*Sub-classes*	*Grades*
LAMB	Lambs	Choice, good, medium, common, culls
	Yearlings	Choice, good, medium
MUTTON	Wethers	Choice, good, medium, common
	Ewes	Choice, good, medium, common, canners
	Bucks	Good, medium, common

Goat carcasses.—Dressed goats are occasionally sold in connection with mutton and lambs, and are frequently substituted for them, especially in the retail markets. They are similar to the lowest grades of western sheep in form, quality, and finish. Long shanks, coarse, dark flesh, long necks, and thin caul, however, render them quite easily distinguished from sheep carcasses.

The Value of the Pelt.

The market value of a mutton animal rests not only upon the carcass it yields, but also upon the pelt. Information has been given out from various sources that buyers of sheep for the packers prefer animals wearing light pelts. It has been said that the slaughtering departments of packing houses without exception dispose of sheep pelts at a fixed rate of $1.25 each, the pelts being consigned at that figure to the wool-pullery department, or to some independent pullery. Buyers have been reported to prefer light-wooled lots in order to obtain high dressing percentages; it has been said that buyers have no particular interest in the welfare of their own pulleries, or in other firms that buy the pelts for pulling. Farmers have been advised that the highest market price is obtained for sheep and lambs that are light in pelt and which consequently dress high.

Can it be possible that the packer, with all his genius for the utilization of by-products, is overlooking such an important item as wool? If the shank bones of cattle may be profitably converted into buttons and other articles, is it not inconsistent and unbusinesslike to discount well-wooled lots of sheep? With wool worth 15 to 25 cents per pound, is it not strange that the buyer should refuse to bid higher on a well-wooled band of sheep than upon a lot with light fleeces, other things being equal, especially as the fleece is secured at the live-weight price of the animal, namely 4 to 8 cents per pound? In handling thousands of sheep, the wool reaches a considerable valuation. If light pelts are wanted, why do shorn sheep sell at a discount?

Such questions as these led the writer to make an investigation which included interviews with the principal buyers at Chicago, and an inspection of a modern wool-pulling establishment owned by one of the packing firms. It was found that a few buyers do give preference to light-pelted lots, but that class of buyers is decidedly in the minority. Swift, Armour, Sulzberger & Sons, and New York butchers have for some time realized the added value of a heavy fleece, and this has enabled them, in many instances, to outbid competing firms who consider only the dressing percentage as an index of the value of sheep for slaughter. The fact that New York butchers have been able to dispose of pelts profitably very largely explains their survival in the face of keen competition with packers.

The slaughtering departments of those packing houses equipped with wool pulleries are credited each day with the value of the pelts sent from the killing floor. The value per pelt varies, depending upon (1) size of pelt, (2) weight of fleece, (3) quality of fleece, (4) cleanness of fleece, (5) amount of grease, (6) color of wool, and (7) thickness of skin. On this basis the value per pelt ranges as low as 50 cents for lambs, and as high as $2.00 for sheep pelts in full fleece, depending mostly upon age, breeding, and season of the year. The value of the pelt plays an important part in determining the value of a sheep to the packer. The buyer's appreciation of the value of the pelt results, in most instances, in a much fairer price than would otherwise be paid.

Packing houses and other wholesale butchers not equipped with wool pulleries have two methods of disposing of the pelts; they may either contract them in advance at a fixed price per pelt, or they may allow them to accumulate and then solicit bids. In the latter case, the bidders make an examination and the pelts sell on their merits. In the former case, the packer or butcher has no incentive to pay a premium for well-wooled sheep, but, on the contrary, it is to his advantage to select those with light pelts. One man prominent on the Chicago market designated the contract plan as "slipshod," and he stated that "eventually it must cease as competition becomes more keen." He also said, "I instruct my men to consider wool as well as meat, and when they make bids, you may be sure they have estimated the value of the pelt as well as the carcass."

Pelts are most valuable in the spring just before shearing time. Shorn sheep sell at a discount because the wool cannot be pulled at a profit until it has a growth of three-quarters of an inch or more. When the staple measures less than this, the pelts are tanned with the wool on, and the price received is small compared with pelts which can be pulled. The time of shearing marks the close of winter and the opening of pasturage, hence shorn sheep are often gaunt, and this is another reason for the lower price.

Pulled wool has the same uses as ordinary clipped wool. The weight of wool from an average pelt is 4 to 5 pounds. This seems a low figure, but the pelts are scrubbed before pulling, which takes out nearly all the dirt and grease, and causes a decided loss in weight.

After the wool is pulled, the skins are prepared for the tannery. Untanned sheep skins are worth from $2.50 to $8.50 per dozen, with an average of $4.50 per dozen. The value depends upon the size, quality, and thickness. The Merino yields a thin, porous skin which makes a leather that scuffs easily and wears out very quickly. These bring the lowest price. The best-wearing and highest-priced sheep leather is made from skins of the long-wooled breeds. Sheep leather is used for making cheap shoes, shoe linings, gloves, bags, book bindings, cheap saddles, sweat bands for hats,

and many other articles. Goat skins are much in demand for furniture leather and are more valuable than sheep skins, the best untanned bringing $10 to $12 per dozen. They average a little larger in size than sheep skins and wear much better.

CHAPTER XV.

SHEEP MARKETS AND MARKET CLASSIFICATION.

The eleven largest sheep markets and their total receipts during the year 1914 were as follows:

1. Chicago	5,378,345	7. St. Paul	794,842
2. Omaha	3,113,889	8. St. Louis	749,293
3. Kansas City	2,002,042	9. Denver	692,247
4. Buffalo	1,081,240	10. Fort Worth	407,793
5. Pittsburg	1,053,799	11. Sioux City	403,927
6. St. Joseph	830,939		
		Total	16,632,947

The Chicago sheep market is almost twice as large as any other in the world. The total value of sheep received at Chicago during 1914 was $30,358,064. Of the 5,378,345 sheep received, 4,105,081 were slaughtered by packers, and the remaining 1,273,264 were shipped out alive. Of the latter number, 568,637 were shipped to other points for slaughter, 702,062 were bought for feeding purposes and sent to the country, while only 2,565 were exported. In 1910, only 2,913 were exported; in 1905, 78,373; and in 1901, 210,216. The marked decrease in the exports of sheep during recent years has been largely due to the high prices prevailing in this country, which make exportation unprofitable. The average weight of Chicago sheep during 1914 was 78 pounds, as compared with 81 pounds in 1910, 83 pounds in 1905, and 84 pounds in 1900.

The commission charge for selling sheep or goats at Chicago is ten cents per head. The charge on a straight carload, however, is seven cents per head, with a minimum charge of $12.00, and a maximum of $14.00 for the car. The charge for yardage is five cents per head.

Market Classes and Grades of Sheep.

The market classes of sheep are three in number, their names indicating the use to which the sheep in each class are put. These are (1) mutton sheep, (2) feeder sheep, and (3) breeding sheep. Each of these classes is divided into subclasses, and these are again divided into grades. Professor

W. C. Coffey, of the University of Illinois, made a detailed study of the market classification of sheep at the Union Stock Yards, Chicago, the results of which are presented in Bulletin No. 129 of the Illinois Station. Professor Coffey outlines the market classes, sub-classes, and grades as follows:

Classes	*Sub-classes*	*Grades*
MUTTON SHEEP (Native and Western Sheep)	Lambs	Prime, choice, good, medium, common or culls.
	Yearlings	Prime, choice, good.
	Wethers	Prime, choice, good, common,
	Ewes	Prime, choice, good, medium, common or culls.
	Bucks and Stags	Choice, good, common.
FEEDER SHEEP (Western Sheep)	Lambs	Fancy selected, choice, good, medium, common.
	Yearlings	Choice, good, common.
	Wethers	Choice, good, medium, common.
	Ewes	Choice, good, medium, common.
BREEDING SHEEP (Native and Western Sheep)	Ewes	Fancy selected, choice, good, common
	Bucks	(Not graded.)
MISCELLANEOUS	Hot House Lambs	
	Export Sheep	
	Throw Outs	
	Dead Sheep	
	Goats	

The division of the sheep in each class into sub-classes is determined either by age or sex. The division of the sheep in each sub-class into grades depends upon their comparative merits and faults and is more arbitrary than the division into classes and sub-classes.

Native and western sheep.—Before taking up a description of the various classes, sub-classes, and grades, it is necessary to explain the differences between native sheep and western sheep. Broadly speaking, native sheep are those kept in small flocks on the farms of the central, southern, and eastern states, while western sheep are those coming to market from large bands on the ranges of the western states. There is also a difference in the breeding; western sheep have a large

proportion of Merino blood, whereas natives have mostly a mutton ancestry. Western sheep are white faced and usually show more or less wrinkles, particularly below the neck; native sheep are mostly brown faced and are usually free from wrinkles. Range methods of feeding and management, as compared with farm methods, result in further differences in appearance and make easy the distinction between natives and westerns. The mutton and breeding classes include both native and western sheep, but the feeder class is composed of western sheep only. Although thin natives are bought up in the country and successfully fed, those that reach the market in low condition do not sell as feeders because they are usually infested with internal parasites, thus making it difficult and often impossible to fatten them.

The stomach worm of sheep, *Haemonchus contortus*, is one of the most serious pests affecting live stock. Sheep of all ages are subject to it, but infested lambs show much more serious effects than do mature animals. The lambs become infested from the older sheep through the medium of the pasture. The symptoms are anemia, loss of flesh, general weakness, dullness, thirst, loss of appetite, and diarrhea. When the fourth stomach of an infested animal is opened and the contents allowed to settle, the parasites may be seen actively wriggling about. They are ½ to 1¼ inches long and about as thick as a pin. The worms in the stomach produce eggs which pass out in the droppings onto the pasture, and, if the season is spring or summer, a tiny worm, nearly one-thirtieth of an inch long, hatches out and crawls up a blade of grass. Uninfested sheep or lambs soon become infested on such pastures. No treatment has been found that will rid the animal of this pest. The best means of combating the parasite is by preventative measures, although no very reliable plan of management has as yet been worked out that really solves the problem. The western rangeman with great areas of pasturage is able to keep his flocks on fresh ground, but on farms this is not easily possible. Hence, western sheep have a great advantage over native sheep for feeding purposes.

At the large markets and in live-stock reports, western sheep are frequently distinguished by the name of the state

in which they are supposed to have been produced or fed, such as "Montanas," "Colorados," "Mexicans," "Idahos," etc. The word "fed" when prefixed to the name of a class indicates that the sheep were fattened on grain rather than on grass alone.

Mutton Sheep.

All sheep and lambs sent to market, no matter what the condition, age, or weight, are classed as mutton sheep if they are suitable for immediate slaughter. They are either

Fig. 42. Prime Lambs.

Grade Shropshire lambs, Grand Champions at the 1913 International. Fed and exhibited by Knollin & Finch of Soda Springs, Idaho.

slaughtered at Chicago packing houses or reshipped to Philadelphia, New York, Baltimore, Washington, Buffalo, and other cities. Only the better grades are shipped. The sub-classes of mutton sheep are lambs, yearlings, wethers, ewes, and bucks and stags.

Lambs.—Of the various sub-classes of mutton sheep, the lamb sub-class is by far the most important, both to the producer and to the consumer. The producer finds the market-

ing of lambs more profitable than the marketing of older animals, while the consumer has developed a strong and increasing preference for lamb. Seventy-five per cent. of the ovine receipts at Chicago are lambs, and the percentage is increasing. Nevertheless, mature mutton sheep will never disappear from the market, because surplus and spent breeding stock will always be available for slaughter. At from 12 to 14 months of age, lambs pass into the yearling or ewe subclasses. No definite age limit can be drawn about the lamb sub-class, for the distinction is based upon the degree of maturity exhibited by the young animal. For this reason native lambs pass out of the sub-class at a younger age than western lambs, because they are better fed and are usually free from Merino blood. The western lamb's slower approach to maturity, due to its breeding and feeding, is something of an advantage, enabling it longer to enjoy the advantage in price that lambs have over older animals. A feeder may buy light western lambs in the late fall and feed them until the following May, at which time they will still be classed as lambs; while native lambs of the same age and similarly managed would be classed as sheep upon their return to market. This makes clear why for several weeks in the year it is necessary to make two separate quotations on lambs, one of which is for those known as "spring lambs," referring to those born in the year the quotations are made, as distinguished from those born the year previous. These separate quotations first appear about May 20, and continue until July 1. After July 1, all animals born in the spring of the previous year are known as yearlings or ewes. The grades of lambs are prime, choice, good, medium, and common or culls. The grade of a lamb depends upon its form, quality, condition, and weight.

Prime lambs.—Only the best lambs, or those that are superior in form, quality, condition, and weight, are graded as prime. They are used to supply the demands of the fancy city market, hotel, and restaurant trade.

1. **Form.**—The buyer demands the form that shows the most development of loin, back, and leg of mutton, these being the regions of high-priced cuts. The lamb should be deep, broad, short of leg, and free from paunchiness. Fullness and

smoothness of outline are important as indications of thickness and evenness in fleshing. A rough, ungainly lamb dresses out low and yields an unattractive carcass.

2. Quality.—The indications of quality are a medium-sized, clean-cut head; fine ears; fine bone; and smooth, well-rounded outlines. These features insure fineness in texture of flesh, increase the dressing percentage, and add to the attractive appearance of the carcass; hence, quality is an important factor in determining price.

3. Fatness and fleshing.—The reasons why a lamb should be fat are: (1) Other things being equal, a fat lamb will dress a higher percentage of carcass than a half-fat or

Fig. 43. Prime Lambs.
Bred and fed by the Iowa State College.

thin lamb; (2) the fat adds to the attractiveness of the carcass, making it more inviting to the purchaser; (3) the fat carcass shrinks less in weight in cooling out in the refrigerator, and the same is true in cooking; (4) some external fat and fat deposited through the lean meat improves the juiciness and flavor of the flesh. The fleshing of the lamb should be deep, even, and firm, yet "springy." Lambs are seldom made too fat, but in the finishing of older animals this is easily possible. The proper degree of fatness is indicated by a thick dock, a mellow purse, thickness and smoothness over the back and ribs, fullness at the neck and flanks, and a plump, well-filled breast.

4. Weight.—The most desirable weight for the prime lamb is 80 pounds. When spring lambs first appear on the

market they weigh little more than 60 pounds, but if they have quality and finish they easily command top prices. During summer months, consumers of mutton desire small cuts, and this gives rise to a strong demand for lambs weighing 65 to 70 pounds. Native lambs showing the best form, quality, and condition, and weighing 100 pounds occasionally sell as prime lambs, although this is exceptional. As a rule, weight is of less importance than quality or condition, but in making selections from the lighter carcasses the average consumer feels more fully assured he is getting lamb and not mutton.

Foreign material and moisture in the wool add to the weight. Should lambs be very wet, buyers may withhold

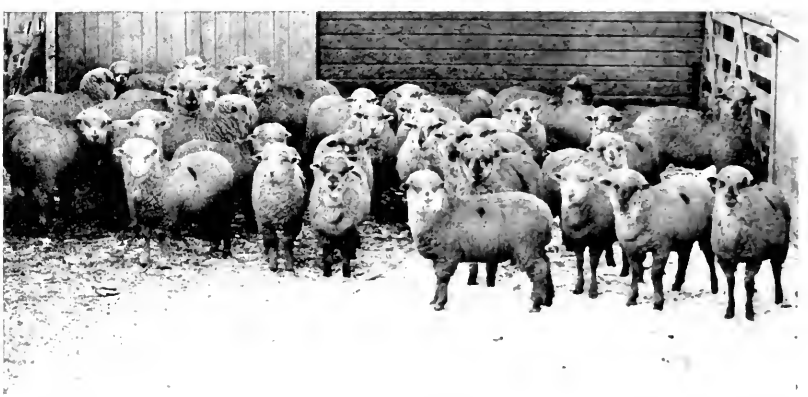


Fig. 44. Choice Fat Western Lambs.

bids until they are more nearly dry, and if bids are made on animals having wet fleeces, the buyer trys to allow for the extra weight in the price he offers. Foreign material, such as mud, sand, or manure, may be lodged in the fleece, and such offerings always command a lower price. It pays to market all sheep in clean condition.

Choice lambs.—This grade includes most of the better lamb offerings upon the Chicago market. Lambs cannot be very deficient in form, quality, fatness, or weight, and grade as choice. Deficiency in quality or in weight frequently accounts for failure to grade as prime, but lack of condition is the most common cause.

Good lambs.—Marked deficiency in form, quality, condition, or weight, or a slight deficiency in each, puts the lamb into the good grade. Lack of quality and lack of condition are the most frequent causes of failure to grade higher than good.

Medium lambs.—Here the form is frequently faulty, and the condition and quality fall far below the standard. Long, narrow, rough lambs much lacking in flesh grade here. They are often paunchy. Western lambs answering to this description classify as feeders unless they are very coarse, hence this grade is mostly filled by native lambs.

Fig. 45. Good Lambs.

Common or cull lambs.—Coarse, ill-shaped, thin lambs grade as common or culls. With one exception they are very light in weight, ranging from 30 to 50 pounds. The exception is found in the case of coarse, "bucky" lambs, the result of too late castration. The development of sex explains their coarseness and heavy weight, as they are heavier than the bulk of common lambs, sometimes weighing as much as 100 pounds. Growers should castrate their ram lambs a few days after they are born. Common lambs are mostly natives. Their lack of flesh is often due to infestation by internal parasites.

Yearlings.—Yearlings are used as a substitute for lambs in the meat trade. The ability to substitute for lamb depends

upon weight, quality, condition, and immaturity; for the nearer the yearling approaches the prime lamb in these respects, the better he fulfills his function. An index greatly depended upon for identifying the carcass of a young sheep, or lamb, is the "break-joint," which was described in Chapter XIV. Yearlings are commonly referred to as "lights" and "heavies," according to weights. Each year there are a number of lambs that for one or more reasons should not be marketed as lambs, and hence the production and marketing of yearlings is economically justifiable. The grades are prime, choice, and good.

Fig. 46. Common or Cull Lambs.

Prime yearlings.—To grade as prime, yearlings must be highly developed in form, quality, and condition, and of a light, handy weight, ranging from 70 to 90 pounds. Correct form in the prime yearling necessitates symmetry, compactness, roundness, and smoothness, with no suggestion of uneven lines or prominent parts. In quality, the requirements are fine, clean-cut features, fine bone, and a smooth form. Sharp discrimination is made by buyers against those not showing a high finish, this being the first essential in prime yearlings.

Choice yearlings.—Yearlings of the choice grade outnumber those grading as prime. A weight of more than 90 pounds is usually alone sufficient to exclude a yearling from the prime

grade. Any noticeable departure from correct form, quality, or condition is sufficient to place a yearling in the choice grade. The difference between prime and choice yearlings is small.

Good yearlings.—When the weight is 110 pounds or more, or when there is marked lack of those qualities sought in the yearling sub-class, the animals grade as good, this being the lowest grade of yearlings. Excepting those that are badly off in form or quality, or both, the good grade of mutton yearlings merges with the yearling feeder sub-class.

Fig. 47. Prime Native Yearlings.
Bred and fed by the Iowa State College.

Wethers.—This sub-class is composed of mature, castrated males. Comparatively few native wethers appear upon the market, this sub-class being chiefly a western product. It is claimed that there are fewer wethers reaching the market each year, and, as the demand for dressed lamb seems destined to increase, the proportionate number of wethers will undoubtedly continue to decrease, especially when transportation lines are further extended through the range districts. At present, the rangeman has a place for wethers if his location is such that the shipment of animals is difficult and expensive, if he has very cheap grazing lands and can produce

his animals at very low cost, or if he has too few breeding sheep to run his ranch at its full capacity. As a mutton product, wethers are used in hotel, restaurant, dining car, and steamship trade, or in any place where the heavier cuts may be advantageously used. The grades of wethers are prime, choice, good, and common.

Ewes.—Yearling ewes, ewes discarded as breeders, and surplus breeding ewes compose this sub-class. Wide differences are therefore noticeable in age, condition, and weight

Fig. 48. Prime Western Yearlings.

of offerings. As a rule, ewes dress out lower and yield proportionately less lean meat that wethers, and hence bring a lower price, the difference ranging from 25 to 50 cents per cwt. The higher grades of ewes are utilized for hotel and restaurant trade, while the lower grades supply the demand for cheap mutton in cities, mining camps, and other places. The grades of ewes are prime, choice, good, medium, and common or culls.

Bucks and stags.—The supply of these is limited and hence they are not graded. This sub-class is of no special importance to the producer of mutton.

Feeder Sheep.

The chief distinction between mutton sheep and feeder sheep is the degree of fatness. Other distinctions are noticeable, however, for a study of the two classes discloses the fact that thinness of flesh is not alone sufficient to gain ready admission to the feeder class. The animal should also be free from extreme coarseness, and should not be much lacking in vitality because of disease or old age. The supply of feeder sheep is greatest during September, October, and November,

Fig. 49. Good Yearlings.

at which time rangemen are thinning their flocks in preparation for winter. However, feeder sheep are taken out of Chicago during the entire year. As previously explained, practically all sheep sold as feeders are those grown on western ranges. The sub-classes of feeder sheep are lambs, yearlings, wethers, and ewes.

Feeder lambs.—Illinois Bulletin No. 129 has the following to say regarding feeder lambs: "Feeder lambs are those thin in flesh left after sorting out those in a band in suitable condition for the mutton trade. A great percentage of the

feeder lambs reaching the markets fall into that class because of certain influences under which they have been placed. It may be that they have had an unequal chance with those in highest condition in the band on account of not being so well nourished by their dams; they may have been born too late to reach that degree of condition, finish, and weight demanded by the packer; or, they may have been held too long at the shipping place on the range or on the road by poor train service without the necessary amount of feed, so that the deterioration in condition placed what would have been mut-

Fig. 50. Common Wethers.

ton lambs in the feeder class." Feeder lambs are graded fancy selected, choice, good, medium, and common or inferior.

Fancy selected feeder lambs.—This grade includes only a relatively small number of lambs, because they must meet not only the requirements for choice feeder lambs, but must also show very good breeding, great uniformity in appearance and markings, and a degree of quality that justifies no adverse criticism. They show slightly more fatness than the general run of feeder lambs, and are heavier, weighing from 65 to 70 pounds. Such lambs are quickly finished into prime lambs.

Choice feeder lambs.—This grade of feeder lambs will develop into choice or prime mutton lambs, provided they are properly managed. The buyer looks for evidences of ability to make economical gains and to reach a high state of finish. Such evidences are manifested in the form, quality, constitution, condition, and weight.

1. **Form.**—The form should be low set, broad, deep, compact, and free from paunchiness. Such a conformation is especially important as an indication of quick maturity and is the form the butcher prizes most in a carcass.

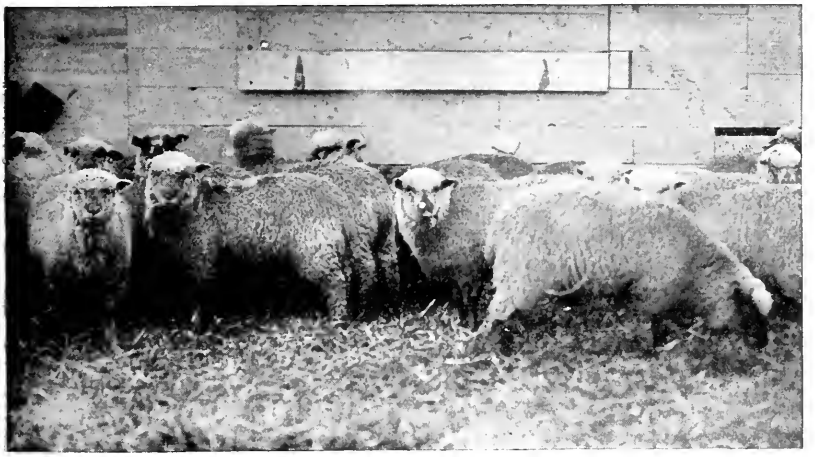


Fig. 51. Fancy Selected Feeder Lambs.

2. **Quality.**—The head should be medium sized and clean-cut, the bone fine, and the skin free from folds or wrinkles.

3. **Constitution and thrift.**—A wide, deep chest and roomy middle are essential to constitutional vigor. Buyers desire a thrifty, active lamb and hence look with disfavor on those that are lame or inactive.

4. **Condition.**—It is not expected that feeder lambs will be fat, yet they should be fairly full in their outlines, and there should be no suggestion of emaciation, as this means a weakened, inactive lamb.

5. **Weight.**—Feeder lambs that grade as choice weigh from 55 to 62 pounds. Those below this range of weight

may be regarded as too young or too much retarded in development to respond to feeding as a choice lamb should. In a normal feeding period of from 90 to 120 days, choice lambs are expected to finish into the weights most desirable on the mutton market; hence, the initial weight cannot be much under 55 pounds.

Good feeder lambs.—These are often somewhat leggy and coarse, yet capable of making satisfactory gains. They average a little light in weight, and are not so high in condition as choice feeder lambs, hence require a longer feeding period

Fig. 52. Good Feeder Lambs.

to finish them. Buyers of this grade feed them all winter and shear before marketing. This grade especially appeals to buyers who take out lambs a few weeks before shearing time to shear and feed for a short period.

Medium feeder lambs.—This grade is deficient in breeding, form, quality, and weight. They are long, leggy, and angular in form, and their wrinkled skins are evidence of much Merino blood.

Common or inferior feeder lambs.—Little, light, late-born, weak lambs grade as common or inferior. The market calls them "bums," "culls," "pewees," and "peanuts." They weigh from 25 to 45 pounds and require five or six months feeding

and careful management to make the feeding profitable. Extremely coarse lambs also grade as common.

Yearling feeders.—This sub-class is composed only of yearling wethers, and, as the mutton yearling should be able to substitute for lamb, quality and weight are of great importance in grading yearling feeders. They are not a prominent feature in the feeder trade, as but few appear on the market. The grades are choice, good, and common.

Feeder wethers.—The supply is very small. The grades are choice, good, medium, and common.

Fig. 53. Common Feeder Lambs.

Feeder ewes.—Most ewes suitable for feeding bring a higher price when sold for breeding purposes, hence the supply of feeder ewes is small. They exhibit considerable variation in condition, quality, and thrift, and are graded choice, good, medium, and common.

Breeding Sheep.

Both native and western ewes are included in this class, but breeding bucks are exclusively natives. Bulletin No. 129 of the Illinois Station has the following to say concerning this class: "The ewes most sought after are two-, three-, and four-year-old dark-faced natives in ordinary field condition. Dark-faced ewes sell better than those that are otherwise

their equals, because their lambs, being dark faced, sell better than light-faced lambs on the eastern markets. Western ewes are very popular for breeding purposes in certain localities, as Ohio, Michigan, and Western New York, and many engaged in the trade think they should be preferred over natives, because they are more hardy and comparatively free from internal parasites. Many of the ewes offered for breeding purposes are yearlings, but they are not as desirable as two- or three-year-old ewes because they are immature and likely to be unsatisfactory at their first lambing. The native yearling is heavier and more nearly mature than the western yearling, and she meets with a correspondingly better sale." Bucks are not graded, but breeding ewes are graded fancy selected, choice, good, and common.

Fancy selected breeding ewes.—This grade of ewes is composed of the few high grades of the middle-wooled breeds, usually grade Shropshires, which reach the market. They must be not only thrifty and sound, but uniform in quality, form, fleece, and style.

Choice breeding ewes.—Most of the desirable breeding ewes found on the market belong to the choice grade. Eligibility to this grade is based upon form, constitution, age, soundness, breeding, quality, and condition. Below, the writer again quotes from Illinois Bulletin No. 129, which bulletin has been followed in preparing this chapter.

1. **Form.**—"The smooth, low-set, symmetrical ewe is preferred over the angular, upstanding ewe with uneven top and lower lines. * * * Choice ewes, unlike fancy selected, do not necessarily have to be of stylish carriage. From the standpoint of breed type, they are often plain about the head, with rather long necks, and long in the coupling to the extent that they could hardly be regarded as compact."

2. **Constitution.**—"Since the breeding ewe is to produce and nourish lambs, it is essential that she be deep and wide in the chest, and that she have a roomy middle, all of which indicates that she has a strong constitution and well-developed assimilative powers."

3. **Age.**—"The most desirable ages are two, three, and four years, and more particularly two and three years. When

breeding ewes go to the country it is the thought of the purchaser that they are to produce, on the average, three crops of lambs before they are sent back to the market as old mutton ewes, hence, if the age is any greater than four years, the ability to produce profitably for three years is very doubtful."

4. **Soundness.**—"Soundness refers to the condition of the mouth and udder. A broken mouth, which means missing teeth or teeth worn down short, indicates advanced age, and although ewes may otherwise look desirable for breeding purposes, they cannot grade as choice if the teeth are not intact. It is necessary that the choice breeding ewe have a sound udder, and it is pronounced sound when it is soft and pliable to the touch, without abnormal development on either side. Any ewe not having a sound udder should be rejected as a breeder, but in the good and common grades some carelessness is exhibited in this respect."

5. **Breeding.**—"The breeding most sought after is some one of the Down breeds, chiefly because of the dark color upon the face and legs. Early in the season of the breeding ewe trade, when Kentucky, Tennessee, and Virginia are taking large numbers of breeding ewes, color has a pronounced influence upon the desirability of a ewe. Of two ewes, one with light markings and the other with dark, but equal in all other respects, the one with dark markings is placed a grade higher than the other. It is also desirable that the breeding of choice ewes be such that they have abundant fleeces of medium wool, which means that the wool be of medium fineness and length, dense, and evenly covering all parts of the body. Since they are to remain in the country for three seasons, the quality and quantity of wool they produce is no inconsiderable item."

6. **Quality.**—"Choice breeding ewes should have smooth, rather refined features, and bone of medium size. Ewes of this grade are used to produce choice and prime lambs for the spring and early summer markets, and without a great deal of general quality, they could scarcely fulfill their mission. It is well to distinguish between good general quality and over-refinement, as delicate, over-refined ewes are without sufficient constitution to be profitable producers."

7. **Condition.**—"While choice breeding ewes should be thrifty and active, fat is not desirable as the purchaser prefers to place these ewes on pasture and cheap forage feeds which will secure the condition desired at a lower cost than the price demanded on the market. Breeding ewes are somewhat like feeder lambs in that they are the result of a sort where those ewes of desirable form, quality, breeding, age, soundness, and thrift, but somewhat lower than mutton condition, are selected out from those that are fatter and desirable for mutton."

Good breeding ewes.—Undesirable markings, age, weight, form, and condition cause breeding ewes to grade as good.

Common breeding ewes.—This grade is characterized by mixed breeding and advanced age. The common grade of breeding ewes merges with the feeder class.

Breeding bucks.—Rams are taken out of the Chicago and other markets for breeding purposes, but most of them are of poor form and mixed breeding. Anyone who has visited the sheep pens at Chicago or at any other large live-stock center will testify that the breeder who goes to the open market to select sires will never succeed in raising the merit of his flock above the level of mediocrity. The practice is unjustifiable and unprofitable.

MISCELLANEOUS.

Hot-house lambs.—These are lambs produced early and marketed before the general run of spring lambs starts to market, which is about May 20. A few shipments reach the Chicago market, where they are called "spring lambs," but the open market is not the best place to dispose of such a product. The men who have made the most profit from the production of hot-house lambs are those who cater directly to the eastern hotel and restaurant trade. The practice is to slaughter the lambs on the farm where they were produced, and pack the carcasses in ice for shipment, small shipments being made regularly during the winter and early spring. They are in most demand from Christmas until Easter. They must be fat and weigh between 40 and 55 pounds.

Export sheep.—Very few sheep have been exported during recent years. The best and heaviest wethers are preferred for export, but heavy ewes, yearlings, and lambs are also taken.

Throw outs.—When bands of lambs reach Chicago, they are at once sorted into the mutton and feeder classes. The buyer of the feeders usually has the privilege of rejecting those not suitable for feeding purposes. Lame lambs, unthrifty ones, ram lambs, large lambs too advanced in age, and black lambs make up the rejections. They are purchased by small city butchers who have a cheap trade. They sell at cull-lamb or medium-lamb prices.

Dead sheep.—Sheep which die in transit are valued chiefly for their wool, and bring 25 cents per head or less. If mangled and badly trampled, they are worthless, and fifty per cent. of dead sheep reach the market in this condition.

Goats.—These are sold for slaughter if they are in good condition, but do not bring as high price as sheep. The supply is limited. Thin goats are often taken to the country to clean up brush land.

Sheep Prices at Chicago.

Chicago prices during 1914.—The lowest and highest prices paid in Chicago on the open market for the various classes of sheep in 1914 were as follows: Native mutton lambs, $5.00-$9.50; western mutton lambs, $5.00-$9.50; spring lambs, $6.00-$14.00; mutton yearlings (natives and westerns), $5.00-$8.00; native mutton sheep, $2.00-$7.00; western mutton sheep, $2.95-$7.20; feeder lambs, $5.15-$7.75; feeder sheep and yearlings, $3.50-$6.40; breeding ewes, $4.00-$6.75.

Market values of the various classes.—The following table gives the yearly range of prices for the market classes and sub-classes of sheep at Chicago from 1905 to 1914, so far as they are available:

Year	Mutton Class						Feeder Class		
	Lambs		Yearlings—natives and westerns	Sheep		Lambs	Sheep and yearlings	Breeding ewes
	Natives	Westerns		Natives	Westerns			
1905	$3 75–$8 25	$4 50–$8 25	$4 90–$7 25	$2 75–$4 50	$2 75–$6 50	$3 75–$7 55	$2 75–$6 60	
1906	4 00– 8 50	4 15– 8 40	5 00– 7 00	3 00– 6 50	3 00– 6 50	4 50– 7 00	2 00– 6 00	$4 00–$6 60
1907	4 80– 8 60	4 00– 8 70	3 50– 8 00	2 00– 7 00	1 25– 7 25	4 25– 8 65	1 25– 7 50	3 40– 7 00
1908	3 00– 7 85	3 50– 8 25	3 25– 7 60	1 50– 7 00	2 00– 7 00	3 50– 7 75	1 50– 5 75	3 25– 5 65
1909	4 00– 8 80	5 00– 9 00	4 35– 8 15	2 00– 6 50	2 50– 6 85	5 00– 7 85	1 50– 5 75	3 50– 6 50
1910	4 00–10 25	4 75–10 25	4 00– 9 00	1 50– 9 00	2 00– 9 30	3 50– 9 85	1 50– 7 75	3 25– 6 10
1911	2 50– 7 50	3 90– 7 55	3 50– 6 00	1 50– 5 25	1 65– 5 60	3 25– 6 40	1 50– 5 00	3 00– 5 00
1912	4 00–10 25	4 60–10 25	4 00– 8 25	2 00– 8 00	2 00– 7 50	4 00– 8 50	2 00– 6 00	3 50– 5 50
1913	4 50– 9 40	5 00– 9 50	4 50– 8 50	2 00– 7 50	2 50– 7 90	5 00– 8 70	2 00– 6 50	3 50– 5 75
1914	5 00– 9 50	5 00– 9 50	5 00– 8 00	2 00– 7 00	2 95– 7 20	5 15– 7 75	2 50– 6 40	4 00– 6 75

The comparative market values of the sub-classes of mutton sheep are shown by the following table, giving the yearly average prices for the several sub-classes from 1905 to 1914, and also the averages for the entire ten-year period:

Year	Lambs		Yearlings	Sheep		All lambs	All sheep
	Natives	Westerns		Natives	Westerns		
1905	$6.75	$6.90	$5.80	$5.00	$5.05	$6.80	$5.00
1906	6.80	6.90	6.00	5.15	5.30	6.85	5.20
1907	6.85	7.10	6.00	5.20	5.25	7.05	5.25
1908	6.20	6.45	5.30	4.60	4.65	6.35	4.65
1909	7.30	7.50	6.00	4.95	5.00	7.40	5.00
1910	7.40	7.65	6.30	5.10	5.35	7.55	5.25
1911	5.70	6.05	4.50	3.80	4.05	5.95	3.95
1912	6.90	7.35	5.65	4.40	4.75	7.20	4.60
1913	7.50	7.85	6.35	5.00	5.30	7.70	5.20
1914	7.75	8.15	6.55	5.35	5.70	8.00	5.55
10-year average	$6.90	$7.20	$5.85	$4.85	$5.05	$7.10	$4.95

The above table shows that western lambs outsell native lambs by 30 cents per cwt., and western sheep outsell native sheep by 20 cents per cwt. All lambs together have averaged $2.15 more per cwt. than all sheep during the ten years from 1905 to 1914 inclusive. Lambs sell $1.25 higher than yearlings, and yearlings outsell sheep by 90 cents. The inability of thin natives to sell for feeding purposes largely explains the difference in prices between native sheep and western sheep in the mutton class.

CHAPTER XVI.

BREEDING FOR THE MARKET.

In colonial times, sheep were all of the coarse-wooled type, brought with the settlers from England and Holland. They were the unimproved original stock from which the present English breeds have sprung. Later, George Washington and other leading agriculturists of the time introduced sheep representing the early breeding improvement in Europe. After the organization of the national government the Merinos made their appearance. Half a century ago, the Merino was the outstanding feature among American sheep. Forty years ago, more than four-fifths of American sheep were Merinos or their grades. There were a few middle-wooled sheep and a very few flocks of the long-wooled breeds in the middle states and in the Ohio valley. The old coarse wools were scattered through the South. Kentucky had the largest number of long wools. Importations were made from England and Canada. In Texas and New Mexico were Mexican sheep of Spanish origin that had degenerated and almost reverted to the wild state. Their fleeces were coarse and hairy and weighed only one or two pounds.

When the first exports of beef were made to England about 1875, the "Scotsman," a Scottish newspaper, sent Mr. James Macdonald to America to investigate the American live-stock industry and render a complete report. The results of this investigation were published by Mr. Macdonald in 1878 in a book entitled, "Food from the Far West." His remarks upon the state of the sheep industry in the United States at that time were as follows:

"No one in political or agricultural circles, or elsewhere, seems so confident of the export of mutton becoming or continuing so extensive or so profitable as that of beef. Mutton is not considered an important article of food in America, and the feeding of sheep has received but very little attention from its farmers. Sheep-farming is certainly carried on very ex-

tensively all over America, especially in the Western States of the Union and on the Pacific slopes; but, with a few exceptions in the older and Eastern States, the sheep-farmer's whole harvest is his "clip" of wool. There is no demand for mutton, and therefore he prepares none. He keeps a class of sheep specially adapted for producing wool, and allows his old sheep to die away naturally, or go where they may—that is, if he cannot dispose of them, even for a mere trifle, before they reach the ripe old age of eight or nine years."

There has been a steady increase since 1860 in the proportionate number of mutton sheep. This has been mostly due to the increased demand for meat, and partly to the demand for wools other than the Merino, that is, combing wools. The flocks of mutton sheep increased in all parts of the country, though Merino improvement was still the predominating feature in sheep husbandry in Vermont, New York, Pennsylvania, Ohio, Michigan, and elsewhere, and the great flocks of the ranges became Merino grades of a high order of merit. In recent years many Merino flocks in the eastern part of the country have been made over into mutton flocks by several succeeding crosses of mutton blood. East of the Mississippi the majority of sheep are of the mutton type, while on western ranges Merino blood predominates.

The sheep census.—The United States Department of Agriculture estimated that on January 1, 1915, there were 49,956,000 sheep and lambs in the United States, and that their average value per head was $4.50. The leading states in numbers of sheep were as follows:

1. Wyoming	4,427,000	6. Oregon	2,563,000
2. Montana	4,379,000	7. California	2,500,000
3. New Mexico	3,340,000	8. Texas	2,114,000
4. Ohio	3,263,000	9. Utah	2,068,000
5. Idaho	3,041,000	10. Michigan	2,033,000

The distribution by geographical divisions was as follows:

North Atlantic	2,075,000
South Atlantic	2,238,000
North Central, East of Mississippi River	8,126,000
North Central, West of Mississippi River	4,879,000
South Central	4,730,000
Far Western	27,908,000
Total United States	49,956,000

The foregoing figures show that the far western division, which includes the range states, has more sheep than all other divisions combined.

Source of improvement.—A certain few men have collected the very choicest purebred and registered mutton sheep that may be had, almost regardless of price, and have established magnificent flocks upon which they have used rams that were selected with great care and at considerable expense. The owner of such a flock makes it his business to supply breeding rams and some breeding ewes to breeders of less prominence than himself. Year after year he slowly improves his flock by careful selection and mating, and he is thus enabled to send out better rams each year to head the flocks of less prominent breeders. In turn, these less prominent flocks supply better breeding animals to more numerous and still less noted breeders, and so the scheme works out, improvement slowly, but surely, flowing downward and outward from a few flocks to the many. There is a third class of breeders who are producing directly for the market. The produce of their flocks is sold to feeders, or else they themselves feed out the lambs for market. We may, therefore, classify all flocks of sheep as follows:

1. A few flocks solely for improvement.
2. Numerous flocks primarily for propagation and secondarily for improvement.
3. Many flocks solely for mutton production.

The breeders of the third class secure their rams from the second-class flocks, and their ewes are generally grades.

The mutton breeding ram.—The selection of the breeding ram should be most carefully made as he affords the chief opportunity for improvement in the flock. For this reason it is wise to invest several times the average value of the ewes in the purchase of a ram to mate with them. However, it is not so much a matter of securing a ram at such or such a price as it is of selecting a sire of merit that is strong in the points wherein the ewe flock is weak, and whose offspring will possess a higher standard of merit than the ewes from which they came. It is a breeding-up process, and this fact justifies more careful selection and greater expenditure of money in

each succeeding purchase of a ram. It is always a matter of locating the sort of ram desired, and the price demanded for him should not stand in the way of a purchase unless it is really exorbitant.

The breeding ram of mutton type must be, first of all, a good mutton animal, including as high development of the form, quality, and fleshing as may be secured. He must, in addition, have a strong, robust constitution as evidenced by a wide, deep chest and middle and good feeding qualities. The story is told of an English shepherd who visited a certain flock to purchase a yearling ram. After much deliberation, he found himself unable to decide among several of the offerings,

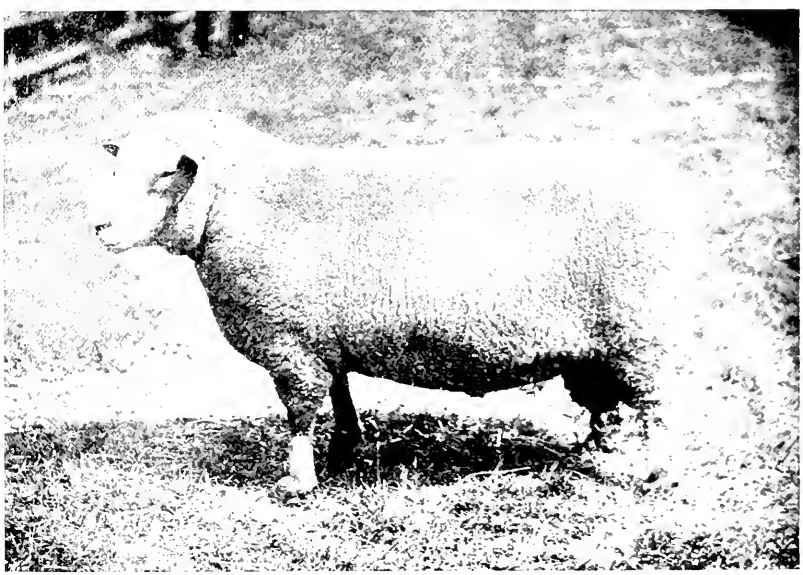


Fig. 54. Correct Type in the Mutton Breeding Ram.
Southdown ram, Babraham Sapper, owned by Mr. C. Adeane, Babraham Hall, Cambridge, England.

all of which suited him. Suddenly his serious expression changed to one of renewed interest, and turning to the owner he said, "Feed 'em." Grain was placed in a trough in full view of the rams, at sight of which one pricked up his ears and marched quickly to the trough, the others following more leisurely. "That's him," said the buyer, pointing to the ram

in front, for in common with all experienced feeders he recognized the significance of good feeding qualities. A strong appetite is evidence of constitution, thrift, lustiness, and health, and indicates a disposition to develop quickly and make economical gains.

The ram should exhibit strong sexual characteristics, these being a strong head with distinctly masculine expression, a well-developed scrag, a sufficiency of bone, and general ruggedness of build throughout. Particular attention should be given to the shape, position, and strength of feet, pasterns, and legs. These points should receive attention in any sheep, but in the breeding ram their importance is magnified. The feet should be well formed, the pasterns strong, the bone ample, and the limbs straight. Weakness in the hind legs is of more consequence than weakness in front, as it injures the breeding usefulness to a greater degree. The hocks should not be bent so as to give the hind leg a sickled appearance as viewed from the side; and when viewed from the rear, the hind legs should not be bowed outward, but placed straight and square beneath the quarters.

The ram's fleece should be heavy and of good quality according to his breed, special attention being given to the wool in case the ewe flock averages below desired standards for fleece.

So far as the fatness of the ram is concerned, greater satisfaction will ordinarily result from the purchase of a ram in medium condition, or what shepherds call a field ram, than one that has been much pampered in preparation for sale or show. The latter may present a more attractive form and appearance at the time of purchase, but must be let down in flesh before he can be used for breeding purposes, and it is often true that with loss of fat there is revealed some rather disappointing points in form. This more often happens when the buyer is a novice and the ram has had the additional advantage of the correcting power of shears in expert hands. In any case, the purchase price of a fitted ram must include the cost of fitting, which may be no inconsiderable amount. It is, of course, a fact that the very choicest rams are highly fitted before being offered for sale, as no flock owner expects to

realize full value for an exceptional ram unless he is presented in finished and fitted form; however, this applies to the best offerings and is somewhat outside of the matter under consideration. When rams are purchased to head ordinary flocks the produce of which are sent to market, it will usually be best to pay up to the limit of price for a field ram that suits, rather than invest the same amount in a fitted sheep.

Only purebred sires should be used on any flock, and the same breed should be patronized each time a ram is purchased; in other words, breeding for the market should not result in a mixture of breeds, but the owner should breed in line, grading up his flock by consecutive crosses of the same breed. Thus will the good features of that breed be so strongly stamped upon the flock as to give it a high average of individual merit and great uniformity.

The mutton breeding ewe.—Assuming that there is an established ewe flock to which additions are made from the best ewe lambs of each year, the problem of the breeder is to weed out the less desirable ewes and send them to the butcher. Herein lies a second advantage from the use of good males, for if the sire proves a successful breeder, the owner is furnished with excellent material with which to replenish his ewe flock, thus permitting closer culling of the aged ewes than would be possible had an inferior ram been used. Hence, the use of a good ram not only results in direct improvement in the first crop of lambs, but there is the added advantage of the indirect improvement which is realized when the best ewe lambs reach breeding age.

It is easiest to cull the flock a short time after shearing, allowing a few days to elapse in order that the ewes may recover from the shabby appearance and somewhat disorganized state common to many of them immediately after being shorn. Aged ewes and broken-mouthed ewes should have been weeded out the previous fall, the cost of wintering them being a needless expense inasmuch as they are difficult to winter without becoming very low in flesh. The wintered ewes may then be sorted two or three weeks after shearing; faulty forms and lack of size are easily detected at that time. It is an easy matter to part with ewes that are aged, broken in mouth, rup-

tured, crippled, or defective in udder, but it sometimes requires strong determination to give up ewes that are sound, but nevertheless unworthy because of faults in conformation, size, fleece, or color. This is especially true when close culling will not leave as large a flock as it is desired to carry, but in the long run it will be best to err on the side of too close culling

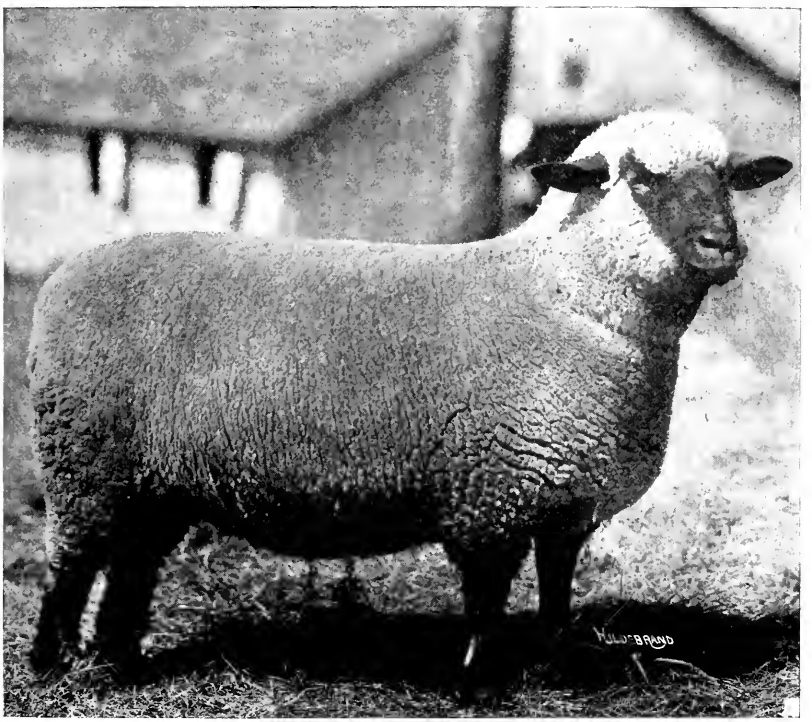


Fig. 55. Correct Type in the Breeding Ewe.

Champion Hampshire ewe at the 1913 International, owned by Mr. A. W. Arnold of Galesville, Wis. This ewe has strength and vigor, combined with femininity and quality. Her dark points are an asset, and her roomy middle and dense fleece are valuable attributes in the breeding ewe.

rather than to carry certain individuals that do not measure up to desired standards. Close scrutiny should be made of heads, necks, breasts, shoulders, backs, ribs, rumps, quarters, and limbs. Form, size, quality, constitution, muscling, and smoothness of outline should receive much consideration, the

requirements for which have been set forth in preceding chapters. One word more, however, on heads and necks, the following being taken from Professor Wrightson's book, "Sheep —Breeds and Management," and is much to the point.

"Nothing looks better than good heads, and, strange as it may seem, a sheep's head, which is only worth 9d. at the butcher's is worth a lot of money when carried on a good ram or ewe. A muscular neck indicates strength of constitution and good muscular development, and I have never known a sheep breeder who did not strongly object to a shabby neck. Mr. Ellman, the father of the Southdown breed, insisted on the importance of this point. Mr. James Rawlence, of Bulbridge, one of the oldest of our noted breeders, would not keep a weak-necked ewe, and no man who values his flock would buy a ram with this fault. The neck ought to be muscular, arched, tapering, and neat."

Uniformity in shape, size, color markings, and appearance in general is a valuable attribute in any flock. When the produce is intended for the open market, this insures a uniform lot of lambs for feeding, and it adds much to the attractiveness of the finished lot when presented to the buyer. The market's preference for dark color markings may well be kept in mind in this connection.

The breeder who aims to supply the open market must emphasize the matter of wool when building up a breeding flock. Although meat production is the principal object in view, the clip of wool from such a flock ought to be an important source of revenue. Furthermore, the ewe with the heavy fleece is better protected from the weather, remains more healthy for that reason, and the density of her fleece keeps it free from dirt, sand, manure, bits of straw, and other foreign matter. Moisture is better excluded and the yolk thus becomes abundant, insuring soundness of fiber and preventing a cotted fleece. Her offspring, being heavily wooled, is less liable to chills which throw the animal out of condition and affect the gains made. In a sense, the heavy fleece is an evidence of strong constitution, so necessary in feeder sheep and lambs. And lastly, the heavy fleece finds an appreciation on the live-stock market. All along the line, therefore, from

breeding flock to packing house, the fleece with density, length of staple, and quality meets with approval and increases the value of the animal it covers.

It is evident that it takes years to build up a flock of much uniform merit and value. It is not a difficult matter to stock a farm with sheep, but whether or not the undertaking will be successful depends very largely upon the wisdom displayed in the culling of ewes, selection of rams, and general management of the flock. In no other kind of live stock does the individuality of the man in charge display itself so strongly as with sheep. With no other kind of stock does the man count

Fig. 56. A Flock of Uniform Type.

Champion Shropshire flock at the 1913 International, owned by A. Broughton & Sons of Albany, Wis.

for so much. A successful sheep breeder is always a man of wisdom, energy, and judgment, a man who emphasizes the importance of little things, because he has seen the cumulative good effects of attention to details manifested in the breeding and management of the animals in his charge.

Although some essential points in flock management have necessarily been touched upon in discussing the elements that constitute a good breeding ram and breeding ewe, nevertheless a detailed discussion of sheep management cannot be presented here, as it would require a great deal of space and is outside the range of the general subject in hand. However, such important subjects as winter management and feeding

of ewes, the age to begin breeding, feeding as a factor in getting ewes in lamb, dipping, management at lambing time, feeding and management of ewes and lambs, docking and castrating, the feeding of lambs, shearing, control of internal parasites, crops to grow for sheep—these and many other subjects relating to sheep feeding and management should be carefully studied by anyone who contemplates entering the sheep business.

CHAPTER XVII.

THE MERINO OR FINE-WOOLED TYPE.

All sheep are wool bearing, but fine-wooled sheep excel in weight and fineness of fleece. This type is the outcome of efforts to develop a sheep capable of producing a fleece of the greatest possible value. Some breeders carried their efforts so far as to ignore the meat-producing qualities of the animals they bred, centering practically all their attention on the fleece. At best, the improvement of any kind of live stock is a difficult and slow undertaking. When improvement is sought in one or a few respects, the desired results are secured more readily and in greater perfection than when an attempt is made to improve the animal in a rather large number of ways. It is still more difficult to improve a breed of live stock along two or more opposing or antagonistic lines, such as beef and milk, mutton and wool, strength and speed, or size and quality. It was for this reason that many breeders of Merino sheep willingly sacrificed the meat-producing qualities of their flocks in order that the production of wool might be made as large as possible. These breeders developed a type of Merino that contrasts with mutton type as strongly as dairy cattle contrast with beef cattle.

Other breeders of fine-wooled sheep did not entirely ignore the mutton qualities of their animals, but placed some emphasis upon a good conformation and a reasonable degree of fleshing; at the same time they gave most attention to the weight and quality of fleece. Efforts of this kind in America resulted in the creation of what is known as the Delaine Merino; in France similar efforts resulted in the breed known as the French Merino or Rambouillet. Thus a type was established having better mutton qualities, a smoother skin, a fleece of greater length and uniformity, and a type that is shorn much more easily because of its freedom from wrinkles. Broadly speaking, however, the differences mentioned in the ideals of breeders of fine-wooled sheep have not resulted in

enough variation in type to prevent a satisfactory study of fine-wooled sheep as a single group or type.

The **general appearance** of the fine-wooled sheep is very distinctive. In a general way, the conformation closely resembles that of the dairy cow. There is the same narrowness of forequarters and moderate width of back and body, the same muscular rather than fleshy covering, and the same tendency to be somewhat rangy of body and long of leg. As compared with the mutton type, there is proportionately more length and narrowness of head, more length and thinness of neck, less arch of rib, and less development of thigh and twist. These differences are marked, so that shorn of their fleeces, the two types of sheep present striking differences in form. When viewed in the wool, further variations are manifest. The fleece of the fine-wooled sheep is more compact and is often very dark in color, the latter being due to the very heavy secretion of yolk which catches dust and dirt and produces a black gum on the exterior of the fleece. The mutton-type sheep has a smooth skin, but the fine-wooled type has a loose skin lying more or less in folds or wrinkles. Sometimes there are only a few folds about the breast and lower border of the neck, while the middle and hindquarters are smooth; but a large class of fine-wooled sheep present a very wrinkled appearance over the entire body. The live weight of rams varies from 125 to 180 pounds, and ewes vary from 90 to 135 pounds.

The **head** should be rather short, medium wide, and well defined or clean-cut in its features. The muzzle should be broad and the nostrils should be large. Rams should have a Roman nose with more width than ewes. The eyes of both sexes should be rather wide apart, large, and clear, and have a quiet expression. The forehead should be somewhat prominent and have a fair degree of width. The ears should be fine, short, covered with silky hair, and actively carried. The horns of the ram frequently interfere with the carriage of the ears. The horns should be placed rather well apart so as to give width and strength to the top of the head. At maturity the horns attain a strong development. They have a corkscrew shape, turning backward from the base, then downward, around forward, and up, making about one and one-half

turns. Wool covers the poll, forehead, upper part of the face, and cheeks, while the ears and lower part of the face are covered with white hair, which should be very soft and fine. The skin about the nose is often wrinkled. The head of the ram should be very masculine as shown by heavy horns, wide poll, Roman profile, and heavy nose, all parts being well developed or massive and the expression resolute. The ewe should have a refined head and a feminine expression.

The **neck** should be moderately short and rather muscular. The neck and shoulders do not blend smoothly as in the mutton type, although extreme angularity or roughness is undesirable. Males should show a heavily muscled neck; a pronounced crest or scrag just behind the poll indicates a strongly sexed animal.

The **shoulders** should be well laid in, and should be muscular. The depth of fleshing is not great enough to give that smoothness of form which characterizes a good mutton-type animal.

The **withers** are often sharp and high, especially in those individuals showing the more extreme development of the type; but a neat, rather rounded conformation with a fair degree of smoothness is more to be desired, especially in rams.

The **breast** should be deep and have moderate width. The absence of heavy fleshing makes impossible the development of any marked degree of plumpness or width, yet a very narrow or peaked breast indicates a cramped chest cavity and lack of strong constitution.

The **chest** gets its capacity from depth more than from width. Extreme narrowness is a serious fault; the fore-rib should arch sufficiently and carry down far enough to provide a roomy chest. The fore flank should be reasonably well filled out. Every type of animal needs a robust constitution, one of the best evidences of which is a large heart-girth, proper allowance being made, when judging, for the thickness of fleshing which covers the forequarters.

The **front legs** are often very crooked at the knees, too close together, and too long. They should be reasonably straight, moderately wide apart, and fairly short. The feet are often poorly formed and rather weak, whereas they should

be well developed and strong. The shanks should be fine and rather short, and the pasterns should be free from weakness.

The **back** and **loin** vary somewhat according to the ideals of breeders. In the very wrinkly Merinos in which the mutton qualities are ignored, the top is noticeably long and narrow, and this may be carried to an undesirable extreme. In the Delaine Merino and Rambouillet, the back is proportionately shorter and wider. In any case the top should be straight from withers to hips, showing a fair degree of width of back and a rather wide, strongly muscled loin.

The **ribs** should be fairly well arched and should show good length in order to provide proper feeding, breeding, and chest capacity. The middle is not very compact, but is moderately long.

The **hips** are somewhat prominent on account of their width and lack of deep fleshing throughout, but ragged hips are undesirable. Much smoothness cannot be expected in a Merino, yet a rather neat, tidy conformation is demanded.

The **rump** is often peaked and drooping, but the best form embodies a rump that is long, level, and medium wide.

The **thighs** and **twist** vary with respect to the class of fine-wooled sheep under consideration. Generally speaking, the thigh should be medium thick, and the muscling between the legs should be sufficient to afford at least a moderate development of the twist.

The **hind legs** should be straight, medium long, fine in the shank, strong in the pastern, and placed somewhat apart. A large percentage of Merino sheep have crooked hind legs, the hocks being close together and the feet too wide apart, or the hocks much bent so as to place the hind feet too far under the body, instead of carrying straight downward from hock to ground. The feet should be well formed and strong.

The **skin** should have a bright pink color, indicating health. Fine-wooled sheep usually show an excellent color of skin superior to the mutton type, this feature being partly due to their thin skins. As already mentioned, the skin is more or less folded or wrinkled. The Merino has not only a thinner skin than the mutton breeds, but it is more richly furnished

with oil glands and secretes a great deal more yolk. Fineness of skin and fineness of wool are correlated characters.

The **quality** of fine-wooled sheep is evidenced by fineness of fleece, fineness of bone, fineness of hair on face and ears, and by a medium-sized, clean-cut head with fine ears.

The **style** of the fine-wooled type is usually rather marked. Merinos have good carriage of head and ear and are quick and active in their movements, walking rapidly and covering ground with more ease and speed than the mutton-type sheep. Their greater activity partly explains their popularity on western ranges where Merino blood forms the basis of most flocks.

The **fleece** of the Merino has a very high degree of fineness, varying, however, in different flocks according to breed and individual. The skin has many more fibers to the square inch than any of the mutton breeds; in other words, the fleece is ordinarily very compact and dense. Density and fineness are outstanding features in a good fine-wooled fleece, the crimp being very fine and regular from skin to tip of fiber. The very finest woolen fabrics are made from this wool. A third striking feature of the Merino fleece as compared with mutton sheep is the large amount of oil or yolk it contains. This gives a generous coating to each fiber so as to preserve its soundness and pliancy. Merino wool commonly undergoes a shrinkage of 65 per cent. in scouring, and this figure is not infrequently exceeded. When the secretion of yolk is very excessive, the fleece is made subject to criticism and the wool buyer makes allowance for the extra weight in the price he offers.

The wool should cover the head in the fashion already described, only the nose and ears being bare. The fleece should cover all of the body and extend down the legs to the feet. The belly and under parts vary a great deal in the covering of wool. It is important that the belly be well wooled, and that the natural bareness occurring at the armpits be as limited in area as possible. The scrotum of the ram should be covered with wool. The wool on the under parts of the animal should be as nearly like the rest of the fleece in density and length as possible. It is usually of superior fineness. A

good Merino flock should average 11 to 15 pounds of unwashed wool.

Classification of fine-wooled sheep.—Breeders of fine-wooled sheep and the managers of the larger sheep shows group or classify Merino sheep into three classes or sub-types, known respectively as A, B, and C. As already pointed out, breeders of Merinos have differed in their ideals for a number of years, and this has resulted in three fairly well-defined classes. The classification is based chiefly on the character

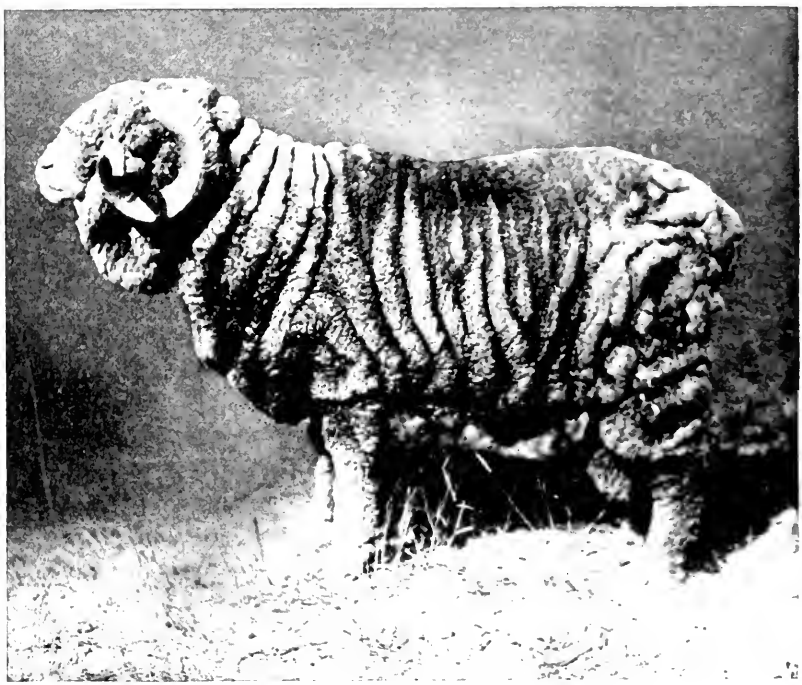


Fig. 57. Class A Merino Ram.

of the fleece, the number and position of the folds or wrinkles, the size and weight of the animal, and the development of mutton qualities.

Class A.—This class is composed of those animals which are most wrinkly and have dense, heavy fleeces. There are heavy folds on the neck, breast, middle, and hindquarters. The fleece is exceedingly dense and fine, and is fully saturated

with a free-flowing, rich-colored, creamy oil. The length of fiber is less than on B and C sheep, measuring from 1½ to 2½ inches. Typical A Merinos have from 44,000 to 52,000 fibers to the square inch of skin, whereas the average mutton sheep has between 4,000 and 6,000. At a public shearing in Middlebury, Vt., in 1882, 54 rams and ewes of this class averaged 23.3 per cent. unwashed fleece to live weight, and instances where 36 per cent. of the original weight of the sheep was fleece have been reported. The ram of this type should weigh about 135 pounds, and the ewe 95 pounds, these being standard weights for sheep out of the fleece. A good ram will shear 28 pounds, and a ewe 19 pounds. These weights for fleeces represent high standards.

The wrinkly skin of the class-A Merino results in considerable variation between the wool on top of the wrinkles and that between. In an investigation of wools made several years ago by the United States Department of Agriculture it was found that the fiber on top of the wrinkles averaged 15.333 crimps per inch, while that between wrinkles averaged 18.143 crimps per inch. The former had an average fineness or diameter of .9751 thousandths of an inch, and the latter averaged .8385 thousandths of an inch. The wool from the tops of the wrinkles also averaged 1.100 inches in length of fiber, and the wool from between the wrinkles averaged 1.1375 inches. These figures show that the wrinkles cause a variation in fineness and length of fiber, the wool between wrinkles being longer and more fine. The form of the class-A Merino is most narrow, rangy, and leggy of the three classes, and mutton qualities are practically wanting. It is entirely a wool proposition, with weight of fleece esteemed above everything else.

Class B.—The class-B Merino is distinguished chiefly by a smoother body with less folds and a fleece with more length and less yolk than the class-A Merino. They have folds on the neck and breast and often at the thighs, and there may be a few less-pronounced folds along the lower part of the sides. The fleece is much longer than the class-A fleece, slightly coarser, more uniform, and a little less dense and oily; in other words, it is a more bulky fleece than that of the A Merino and

worth a little more per pound. Class-B sheep are the largest and heaviest of the three classes. Proportionately, they show more width, compactness, and lowsetness, and there is also a little more natural fleshing and smoothness than is characteristic of class A, but none of these features are so pronounced as in class C. The B type has resulted from efforts to secure as much body weight as possible and still produce a fleece in which weight and bulk are the leading features, with quality

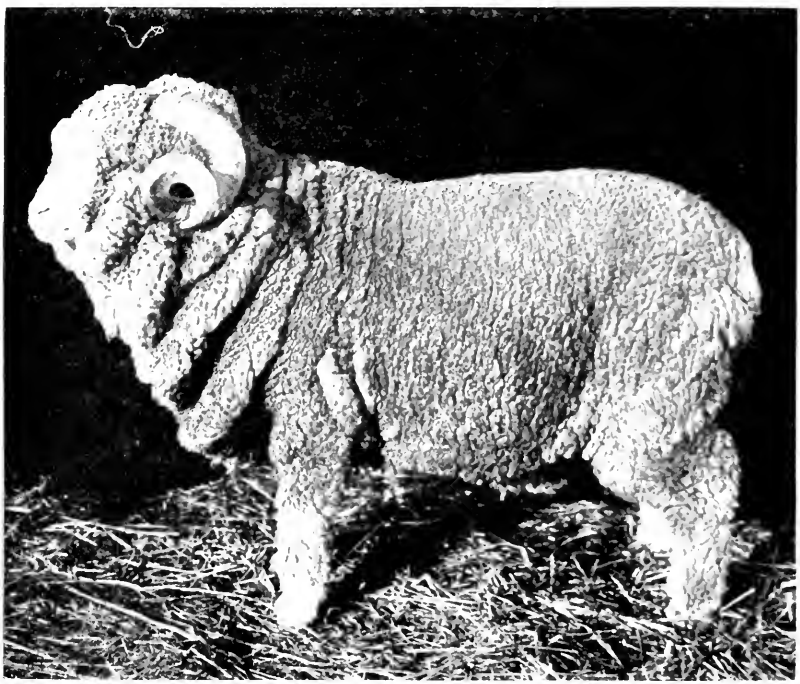


Fig. 58. Class B Merino Ram.

of wool almost disregarded except that the quality be uniform and the fiber fairly well crimped. B-type fleeces measure 2 2/3 to 4 inches in length of staple. The weight of a B-type ram may be 140 pounds or it may reach 200, there being no definitely established standard of weight essential to best results. Ewes weigh between 115 and 135 pounds. A high-class ram will shear 29 pounds, and the ewe 20 pounds.

Class C.—This class is also called the Delaine class. The skin is practically smooth, there being no folds excepting one

large fold, called the "apron," which lies across and below the breast, and there may be also a few light wrinkles below the neck. The shoulders, middle, and hindquarters are smooth. The C-type fleece has a definitely established standard for the character of wool. It should be very fine and have good length of staple, measuring 2¾ to 3¾ inches. There is less density and less fineness than in the A or B fleeces, and also less oil; hence, the Delaine fleece is lightest in weight, yet it sells at

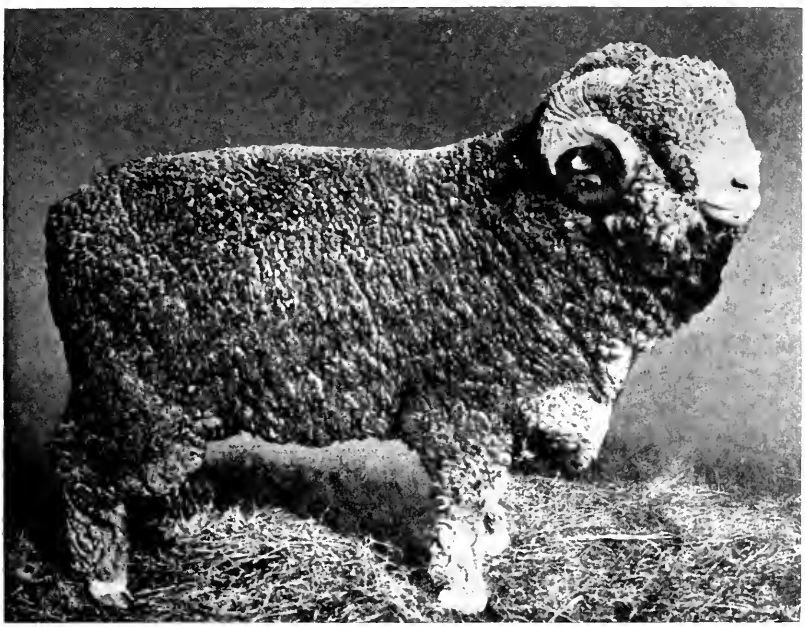


Fig. 59. Class C Merino Ram.

top prices because it is of combing length and has a comparatively small percentage of grease. Breeders of Merinos have found it an impossibility to grow the heaviest fleece on a smooth skin, and have devoted their attention to developing a long, fine fiber, in which field the Delaine Merino has no superior. It is undesirable to run below 130 pounds, fleece off, in the rams, and unsafe to go above 160 pounds when best results are wanted. For ewes the corresponding range in weight is 95 to 118 pounds. A good ram should shear 18 pounds, and the ewe 11 pounds. The Delaine is most wide,

compact, low set, and smooth in outline of the three classes, approaching mutton type more closely than the A and B classes. The covering of flesh over shoulders, back, and loin, and the thickness of thighs and development of twist are sufficient to merit some credit as a meat-producing animal, though not great enough to enable the Delaine to compete with the true mutton breeds as mutton producers.

Origin of the three classes.—Inasmuch as the Spanish Merino was the foundation of the American Merino, the Rambouillet, and of all present fine-wooled flocks in all countries, a word may be said about the introduction of the Spanish Merino into the United States and of the causes that led breeders to diverge somewhat in their ideals, thus resulting in the A, B, and C classes as they are known today. Spanish Merinos were imported into this country in great numbers from 1800 to 1850. For a time these sheep were esteemed merely as wool producers, and there was a strong temptation and tendency to breed for grease in order to give more weight to the wool. But on account of the difficulty of shearing a wrinkly sheep, seconded by a drop in the price of wool, especially wools of short staple, certain breeders in Pennsylvania, West Virginia, and Ohio developed, by selection, a smooth-skinned Merino with better fleshing qualities and greater length of wool, which they called the Delaine Merino. This type produced a longer, less dense wool than the wrinkly Merino, and this wool sold at a higher price per pound. Trouble was experienced, however, in maintaining sufficient density and weight of fleece in the new type, these faults becoming more pronounced in each succeeding generation. Recourse was then made to wrinkly rams which were crossed upon the plain type to correct the faults mentioned. In this way, breeders of Delaines have been able to regulate the fleece and keep it up to the desired standards, although it is unfortunate that the Delaine or class-C Merino will not breed true to type. As already mentioned, the B type originated from attempts to push the body weight to the extreme and at the same time grow a fleece of great density, length, and oil.

The following, written by Mr. S. M. Cleaver, President of the Ohio Association for the Promotion of Purebred Sheep,

and Secretary of the American and Delaine Merino Record Association, is of considerable interest concerning the evolution of the Delaine Merino. Ohio has long held first rank in the breeding of fine-wooled sheep. Mr. Cleaver points out how the state may further improve its reputation for the production of Merinos and wool.

"During the low price of wool in the early nineties, the extremely wrinkly flocks of the country became unpopular, and for the lack of mutton qualities became unprofitable. For this reason a large per cent. of the Spanish flocks of the State drifted their breeding to a plainer type, selecting rams from the Delaine flocks in order to increase the size of the sheep, lengthen the staple, and make it a more practical wool-and-mutton Merino. While this proved to be a valuable move, the old Delaine flocks that had long been bred free from wrinkles were having their troubles by a lack of sufficient weight of fleece for the best results. The union between the wrinkly flocks and the plain sire furnished an excellent opportunity for the Delaine flocks to secure rams of a medium type with only a few wrinkles and with greater density of fleece than could be found in the plain-bred flocks. The increased density from the union between the plain and wrinkly flocks proved to be of great value to the plain breeders in bringing up their weight of fleece, without diminishing the size of the Delaine Merino, and, from such a union the flocks of Ohio are greatly improving in length of staple of a reasonable density, besides increasing the size of the carcass, until the sheep of today average in real merit far above what they did fifteen years ago.

"With proper culling each year we should, during the next ten or fifteen years, bring up the general form of the sheep to better size, better backs, and better quarters, covered with a better fleece of more bulk, more staple, and more quality, avoiding extremes by breeding too wrinkly or breeding too plain. Either is disastrous to the most practical type of Merinos, remembering that the quality of oil has much to do with the quality of fleece and general appearance of the sheep. Ohio's reputation for good wool must be taken care of. This is done by the judgment of the breeder. Too many of our

breeders breed only for pounds instead of real merit in the quality of the fleece. Some of the eastern states do not understand why they can't get the same price for their wool that Ohio does. This question explains itself when fleeces are compared. We can produce a heavy fleece with both quality and staple, and they who fail to do this must abide by results."

CHAPTER XVIII.

WOOLS AND WOOL GROWING.

No animal has a covering entirely of wool; even sheep have hair upon the face and lower parts of the legs. Wool served as a necessary protection to sheep in the wild state, the original home having been in the higher parts of mountainous regions. Wool ranks next to cotton as a source of textile fabrics, the temperate regions universally using woolen products. The per capita consumption of wool has increased very greatly. It was about 3 pounds in early times in the United States when all spinning and weaving was done in the home; in 1850 it was 4 pounds; it is now 8 pounds. No other people use as much wool as do Americans, nor as much cotton. The world's clip of wool averages about 2 pounds for each person.

Growth and structure.—Wool is modified hair. The term hair is ordinarily used to designate a smooth, straight fiber or filament like horse hair. Wool differs from hair in being

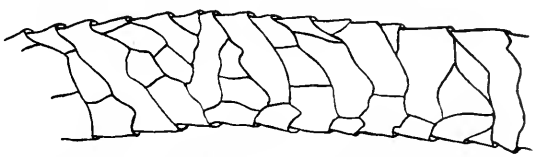


Fig. 60. A Wool Fiber Highly Magnified.

This drawing shows the scaly surface of the wool fiber; the tips of the overlapping scales project outward and point toward the tip of the fiber.

more or less crimped and in having a much more serrated or ridged surface. The surface of the fiber is composed of a single layer of irregular, overlapping scales, forming the wool cuticle, there being from 1200 to 3000 exposed points of these scales to an inch. The scales open or point toward the tip of the fiber, like shingles put on the wrong way. Beneath the covering of scales is the cortex or body of the fiber, made up of greatly elongated cells united into bundles, and in the center of the fiber there is sometimes a cavity or canal which may contain granules of pigment.

Hair and wool are very similar in growth and structure, but wool is crimped, has more scales, the points of the scales are more open or projecting, and the entire fiber is more soft and flexible than hair. These small differences give to wool its special commercial values. Hair will not retain the twisted state given to it in spinning, but the crimp of wool causes the fibers to become entangled, and the minute scales hook together and hold the fibers in position when wool is spun into

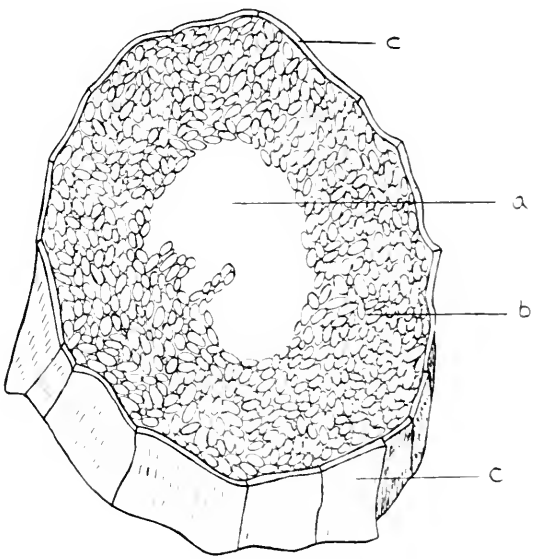


Fig. 61. Cross-Section of a Wool Fiber.

a, Central canal, which is not present in most wools; b, cortex or body of fiber, composed of long, spindle-shaped cells which here appear oval because they are cut transversely; c, wool cuticle, composed of scales. (After McMurtrie.)

yarn. Thus wool has a thread-forming quality which hair has not, preventing slipping and separation of the fibers in the yarn. The entanglement and locking of the fibers is referred to as the felting quality of wool.

The peculiar structure of the wool fiber was first determined by Youatt, a famous English observer and writer. In Merino wool, the scales or projections are very distinct and sharply pointed, and it was by an examination of Merino wool

that Youatt determined the structure of the wool fiber. In the middle-wooled breeds, the scales are less distinct and sharp, and in the long-wooled breeds, they are rounded off and indistinct. In fine Saxon Merino wool, 2720 of these scale ends are found to the inch; in the ordinary Merino there are about 2400; in the Southdown, 2000 to 2080; and in the Leicester, 1850 to 1860. Hence, Saxon Merino wool is superior to all others in felting quality, the others standing in a relation proportional to the figures given.

Fineness of fiber.—Dr. William McMurtrie, who conducted extensive investigations of wools for the United States Department of Agriculture, found the average diameter of the Merino fiber to be 1/1194 of an inch, while the Southdown had an average diameter of 1/865, the Hampshire Down 1/769, the Lincoln 1/685, the Leicester 1/654, the Cotswold 1/605, and the Oxford Down 1/581. In 1860, American Merino fibers with a diameter of 1/1572, and American Saxon Merino fibers measuring 1/1875 of an inch in diameter were exhibited in London, showing the extreme fineness which may be secured in wools.

Secretion and composition of yolk.—Opening into each wool follicle are a couple of sebaceous or oil glands, furnishing a profuse secretion of an oily or fatty material, called the yolk, which is thrown out at the same time the fiber is formed. This secretion consists largely of a soapy matter having a potassium base, together with an animal oil which gives to the yolk its peculiar odor. Yolk, then, is not strictly a grease or oil, but is a soap with an excess of oil. This explains why it dissolves freely in warm water and may be washed almost entirely out of the fleece, why it cleanses and whitens the hands as soap does, and why, when sheep are washed, the hard water of limestone regions does not cleanse the fleece so thoroughly nor cause it to shrink so much in weight as does water containing less alkali. The quantity and fluidity of the yolk vary greatly, being greater when the sheep are healthy and well fed, and varying also according to the breed. The coarsest wools seldom contain less than 20 per cent. of yolk; the Southdown averages 45 to 50 per cent.; and in the finest Merino wools it ranges from 60 to 75 per cent. of the weight,

and has even been known to reach 80 per cent. The yolk maintains the softness and pliancy of the fibers, and protects the scaly surface from injury such as might result from friction of the fibers against one another during the movements of the animal. It also helps to keep the fleece clean and free from a cotted or matted condition.

Woolens and worsteds.—When wool is combed, that is, drawn through metal teeth, the fibers are made to lie parallel to each other, some of the scales and the points of others are broken off, thus decreasing the felting property, and the wool becomes adapted to the manufacture of light fabrics. Wool used for combing must be at least 2½ inches long in order to give the yarn sufficient strength. Such wool is called combing wool. The yarn made from combed wool is called worsted, and the cloths made of it are known as worsted goods. Wools which are short and much crimped and serratured are called clothing or carding wools. They are prepared for spinning by carding machines. The two distinct classes of fabrics thus established are known respectively as worsteds and woolens. It has, however, become common to intermix some long or combing wool in cloths proper; while in the making of worsted fabrics a varying proportion of cotton is very often combined. Shoddy, obtained by tearing up woolen rags by machinery, now enters into the composition of all except the very finest woolen cloths, having been first used about eighty-five years ago.

The difference between woolens and worsteds is largely due to the way the yarn for each is spun. In worsted yarn the fibers are arranged as parallel as possible by the combing process; in woolen yarn they are crossed in every direction so as to assist the felting or milling of the cloth. Yarn for woolen cloth is very slightly twisted, so as to leave the fibers as free as possible for the felting process; worsted yarn, on the contrary, is hard spun and made into a much stronger thread. By the process of manufacture, woolens are felted so as to leave no appearance of the thread, while in worsteds the threads are plainly evident.

Classification of wools.—Many classifications of wools are in use. The classes and grades vary in number and name on

different wool markets and in different market reports, resulting in considerable confusion in the minds of many persons who read wool quotations.

Clipped wools and pulled wools.—The first distinction made in wools is to divide them into fleece or clipped wools and pulled wools. The former are the ordinary clipped wools coming to market in separate fleeces. These are the more valuable and constitute by far the greater portion of the wool of commerce. Pulled wools are those derived from the pelts of slaughtered sheep in the manner described later on. They are marketed in 500-pound bales. Pulled wools constitute about one-seventh of all the wool produced in the United States.

Clothing, combing, and carpet wools.—Clothing wools are short wools and combing wools are long wools, any staple with a length of 2½ inches or more being suitable for combing. Clothing wools are also those possessing the felting quality to high degree, thus adapting them to the making of cloths, hat bodies, and other similar products. Combing wools are poor in felting quality, permitting their manufacture into such open fabrics as flannels and hosiery. As a rule, the short-stapled fleece wools only are made into cloths, while worsteds are made from both long fleece wools and pulled wools. Carpet wools are the product of neglected flocks and lack of attention to breeding. They are inferior wools. Some can be used for coarse flannels and cheap cloths, but most of it goes into carpets. It sells at a low price, costing the manufacturer an average of 10 cents per pound, and some of it not more than 7 cents.

Classification based on condition of wool. — Wools are classed according to their condition into the following grades: 1. Domestic wool, which is clean, bright, and produced under the best domesticated conditions. 2. Territory wool, which is dirty and discolored, produced under range or inferior farm conditions. 3. Blanket wool. 4. Carpet wool. The last two sorts belong to the same general class, being the poorest kind of wool, containing kemp or dead fibers, so as not to dye readily. Domestic wools are subdivided into two groups

or sub-classes, known as "bright" and "semi-bright," depending on the whiteness and luster of the fiber. Bright wool is produced in Ohio, Pennsylvania, Michigan, West Virginia, Kentucky, Missouri, Southern Illinois, and Southern Iowa. Semi-bright wool comes from Iowa, Nebraska, Minnesota, and Wisconsin. The best bright wools are those known as "Ohio" wools, produced not only in Ohio, but in Western Pennsylvania, Kentucky, West Virgina, and Southern Michigan. Ohio wool is famous for cleanliness and general quality and always commands a premium on the market.

The most commonly used classification is one which first divides wools into clothing and combing classes, and then subdivides clothing wools into Picklock, XXX, XX, X, No. 1, No. 2, No. 3, and No. 4 grades according to length and fineness. Picklock is an extremely fine fiber, of which very little is found, being produced by a few remaining flocks of Saxon Merinos in Western Pennsylvania and elsewhere. There is also very little of the XXX grade, which ranks just below Picklock in fineness. The bulk of high-grade clothing wool is of XX and X grades. No. 1 and No. 2 represent grades inferior to the foregoing. Very little clothing wool grades as low as No. 3 or No. 4. The combing wools are of two sorts. Formerly they were exclusively from the English mutton breeds, or at least were not of Merino origin. But on account of lack of supply of true combing wools, the combing of the longer Merino carding or felting wools was taken up. This made necessary a fiber longer than 2½ inches; such Merino wool is called "delaine," and the sheep which have been selected and bred to produce this long, fine staple are known as Delaine Merinos, of which there are several families. French breeders of sheep, working along similar lines with a similar object in view, developed the Rambouillet from the Spanish Merino. This Merino division of combing wools is graded into fine delaine, medium delaine, and low delaine. The first includes the finest of long-staple Merino wools, the second not quite so fine, and the third comprises wool of combing length and a little finer than the combing wool of the mutton breeds. The wool of the mutton breeds is classed as one-half blood, three-eighths blood, one-fourth blood, common, and braid, the

last being the long, lustrous wools of coarse-wooled sheep. Such terms as "one-half blood," "three-eighths blood," and "one-fourth blood" or "quarter blood" seem to indicate a knowledge of the breeding of the sheep that produced the wool, although such is very rarely the case so far as wool in the hands of wool merchants is concerned. Theoretically, at least, the term "one-half blood" is applied to such wool as is ordinarily produced by a sheep possessing 50 per cent. of Merino ancestry, while the three-eighths and one-quarter blood wools resemble the product of sheep having 37.5 per cent. and 25 per cent. of Merino breeding respectively. However, some of the mutton breeds produce three-eighths and quarter-blood wool. In outline, the classification of wools is as follows:

- CLOTHING WOOLS
  - Picklock
  - XXX
  - XX
  - X
  - No. 1
  - No. 2
  - No. 3
  - No. 4
- COMBING WOOLS
  - Merino
    - Fine delaine
    - Medium delaine
    - Low delaine
  - Other than Merino
    - ½ blood
    - ⅜ blood
    - ¼ blood
    - Common
    - Braid

The grading of wool in the wool houses is done by expert graders who know wools so well that at a glance they can determine the grade to which the wool belongs and the kind of material into which the wool will be made. The larger per cent. of these wool graders may never have seen a sheep in fleece, neither do they know the breeds of sheep and the characteristic fleeces. Hence, the wool grade does not depend upon the breed of sheep, and the wool from different individuals of the same flock and breed may be graded differently.

Wool pulling.—Wool pulleries may be divided into two groups—those owned by packers and forming a part of the by-products division of packing plants, and those owned and operated independent of packing establishments. The wool pullery of a packing plant receives pelts daily, direct from the killing floor. They are at once placed in vats of cold water, which takes out all of the animal heat and removes some of the dirt and blood. The soaking continues from 12 to 24 hours. Packing plants not equipped with pulleries salt their pelts, and when a quantity has accumulated send them to a

pullery. Salted pelts are soaked 36 hours, as it requires considerable time to dissolve the salt out of the hide. When removed from the vats, the pelts are given mechanical treatment in a scrubbing machine which washes them in a spray of water, completing the removal of dirt, and leaving the fleece in an attractive, white condition. The wet pelts are then put in a centrifugal wringer which throws out the water to such an extent that the fleece is made very nearly dry. The pelts are next taken to a room where they are spread, fleece downward, upon wire screens and painted on the inner surface with a thick liquid bearing the trade name of "Depilatory," consisting of a mixture of sodium sulphide and slaked lime. Within 2 to 4 hours after this treatment the wool fibers become loosened and easily part from the hide, coming out by the roots when pulled.

Before pulling, however, the pelts are taken to large rooms where they are spread out on the floor, fleece upwards, being grouped or classified according to the nature of the fleece. The pelts are then taken up and the wool pulled by hand. Coincident with the pulling the operator sorts the wool. The wool from the back and shoulders is put into one receptacle, that from the sides and belly, called "skirts," into another, wool from thighs and shanks into another, and painted wool into still another. The operator also separates out wool that contains much sand, manure, or grease, called "shrinkage;" also wool of different colors. Thus the wool pullery not only classifies and grades the fleeces, but it also sorts the wool as pulled. Furthermore, the pullery keeps each month's product by itself, thus multiplying the assortments by twelve, and resulting finally in over two hundred kinds of pulled wool, each having a distinct trade name.

Wool pulleries report a strong demand from wool manufacturers for black wool which is used to produce various shades of natural gray by mixing it with white wool. For example, the manufacture of army blankets creates a demand for black wool, because a natural gray coloring is required by the government contracts. Black wool thus sells at a premium, for the supply is small. Pelts that vary in color through

various shades of gray and brown are not in the class of black pelts because the varying color makes them an unknown quantity in color mixing where definite results are wanted.

The growth of wool must be at least three-fourths of an inch before it may be profitably pulled. Some pelts are not pulled, no matter how long the fleece may be, because the wool is not salable, or not valuable enough to pay for pulling.

Scouring.—If the grease wool comes to the scouring plant in bales, it is first put through a shredding machine which loosens it. This machine is equipped with a blower for the removal of dust, and a screen for the removal of heavy dirt. Scouring is accomplished by passing the wool through a series of four bowls or vats, each containing a different liquor. These liquors are composed as follows:

Bowl No. 1—Mild alkaline solution, preferably potassium; temperature 130 degrees Fahrenheit.

Bowl No. 2—Same alkaline solution as first bowl, plus soap; should be a potash soap; temperature 120 degrees.

Bowl No. 3—Soap solution only; temperature 110 degrees.

Bowl No. 4—Luke warm water.

Nearly all the yolk or grease is removed from the wool in the first bowl. This is done by the saponification of the oil, the soap readily dissolving in the warm liquid. The action of the soap in the second and third bowls is to whiten the wool and give it "life" which it loses in bowl No. 1. After rinsing in the fourth bowl, the wool is passed through a steam dryer.

During treatment in the bowls, a mechanical device keeps the wool moving slowly, for if it is moved rapidly through the liquids it forms a ropy mass. The yolk forms an emulsion in the bowls and may be recovered by chemical processes. It is known as "lanolin," and is much used in salves and ointments. Clipped wools shrink as much as 65 per cent. or more in scouring, while pulled wools shrink about 27 per cent. on the average. Often, pulled wools shrink only 10 per cent. The difference is due to the very thorough washing given to pelts before pulling.

American wools and wool growing.—America is one of four great wool-manufacturing countries, the others being Great Britain, France, and Germany. American sheep are said to have no superior in constitutional vigor and strength of wool fiber. The average weight of fleece of American sheep has shown much improvement. In 1840 it was only 1.9 pounds; in 1850 it was 2.4 pounds; in 1860 it was 2.7 pounds; in 1870 it was 3.5 pounds; in 1880 it was 4.4 pounds; in 1890 it was 4.8 pounds; in 1900 it was 6 pounds; in 1910 it was 6.7 pounds; in 1914 it was 6.8 pounds. The increase in the annual wool clip since 1840 is shown by the following figures:

1840	35,802,114 pounds
1850	52,516,959 pounds
1860	60,264,913 pounds
1870	162,000,000 pounds
1880	232,500,000 pounds
1890	276,000,000 pounds
1900	288,636,621 pounds
1910	336,896,903 pounds
1914	247,192,000 pounds

According to the estimates of the National Association of Wool Manufacturers, the leading states in number of sheep, average weight of fleece, and pounds of wool produced during 1914 were as follows:

	States	Number of fleeces	Average weight of fleece	Wool product, raw	Per cent. of shrinkage	Scoured wool
			Lbs.	Lbs.		
1	Montana	3,869,000	7.8	30,177,000	63	11,165,490
2	Wyoming	3,560,000	8.0	28,476,000	67	9,397,080
3	Ohio	2,098,000	6.6	13,844,000	52	6,645,120
4	New Mexico	3,233,000	5.9	19,077,000	66	6,486,180
5	Idaho	1,896,000	7.8	14,792,000	62	5,620,960
6	Oregon	1,970,000	8.0	15,763,000	67	5,201,790
7	Utah	1,770,000	7.4	13,100,000	62	4,978,000
8	California	1,852,000	6.2	11,480,000	65	4,100,800
9	Michigan	1,191,000	6.8	8,098,000	50	4,049,000
10	Missouri	1,071,000	6.7	7,179,000	45	3,948,450

This table brings out some important distinctions in wools. The figures for shrink are interesting; the western states exceed the eastern states by 10 to 22 per cent., due to the greater percentage of Merino blood in range flocks and hence a more greasy wool with a greater shrink. The introduction of mutton sheep into the cornbelt has decreased the average weight

of fleece, but has improved the shrinkage. The entire clip of the United States is estimated to shrink 60 per cent. Wool buyers fix the price on a scoured basis, this being the fairest method of dealing and also the fairest basis on which to compare production by states. Montana has the most sheep, and Delaware the fewest. Washington, Oregon, and Wyoming have the highest average weight of fleece, which is 8 pounds, and Georgia is lowest with 2.8 pounds. Virginia has the lowest per cent. of shrinkage, which is 36 per cent., and Washington with 68 per cent. has the most.

Imports and exports of wool.—During the fiscal year, 1913-'14, the United States imported 195,293,255 pounds of wool value at $35,579,823. The average value per pound would thus be 18.1 cents. We export less than 100,000 pounds of wool annually. American wool growers produce slightly more than one-half of the wool used by American wool manufacturers. Australia is the largest exporter of wool, the figure for the calendar year, 1912, being 693,496,000 pounds; Argentina ranked second with 363,680,000 pounds; South Africa was third with 185,471,000 pounds; and New Zealand was fourth with 175,982,000 pounds. The four countries mentioned furnish over three-fifths of the exports of the world. France was the largest importer in 1912, with 579,624,000 pounds; Great Britain ranked second with 555,161,000 pounds; Germany was third with 523,655,000 pounds; Belgium was fourth with 345,758,000 pounds; and the United States was fifth with 238,118,000 pounds. These five countries annually consume over four-fifths of the total imports of the world.

Principal American wool markets.—The principal wool markets in the United States are Boston, Chicago, Philadelphia, St. Louis, and New York. During the past few years Boston has handled nearly 75 per cent. of the total wool crop of this country, and nearly 60 per cent. of the foreign wool shipped into this country. Recently Chicago has come forward as a great wool center, although the part that Chicago plays is largely in the storage of wool, rather than in manufacture. Wool is purchased from the producer by different methods depending upon the size of the clip. In sections where wool is not extensively grown, the country wool buyer takes the

whole clip of the neighborhood regardless of quality or cleanliness. In some sections a wool merchant, or his representative capable of grading wool, will advertise that he will buy at a certain place and at a certain price, depending upon quality, cleanliness, and grade. In such instances the farmer will receive a price according to what is deserved. Then again, wool may be shipped to commission firms and stored and sold for a certain commission charge, including the expense of sale and storage. Again, large wool producers may sell direct to the wool merchant. Quite a number of localities in the West arrange wool sales on three or four dates during the season, the wool being examined by buyers representing various wool merchants. Bids are made and the producer accepts or rejects the bids as he thinks best. This scheme brings the producer and consumer into close relationship which is mutually beneficial, and to some extent the producer benefits by the competition among the buyers.

Marketing wool properly.—Poor methods of sheep husbandry annually result in the loss of many thousands of dollars to wool growers. Neglect of flocks in winter, filthy conditions of keep, carelessness in handling, weedy pastures, the use of oil paint or tar to mark sheep, failure to separate the tags when the sheep are shorn, and improper tying of fleeces are factors which greatly lessen the returns to wool producers. Ohio and contiguous territory has long enjoyed a reputation for marketing cleaner wool of much better general quality than the average run of American wools. Yet in Ohio there is much room for improvement in the production and marketing of wool. The loss is large because of the presence in fleeces of seeds, burs, dust, chaff, sand, manure, and other foreign material, and because unnecessary quantities of unreasonably large twine are used, or because a kind of twine is used that injures the cloth made from the wool. The use of binder twine is objected to by wool manufacturers because the fibers of the twine become mixed with the wool and blemish the fabrics made from it. Often there is enough twine around one fleece to tie a half-dozen or more fleeces. Even baling wire has been used in some instances. There has recently been put on the market a small, light twine of twisted paper, especially in-

tended for the use of wool growers. If wool buyers would make more discrimination against fleeces improperly handled and tied, and show more appreciation in the price they offer for clean fleeces properly tied, reform would come more quickly. Recently the writer has noticed the following statement appearing regularly in one daily wool market report:—"Wool tied with sisal or binder twine or undue amount of other twine will be classed as unmerchantable." This is surely a step in the right direction. Neatness and honesty constitute the wisest and best policy, especially if the wool grower is to engage permanently in the business.

PART THREE.

SWINE.

INTRODUCTION.

Swine are useful as a source of meat and lard. Some swine produce meat only, and some produce lard as well as meat. Differences in the demands of consumers of pork, together with differences in the kinds of feed available for pork production, have resulted in the establishment of two distinct types of swine—lard type and bacon type. The lard hog is an American production found chiefly in the cornbelt states where corn is the principal feed for all farm animals. Corn is a great fattening food, and when fed to hogs it is converted into fat from which lard is made. Breeders have therefore developed a type of hog specially adapted to converting feed, principally corn, into fat, although the butcher or packer values this type for meat production as well as for lard.

The bacon hog is also found in America, principally in Canada, however, which is outside the cornbelt. In Canada the feeds available for pork production are peas, barley, wheat, oats, rye, skim milk, and roots. As compared with corn, these feeds are not fattening; they are muscle builders, and hogs produced with such feeds take on but little fat and are not useful as a source of lard. Canadians have made no effort to compete with the hogs of the cornbelt; instead they produce a hog suitable for the English and Canadian trade—a hog whose entire carcass may be cut up into bacon.

From what has been said it may appear that there is no real hereditary difference in the temperaments and make-ups of the two types of hogs, but that the differences between them are solely the result of differences in the feeds upon which they are produced. This is largely true, yet it is a fact that when pigs of the bacon type are brought into the cornbelt and fed along with lard hogs, they never entirely lose the

bacon type; and when the lard hog is taken into a bacon-producing section and fed with bacon hogs, there is the same degree of change, but the lard hog does not lose his identity under such a system of feeding. Therefore we must conclude that there is something besides the difference in the feeds which accounts for the two distinct types; in other words, there is an hereditary difference between the two kinds of swine.

These facts in regard to swine are no more unique than the results of efforts by some men to produce milk from beef cattle, or beef from dairy cattle, or mutton from fine-wooled sheep. In such instances, we find dairy-bred steers tending toward the form of the beef animal, we find beef cattle taking on somewhat the appearance of the dairy animal, and we find that the Merino approaches nearer to mutton type. Wise selection and breeding and the establishment of definite types of animals suitable to special purposes cannot accomplish the desired ends unaided. The feeding and care must receive as much attention as the breeding. No matter how well bred an animal may be, and no matter how great may be its tendency to conform to a given type, it must enjoy a favorable environment before its inherited good qualities can fully assert themselves and thereby enable the animal to fulfill its mission.

In America the lard type of swine is represented by the Poland-China, Duroc-Jersey, Chester White, Berkshire, and Hampshire breeds. The bacon type includes two breeds, the Yorkshire and Tamworth. The Berkshire and Hampshire do not possess true fat or lard type, but occupy a position about midway between the bacon and lard types, being general-purpose breeds.

CHAPTER XIX.

THE AMERICAN OR LARD-TYPE HOG.

The United States has created comparatively few of the breeds now found within her borders. By the time this country reached that stage in her live-stock development when improvement in domestic animals became imperative, European nations had met and solved a similar problem by the creation of numerous useful breeds. It was but natural, therefore, that many of these foreign breeds were imported to this country, and it was fortunate indeed that most of them proved fully capable of fulfilling the requirements of our stock growers. We were thus afforded an easy short cut across what would have been a long, laborious period in the development of our live-stock industry. We borrowed whenever such procedure was practicable, and the fact that we have never found it really necessary to create a breed of draft or carriage horses, beef, dairy, or dual-purpose cattle, mutton sheep, or bacon hogs shows how great is our indebtedness to the breeders of Europe.

Our needs were not entirely met, however, for we have created a breed of trotting horses, a breed of saddle horses, a breed of fine-wooled sheep, and a number of breeds of lard-type swine. We have also found it necessary to modify slightly some of the breeds we have adopted, and to our credit it may be said that we have made certain changes in some of these adopted breeds which, as viewed from the standpoint of American conditions and requirements, represent decided improvements. The Polled Durham, the Polled Hereford, the "American-type" Hereford, and the "American-type" Berkshire are examples of such modifications.

The extended patronage which we have given to foreign stock and the lack of necessity for developing breeds of our own, while highly advantageous, has tended to dim our own glory as a breeding nation. If, because of this fact, our live-stock industry needs a redeeming feature, it is furnished by

the creation of a distinctly American type of hog, which includes several breeds. European breeds of swine proved so fully incompetent to make pork under American conditions that our breeders found it necessary to create distinctly new breeds of a new type, and this work has been so well done as to give us a clear title to the distinction of leading the world in swine breeding and in pork production.

Our conditions demand a type of swine possessing a moderate degree of compactness of form, great breadth of back, much fullness of ham, medium shortness of leg, rapid and heavy fattening qualities, and quickness of maturity. Such a type has been developed and maintained by American swine breeders. On account of its heavy and easy fattening qualities, it is commonly referred to as the lard-type hog. Its ability to assimilate the carbohydrates of corn and build up a valuable fat from which lard is made has played no small part in the rapid development of American agriculture and in the prosperity of our farmers. "King Corn and the American Hog" have always constituted an invincible combination, creating a channel of disposal for the former in the early days when there was a great surplus of that food stuff, and supplying the people of this country with highly palatable and nutritious meat at a moderate price.

The **general appearance** of the lard-type hog embodies a broad, deep, fairly compact, and rather short-legged conformation, together with great smoothness. Both the head and neck are short and wide, the top is very broad and slightly arched, the sides are deep, and the hams are massive. As viewed from the side the lard-type hog shows great depth of body, moderate length, a slightly arched top line from head to tail, and a straight underline that tends to be rather close to the ground. He should be as deep in front as behind, in other words, symmetrical. When viewed from behind, the hams show great breadth or thickness, not only at the top but also at the lower part about the hocks. When a view is taken directly down upon the top of the hog, he should exhibit great width at all points along the top from shoulders to tail. The shoulders should not be wider than the rest of the hog, nor should the hog taper in width from front to rear, but be uni-

formly very wide from one end to the other, thus presenting a balanced or symmetrical conformation and increasing the value of the carcass. Much quality should be shown in head, ear, coat, skin, smoothness of form, and fineness and smoothness of bone and joints. This type is disposed to be mild and quiet in disposition, but a sluggish, inactive hog is an objectionable extreme.

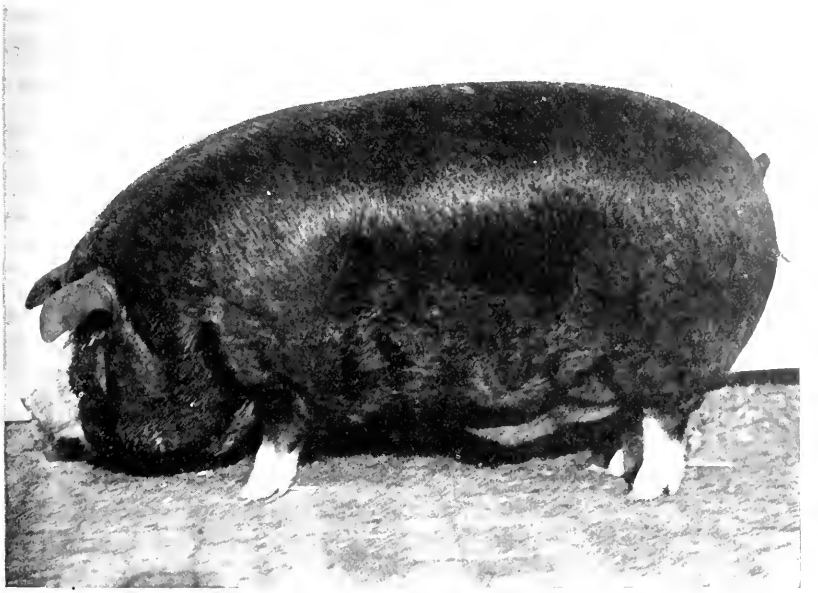


Fig. 62. Correct Type in the Lard Hog.

Poland-China barrow, Grand Champion at the 1913 International. Bred and exhibited by John Francis & Sons of New Lenox, Ill. Lengthy, deep, symmetrical, and smooth. This hog has remarkable quality in head, ear, hair, and bone. His legs are short and his pasterns strong.

The **head** is of medium size, rather short, broad between the eyes, and short of snout. A narrow head and finely pointed snout are indications of a poor feeder. The shape and length of head vary according to the breed, but in none of the lard breeds is much length or narrowness desirable. The eyes should be as large, prominent, and clear as possible, a small, sunken eye obscured by rolls of fat around the socket being objectionable. The carriage of the ear varies according to

the breed, being erect in some and drooping or broken in others. All the breeds, however, should have a fine and rather small ear neatly attached to the head. The jowl should be well developed or full, and should extend back into the shoulder. It should not be loose and flabby, but rather trim and firm. The cheeks and jowl should be free from wrinkles or seams. The poll of the head should be broad and carry forward prominently.

The **neck** should be short and wide, and blend smoothly with the shoulder. The neck should be especially broad on top, and it should be deep. A neck that is narrow or peaked on top and rather long is not often associated with a body of the desired conformation.

The **shoulders** are very frequently too open and prominent, so that as one looks down at the top of the hog the shoulders are found to be much the widest part of the animal. They should be well laid in, very smooth, and have no greater width than the rest of the body, such a hog being much more desirable from a market and carcass point of view. The skin over the shoulders of mature boars is thicker and heavier than on sows or barrows. This character is called the shields, and was a highly useful feature in the wild boar as a protection in fighting. The wild boar has transmitted this character in greater or less degree to his domesticated descendants. In some instances the thickening and hardening of the skin is so great as to produce pronounced callouses, and these are objectionable. A smooth shoulder is desired in the boar as well as in the sow and barrow. The tops of the shoulders should not stand open and apart, but should be laid together and thickly fleshed so as to present a broad, smooth surface in harmony with the rest of the top.

The **front legs** should be medium short or short, this being a somewhat variable feature depending on the breed, and they must also be straight. It is especially important that the pasterns shall be short, upright, and very strong, and that the toes shall be strong also. These points should be particularly emphasized in judging breeding animals, for it is a fact that weak, broken-down pasterns and weak, spreading toes are among the most common and most serious faults to be found

in swine of the lard type. The bone of the market hog should be fine, yet sufficient to carry the weight of the hog. Refinement of bone is pleasing to the butcher because it is associated with general refinement of the entire animal, thus insuring a clean-cut carcass of quality, and a smaller percentage of waste in dressing. The breeding boar should stand on large, strong bone, this being one evidence of masculinity, but extremely large, rough bone, covered with a thick, puffy skin is undesirable, indicating coarseness. The breeding sow should show greater refinement of bone than the boar, her somewhat smaller, smoother shanks being an indication of that refinement which should characterize the female. However, refinement is often carried to the extreme in the sow, whereas the bone should be amply sufficient to sustain not only her weight but also the added weight imposed by pregnancy and large litters. Fine shank bones are not objectionable because they are liable to be fractured by the weight of the sow, but because extremely fine bone is associated with small, weak tendons and ligaments which permit the pastern to drop down and the toes to spread apart, thus making the legs weak and greatly injuring the usefulness of the animal. Weak legs may be due to a natural or inherited weakness, or to improper feeding during the growing period. If growing pigs are fed on corn exclusively, they are liable to develop weakness of the legs, because corn does not carry sufficient bone- and muscle-building constituents to satisfy the demands of the animal during the growing period.

The **chest** is an evidence of the constitutional vigor possessed by the animal. It should be wide and deep, filling out behind the shoulders and elbows and affording a large heart-girth. The underline should not cut up between the fore legs, but carry straight forward so as to give as much depth through the chest as through the middle of the body.

The **back** and **loin** of the lard hog are very important parts. They should be medium long and very wide, and, as the animal is viewed from the side, they should be slightly arched. The top of the hog should be very deeply fleshed so as to build the back and loin out level and square on either side of the middle line, thus forming a rather well-marked

corner at the junction with the upper border of the side. There will thus be no marked rounding off from the middle line, but a gentle arch over the top from side to side and great width of top due to well-sprung ribs and very heavy fleshing. A "ridgy" back is an evidence of lack of fleshing, and a narrow, "sunfish" conformation is very faulty for the same reason. A dip in the back, or sway-back conformation, greatly detracts from the appearance of the animal and indicates weakness of muscling; hence the cuts from the back and loin will be lacking in lean meat. Or, if the animal is intended for breeding purposes, its value is lessened because of this weakness and because the defect is as liable to be transmitted to offspring as is any other good or bad quality.

The sides of the hog should carry down straight and deep from top to bottom, and should be neither long nor short, but moderate in length. Very short hogs are open to objection because such a type does not grow big enough, and sows of this type are usually lacking in prolificacy because they do not have the capacity for carrying large litters. On the other hand, extreme length is secured at the expense of width and depth, and also at the expense of quick fattening qualities. For these reasons, extremes in either direction are to be avoided. When fattened for the market, the sides should be thickly and smoothly fleshed so that every point along the side fills out to meet the same straight line from shoulder to ham. Wrinkles in the skin along the side are objectionable because they injure the smoothness of appearance which is so desirable, and if the wrinkles are very deep and are permanent, that is, do not disappear when the hog changes position, then they may be called seams and are highly undesirable. These seams most often occur just behind the shoulder, but they may occur all along the side. They are due to creases in the skin and in the flesh underlying the skin, so that when the fingers are inserted into them they are found to be deep and pronounced. They indicate lack of quality and lack of evenness in fleshing, and are especially objectionable because they remain in the side meat even after it has been pressed and cured by the packer, thereby injuring the appearance of such cuts and affecting their selling price.

The **belly** should be straight or "well tucked up," thus insuring a good dressing percentage when the hog is killed. The belly should be firm, not flabby, and should be wide rather than narrow or V-shaped. However, this description will not apply to brood sows that have suckled several litters of pigs, for it is not desirable that they have straight, tidy underlines, but instead an udder composed of twelve or more well-developed glands and teats.

The **rump** should be long and as wide as the rest of the top, and it should carry out from hips to end of body with a slight curve downward to coincide with the slight arch of the entire top from head to tail. Very often the rump will be found very steep or drooping, the hips being carried too high and the tail set very low. Accompanying this kind of a rump, and to a certain extent causing it, is a faulty position of the hind legs, the feet being set too far under the body. This constitutes a weak conformation of the hindquarter, and gives the animal an ungainly appearance. The rump should carry out wide on either side of the tail to form rather square corners, and should not taper in width from hips to end of body, but be uniform in width throughout. When the hog is fat, the tail sets in a socket.

The **hams** really include the rump as well as the thighs and twist. They should be very large and well developed, being plump and thick from every point of view. The thickness should carry down to the hocks, and the space between the hind legs and above the hocks should be filled with flesh. Loose, flabby hams are undesirable because they carry too much outside fat and require too much trimming off before they can be sold. Some hams lose fifteen per cent. in trimming at the packing house. The hams should be reasonably firm in fleshing and neat in form, yet very plump, wide, and deep.

The **hind legs** should be medium short, or short, and should carry down straight and vertical from the hocks to the ground. The pasterns should be short, upright, and very strong, the feet well formed, and the toes strong. The bone should show no coarseness, and in the market hog should exhibit considerable refinement.

The **hair** should be straight rather than curly, and should be fine. A harsh, bristly coat is an evidence of coarseness. A curly coat is objectionable because curly hair is usually coarser than straight hair, and curly-coated hogs do not shed their coats properly, which injures the appearance. A swirl or rose in the hair on the back or rump detracts from the appearance, and is objectionable for that reason. The hair should be abundant and smooth, and should lie close to the skin. Such a coat affords the most protection and adds to the attractiveness of appearance.

The **quality** of a fat-type hog is determined by the refinement of the head, hair, and bone, smoothness of finish, and freedom from wrinkles and seams. The hog with quality has a clean-cut, well-bred appearance that pleases not only the producer and hog fancier, but also the butcher, because such a hog yields a neat, tidy carcass that attracts buyers, and the cuts of meat show a refined texture that is not to be found in the cuts from a coarse, rough hog.

The proper **finish** of a lard-type hog is secured by a high degree of fattening, but the feeding should not be continued long enough to give the hog a soft, flabby covering. When handled along the back, below the shoulders, and at the lower border of the hams, the fleshing should be rather firm instead of soft as is often the case, especially in some breeds. When the fattening has proceeded far enough to round out the lines of the animal and give him a smooth, springy, mellow covering of flesh, he is in just the right condition to meet with most favor from the butcher.

The **temperament** of the fat-type hog is quite different from that of the bacon hog, being less active and more inclined to quietness, lying down, and the taking on of fat. Ideas as to what is most desirable in the temperament of this type of swine are tending somewhat away from the one formerly in favor, namely, that a hog should eat and lie down, and that a minimum of exercise is conducive to greatest economy in pork production. Many producers are now coming to believe that better results are secured if the hog is disposed by temperament to take considerable exercise, especially during the growing period; they are selecting more

active hogs for breeding, and are managing their young stock in such a way as to induce them to take a large amount of exercise. This results in growthy pigs of robust constitution and lessens the dangers of disease. Exercise also develops the muscles and strengthens the pasterns and legs. Notwithstanding this present-day tendency to select a more active hog than in the past, there must always be considerable difference between the fat type and bacon type in this respect, the former being more quiet, slower in movements, and having much greater natural aptitude to fatten.

The **weight** for age is an important consideration because it is a measure of the profit-making ability of the hog. Certain standards of size and weight must be maintained in breeding stock in order that pigs fed for the market may reach marketable weights as quickly as possible. In early times hogs were fed to maturity before being marketed, but under modern conditions of higher cost of feed it is most profitable to finish them at an early age before the limit of growth has been reached. The average weight of hogs received at the large markets at the present time is about 225 pounds, and hog growers generally agree that weights from 250 to 300 pounds for market hogs are most profitable. Nevertheless it is as important to maintain large size in breeding animals today as it was in early times when the market wanted big, matured hogs. This is true because the cheapest gains are made during the growing period; the most profitable hog is one that inherits the ability to grow to large size, but which will fatten before maturity is reached. It is desirable, therefore, to set the standard for matured weight as high as is consistent with proper form and quality. Extremely heavy weights are very often secured at the expense of symmetry and proper refinement, but it is believed that for boars in good flesh the standard may be set at 800 pounds or over without necessarily sacrificing other desirable qualities. This may seem a high figure to some, but it is a fact that swine breeders now realize that they have not given enough attention to size during recent years, and today there will be far less objection to the figure mentioned than would have been true a few years ago. Sows in good flesh should

weigh not less than 650 pounds. By proper selection of breeding stock and by improved methods of feeding and management, the weights here mentioned may be equalled or surpassed. Some very excellent show animals of recent years have exceeded these weights at maturity. At six months of age, pigs should weigh 200 pounds; at twelve months they should weigh 400 pounds, and at about twenty-four months should be matured. Sows reach maturity a little sooner than boars, but do not attain as great weight.

CHAPTER XX.

THE BACON-TYPE HOG.

The bacon hog presents some very marked differences when compared with the lard hog in form, fleshing, and temperament. These differences are very necessary because the bacon hog yields a product that is quite different from that of the fat or lard hog. The foremost countries in bacon production are England, Denmark, and Canada, the first mentioned consuming the surplus production of the other two. It is a superior product to that with which the American public is furnished, being the finest that is produced. American bacon is the belly meat of the lighter and thinner hogs of the lard type, but English bacon is supplied by a hog the entire carcass of which is suitable for bacon. Denmark and Canada ship bacon to England in the form of what is called the "Wiltshire side." A Wiltshire side represents half the carcass of the hog, minus the head and legs. The neck, shoulder, back, loin, side, belly, and ham are included.

The best bacon contains a relatively large amount of lean meat and small amount of fat. The price charged for bacon at wholesale or retail is very largely regulated by these features, a cheap slab of bacon always being characterized by greater thickness, little lean, and much fat. The production of high-quality bacon therefore necessitates a different kind of hog than the lard hog, a hog disposed to be muscular and active, but not a hog that fattens readily. The production of the best bacon also necessitates feeding this hog on such feeds as will furnish nitrogenous or muscle-building materials in abundance, the carbonaceous or fat-forming elements of the ration being supplied in much less amount than would be advisable if lard hogs were being fed. This fact explains why but few bacon hogs are found in the cornbelt, and also why the United States is able to produce the lard hog at lower cost than he can be produced elsewhere. Whereas corn plays a large part in the production of lard-type swine for the market,

the bacon hog is fed on such feeds as peas, barley, and skim milk, which are much better suited to bacon production than is corn, because they contain a larger percentage of protein.

It is of considerable importance that the producer of bacon hogs turn them off to market at that period in their development when the character of the flesh will be nearest the bacon ideal. To be more explicit, if the hog is marketed too young its flesh will be watery and flabby, whereas further feeding and more age result in a more desirable carcass. Pigs have a very strong tendency to utilize their feed for growth during the first months of their existence, and as they become older and more matured they fatten much more readily. It is for this reason that the best bacon comes from hogs within certain limits of weight. Experience has shown that a weight of 160 pounds is the minimum weight at which to market a bacon hog and that the upper limit is 220 pounds. These figures represent the extremes; the best bacon carcasses are from hogs that weighed 175 to 190 pounds. This does not mean that the bacon hog reaches maturity at a weight of 190 or 220 pounds, or that it is desirable that he should do so. The matured weight for boars in good flesh should be not less than 700 pounds; sows weigh about 100 pounds less than boars at maturity.

When the carcass of a bacon hog is split down the back, the layer of fat along the spine and back should be not less than one inch or more than one and one-half inches in thickness, and it should be as uniform in thickness as possible from one end to the other. The production of the best Wiltshire sides is possible only from hogs that are long from shoulder to ham, light and smooth in the shoulder, neck, and jowl, and very straight and trim along the belly.

When thinking of a bacon hog we usually have in mind such a hog as the market wants, in other words, a hog suitable for slaughtering and cutting up into Wiltshire sides. Also, from what has been said of the importance of certain weight requirements, it is at once apparent that boars and breeding sows are not desired by the packer. If, however, their form, quality, and temperament are such as will cause them to transmit to their pigs the characteristics which are

necessary in order that these pigs may be fed out successfully for the bacon market, then the boar and sow are said to possess bacon type. In judging breeding stock, certain allowances must therefore be made and certain points must be emphasized which do not concern us in judging bacon hogs for slaughter. The same general principles and the same general type apply in both cases, but the judge must emphasize certain points that are peculiar and essential in each.

The **form** of the bacon hog is strikingly different from that of the lard hog. There is much less thickness and depth of body, greater length of leg, a lighter shoulder, neck, and jowl, and greater length from snout to tail, especially from

Fig. 63. Fancy Market Bacon Pig.

shoulder to ham. From the snout to the rear border of the shoulder the hog should be comparatively short, this being the low-priced end of the carcass. There is considerable difference between the retail prices received for the front and hind ends of the Wiltshire side. Length of side from shoulder to ham and length of ham from front to rear are of very great importance, but it is a mistake to make everything else secondary in importance to length; length should not be car-

ried to the greatest possible extreme. The hog should have enough depth and width of body to give him a strong constitution in a well-developed chest and middle. This applies both to the market hog and the breeding animal. There should be as much depth of body in front as behind, and as much width at one point as another—in other words, the hog should be symmetrical or balanced in his conformation. Great smoothness from one end to the other is a prime essential, and smoothness must be secured without the assistance of very much outside fat, such as greatly assists in giving smoothness to the lard hog.

Proper **quality** in a market bacon hog is very important because a rough or coarse appearance detracts much from the price, and because it is desired that the flesh be fine in texture. In both market hogs and breeding stock, a fine, smooth coat of hair denotes quality. Well-developed wrinkles or seams in the skin indicate coarse-grained flesh, and injure the appearance of the finished product. The snout, face, jowl, and ear should show refinement, yet not to an extreme that indicates lack of vigor and feeding qualities. The bone should be flinty and smooth, rather than porous and rough. As there is a relation between the development of bone and muscle, bacon hogs have proportionately larger shanks than lard hogs; but coarse bone, covered with thick, puffy skin cannot be excused for this reason. Coarse bone is very objectionable because it indicates hard feeding qualities and slow maturity. The butcher prefers a fine-boned hog, but the breeder wants the boar to stand on heavy, clean-cut bone covered with skin that shows no coarseness. The brood sow should have finer bone than the boar, but it should be in every way proportionate to her weight, plus the added weight resulting from pregnancy.

Proper **condition** for a market bacon hog is a feature requiring considerable practice in judging. There is danger of too high a degree of fatness, even though the live weight be within the limits that have been mentioned. Most persons residing in the cornbelt experience some difficulty in accepting a properly finished market bacon hog as such when first taking up a study of this type. To them the hog looks con-

siderably underdone. The indications of the proper degree of fatness are difficult to describe. The hog has a well-fed, thrifty appearance, but not a finished look comparable to that of the properly finished lard hog. The flesh is firm and the hog is reasonably well filled out. Soft flesh at the lower part of the hams, at the lower border of the shoulder, or on the jowl, is undesirable because it indicates an over-fat condition and an uneven distribution of the fat. Smoothness and firmness of fleshing are decidedly essential.

The **style** of the bacon hog should be marked. He should be very active, thus indicating a full muscular development. He should walk without apparent effort. A writhing movement when walking is taken as an indication of weakness in muscling along the back and loin.

The **head** varies in shape a great deal, depending to a large extent upon the breed, but there is also much variation between individuals belonging to the same breed. Length of snout varies with the breed. A long snout is very often associated with a narrow chest, and a very short snout often goes with a heavy jowl and neck. The face should be broad, and the poll should be broad also and come well forward, these being indications of constitutional vigor and feeding qualities. Large, prominent, bright eyes indicate health and constitution. The jowl has very little market value. A heavy, fat jowl denotes too strong a fattening tendency for a bacon animal. Good width across the jowl is desirable, but it should be very trim and neat. Size and carriage of the ear vary according to the breed. A large ear does not indicate lack of quality provided it is fine or thin. Thick, coarse ears denote a thick, coarse skin, which, in turn, denotes coarse-grained flesh.

The **neck**, while not a valuable part of the carcass, is important as indicating constitution and feeding qualities. A long, thin neck is an indication of deficient constitution and low feeding qualities; while a short, thick neck, with a crest of fat on top will result in a side of bacon that is too heavy at the fore end, which is the cheap end of the side. Moderate length and width of neck are wanted. It is to be expected

that mature boars will have heavier necks than sows or barrows.

The **shoulders** should be light and set in the body smoothly. They should be deep from top to bottom, but not wide from front to rear, and as one looks down on the top of the hog, they should show no greater fullness than the back and loin. Shoulders that have more width from side to side than the rest of the hog are objectionable, but nevertheless should be given preference over a narrow chest in a breeding animal.

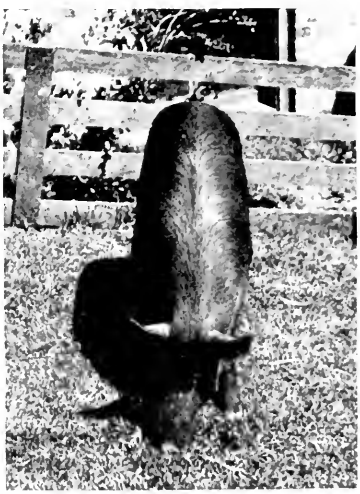


Fig. 64. Correct Bacon Type.

The **breast** should be wide and carry well down between the fore legs and straight out in front to join the lower border of the neck, thus insuring a large chest capacity.

The **front legs** should be rather long, but not extremely so, straight, strong, with upright pasterns, and carrying the weight full on the toes.

A **back** of moderate width, very slightly arched, and rounded over the top from side to side represents correct bacon-type development in this valuable part of the carcass. A sagging back or a very much arched back is an evidence of weak muscling and consequently of a lack of lean meat along

the top where the highest-priced bacon is found. The top of the hog should show a slight arch from head to tail as viewed from the side, the highest point being over the loin. A wide, flat back denotes a high degree of fatness such as is wanted in the fat-hog carcass, but not in the carcass of a bacon hog. A very narrow back is an indication of a lack of flesh or lean meat.

The **loin** furnishes the most valuable part of the side of bacon and therefore should be strongly developed. It should have the same width and form as the back. From shoulder to hindquarter the top of the hog should exhibit a uniform width, uniform arch, and uniform fleshing. When the loin is narrower than the back, the hog is not developed symmetrically and the loin may be said to be deficient.

A **side** that is flat, straight, and deep, with a great deal of length, and carrying a firm, smooth covering of flesh is demanded. The packer likes as long a side as can be had, but the breeder must avoid extreme length because such hogs incline to be narrow and shallow bodied. They lack constitution and feeding qualities to such an extent that they do not make economical gains on feed. The side of the bacon hog constitutes the most important consideration in judging either breeding or market animals. Score cards for bacon hogs universally allow more points to the side than to any other part of the animal. A study of the side more nearly reveals the worth of the bacon hog than a study of any other single item on the score card. No other part of the animal plays so large a part in determining the nature and value of the carcass. When the hog is standing, a straight-edge laid against his side, either vertically or horizontally, should touch every point beneath it. There should be no signs of seams or wrinkles, but a smooth development everywhere. The side should also be firm in fleshing, without any softness just behind the shoulder or elsewhere.

The **flank** constitutes an important consideration because a high flank injures the appearance of the carcass, necessitates more trimming in order to give evenness to the lower border of the side of bacon, and also is an indication that the belly meat is too thin. When the flank is carried down well, the

flesh is usually carried well down on the ham, the belly meat is thick and fleshy, and the development of the side is made more uniform in depth and thickness.

The **belly** should be straight, trim, firm, thick, and free from flabbiness. This part yields good bacon, but it is not so high priced as that from the loin and back.

The **rump** should not be broad and flat, which indicates too much fat, but should have the same width as the rest of the top and should be rounding from side to side across the top, the same as the back and loin. It should be long also, and should round slightly toward the tail, but should not be drooping with the tail set low.

A heavy, bulging **ham** is not an indication of correct bacon type. Such hams must have a great deal of fat trimmed off them in preparing the side of bacon for the market. The ham of the bacon hog should taper toward the hock and should be smooth and firm, especially at the lower part where flabbiness is likely to occur. The flesh should carry well around the bone, inside as well as outside, and should not taper off too suddenly below, but let down well toward the hocks. The ham of the bacon hog is often called the *gammon*.

The **hind legs** should be straight and strong, the pasterns upright, and the weight carried full on the toes.

CHAPTER XXI

THE HOG CARCASS.

A comparative study of the importance of the various kinds of meat in American, English, French, and German dietaries discloses the fact that civilization is greatly dependent upon the hog and its products. The following table gives the latest available figures for the annual per capita consumption of the various kinds of meat in the four countries mentioned, and shows the large contribution of the hog to the meat supply.

Kind of meat	United States (1909)	United Kingdom (average 1905–1908)	Germany* (1913)	France* (1904)
	Pounds	Pounds	Pounds	Pounds
Beef	80.00	56.00	31.35	37.00
Veal	7.50	4.00	7.25	8.00
Mutton and lamb	6.50	26.00	1.90	9.00
Pork, including lard	78.00	33.00	71.30	26.00
Total	172.00	119.00	111.80	80.00

*In addition to the above, the consumption of horse flesh amounts to about 1 pound per capita in France, and in Germany 1.9 pounds of goat, horse, and dog meat is consumed per capita.

The British are well known to be partial to beef in their meat dietary, and the Germans to pork, and this is amply substantiated by the table; nevertheless it is seen that the people of the United States consume more beef than the English and more pork than the Germans. The British, however, consume more mutton per capita than any other nationality, and the French come first with veal. The figures show that the consumption of pork, as compared with the consumption of beef, is greater than might be supposed. Germans consume more pork than beef, and Americans eat equally of the two kinds of meat, but the table shows a different proportion for the English and French. These variations may be due to

differences in the way appetites have been cultivated in the various countries, or to differences in the quantities of pork produced and the cost of it.

The type of hogs found in the several countries varies considerably. In the United States the fat or lard type is produced almost exclusively, this being particularly true of the cornbelt. The stock yards of this country receive practically no bacon hogs; the St. Paul market is something of an exception, although the number received there is comparatively small. We shall, therefore, give more attention to the fat carcass than to the bacon carcass.

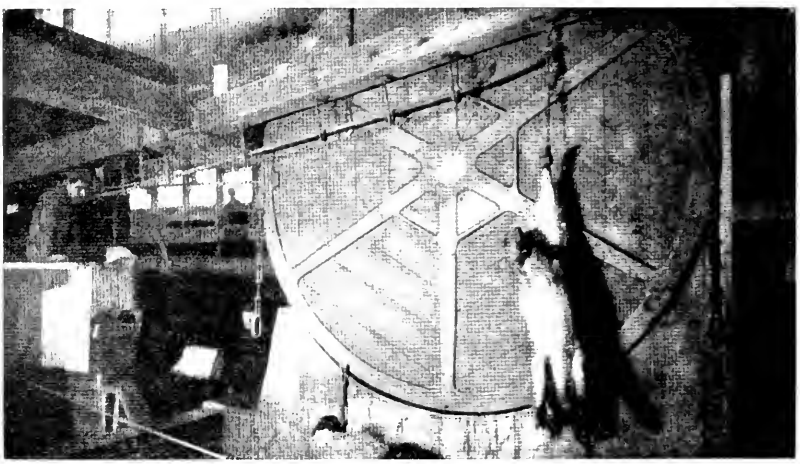


Fig. 65. The Hog Hoist.

Slaughtering and dressing.—When the hog enters the packing house, and this applies to both the fat hog and the bacon hog, he passes rapidly through the operations of (1) bleeding, (2) scalding, (3) scraping, (4) disemboweling, (5) removal of leaf fat, (6) splitting, (7) dry room (four hours), and (8) cooling. The legs, feet, cheek, and jowl are left as part of the carcass. An exception is made in the case of pigs and some light hogs intended for the fresh pork trade, these being dressed with the head on, leaf in, and the backbone not split. Some variation also occurs in the manner of splitting the carcass. All dressed hogs are cut open along the underline and through the aitch bone and brisket, but the best heavy

carcasses, called loin carcasses, are split through the center of the backbone, while the inferior heavy carcasses, called packing carcasses, are sometimes split on one side of the backbone. Bacon carcasses are usually cut with a knife on each side of the backbone and then split on one side and the backbone taken out, making sides suitable for the English bacon cuts.

The offal and the dressing percentage.—The parts which the hog loses in dressing are the blood, viscera, head, leaf fat, and hair. The dressing percentage is determined as easily as

Fig. 66. Dressing Hogs.

with cattle and sheep. Hogs easily dress 83 to 85 per cent. Some hogs in the carcass contests at the International Live Stock Show have dressed as high as 89, 89.3, and 89.6; but these were hogs of show-yard quality weighing 417, 429, and 520 pounds respectively, and had been without feed or water for more than twenty-four hours prior to killing. The chief factors determining the dressing percentage of a hog are fatness and paunchiness, of which the former is by far the more important.

The wholesale trade in pork. — Only about one or two per cent. of the hogs slaughtered by the large packing houses are sold as whole carcasses. About three-fourths of the wholesale trade in pork consists of various cured meats and fresh

cuts, the remainder consisting principally of lard and a small percentage of sausage and canned meats. Only about twenty per cent. of the domestic trade and five per cent. of the export trade in pork products, other than lard, consists of fresh meat.

The Fat or Lard-Hog Carcass.

Wholesale cuts. — After the carcass has been thoroughly chilled it is cut up into shoulders, hams, fat backs, loins, spare ribs, and belly. These wholesale cuts are shown in the drawings which accompany this chapter.

Fig 67. A View of the Pork Coolers.

The part labeled "fat back" is a clear layer of external fat containing no lean meat. Studies of the carcasses of cattle and sheep disclose the fact that it is easily possible to feed a steer or a wether too long, and thus make the animal too fat to suit the consumer. One-half to three-fourths of an inch of external fat is all that is wanted on the carcasses of cattle, and for mutton and lamb the desired thickness is proportionate to the requirements for cattle. With fat hogs we find an entirely different state of affairs, for the packer wants a very thick layer of external fat over the top of the hog. This heavy layer of fat constitutes a separate cut known as the fat back, which may be rendered into lard, or dry salted and sold as a

dry-salt cut. When manufactured into lard they render 85 to 88 per cent. About one-half of them are sold as a dry-salt cut for which a demand exists in the South and in Europe. Lard is far more valuable than tallow, hence the difference in the packer's attitude toward very heavy fatness in the lard hog as compared with a similar degree of fatness in cattle or sheep.

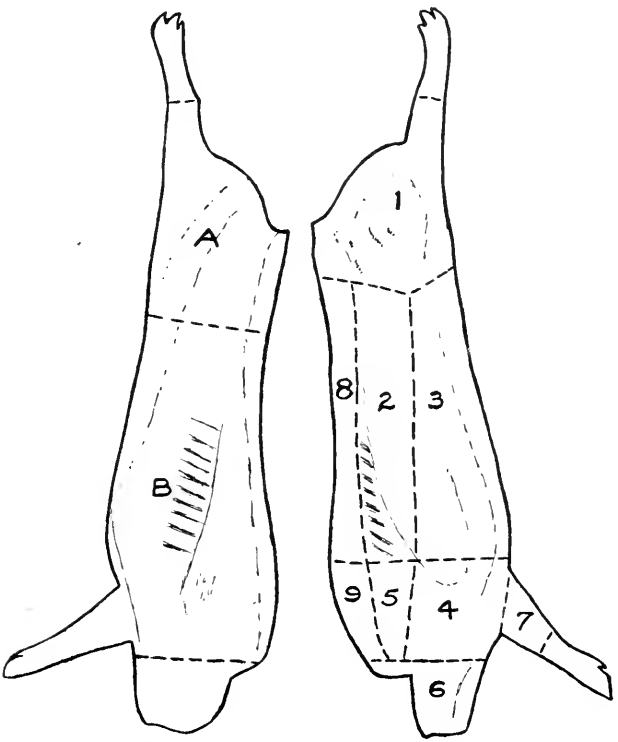


Fig. 68. Wholesale Cuts of Pork.

English Cuts—A, Long-cut ham; B, long side or middle.
American Cuts—1, Ham; 2, loin; 3, belly; 4, picnic butt; 5, Boston butt; 6, jowl; 7, hock; 8, fat back; 9, clear plate; 2 and 8, back; 2, 3, and 8, side; 4 and 7, picnic shoulder; 5 and 9, shoulder butt; 8 and 9, long fat back; 4, 5, 7, and 9, rough shoulder.

The belly contains stripes of lean and is suitable for a "breakfast bacon belly" if the cut is from a light, thin hog. If the hog is heavy, the belly cut is dry salted or pickled and sold as a "dry-salt belly" or as a "sweet-pickle belly," as the case may be.

The following table gives the weights of the various wholesale cuts of pork, the per cent. of live weight included in each cut, the wholesale prices per pound, and the total wholesale price of each cut. This table was compiled from unpublished data of a slaughtering and cutting test conducted by Mr. J. M. Evvard of the Iowa Experiment Station, in cooperation with Sulzberger and Sons' Company of Chicago. The test included 24 Duroc-Jersey hogs which averaged 300 pounds live weight and which dressed 75.19 per cent. If the heads and leaf fat are included, the dressing yield was 81.95 per cent. The following table represents averages of the 24 hogs.

From carcass of hog having live weight of 300 pounds.

Wholesale cuts	Weights of cuts	Per cent. of live weight	Wholesale price per pound	Total value of cut
	Pounds		Cents	
Hams	36.67	12.22	16.5	$6.05
Shoulders	45.46	15.15	12	5.46
Bellies (dry salt)	56.70	18.90	14	7.94
Fat backs	31.04	10.35	11	3.41
Spare ribs	1.58	.52	10	.16
Loins	26.92	8.97	15	4.03
Miscellaneous	8.45	2.82	5.5	.46
Leaf fat	8.35	2.78	11.25	.94
Cutting fat	17.77	5.92	10	1.78
Head	12.95	4.32	6.5	.84
Total carcass	245.89	81.95	12.6	$31.07

Note.—The above table includes both sides of the carcass. The shoulder cut is a rough shoulder, including the jowl. "Miscellaneous" includes trimmings, tail, neckbones, and rough feet. "Cutting fat" includes small fat trimmings from the hams, fat backs, bellies, and other cuts. It is rendered into lard.

High-priced and low-priced cuts. — There is not much variation in the wholesale prices of the various cuts of pork—much less variation than occurs in the wholesale prices of the various cuts of beef, mutton, or lamb. The rib and loin cuts of the beef carcass sell far above the other cuts, and the rib and loin development, together with the development of the round, practically determine the value of the beef carcass. In the fat-hog carcass, values are rather evenly distributed, although the ham may be said to be the most valuable part of

the hog. A study of the swine carcass emphasizes the importance of good development in all parts of the hog, and especially is this true of the back, loin, and hams. The top of the hog and the hams hold most of the value of the carcass, but the shoulder and belly are almost equally valuable.

Qualifications of a good carcass. — The value of the fat-hog carcass depends upon shape, finish, quality, and weight. These various factors will now be discussed.

1. Shape. — The shape desired is one combining great width of side and back in proportion to length of body, straight, even lines, and well-filled hams and shoulders. A neat, trim carcass is wanted that is free from prominence on the underline. Hence, barrows are always preferred to sows because sows carry more cheap belly meat, this being especially true of sows that have had several litters of pigs. Such sows are called "seedy," and they bring a lower price than neat, trim animals that are well tucked up along the belly. The accompanying drawings show the importance of the underline in determining the value of the side cut from a hog. The trimming from a seedy sow goes to the rendering tank and is made into a cheap grade of lard.

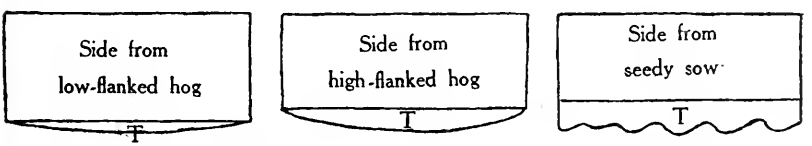


Fig. 69. Effect of the Underline on Trimming of Side.
T. trimming.

2. Finish.—This is indicated by the depth and evenness of fat covering the carcass, especially along the back and over the sides; also by the amount and quality of leaf fat. The leaf is the internal fat and includes the kidney fat and extends down to the flanks and "skirt" or diaphragm. It is important that the fat be white and firm. Packers like hogs well fattened because this means a higher yield of lard and a higher dressing percentage. As a rule, the heavier the hog the more fat he carries, because the nearer an animal approaches maturity the more easily he takes on fat. This is shown by the follow-

ing figures giving the percentage of yields and percentage of parts of carcasses of swine of different live weights. The fat backs were all rendered into lard.

Number of hogs slaughtered	Average live weight	Side meat	Hams	Shoulder cuts	Lard	Total yield
Figures from Boore and Company, Chicago.						
	Pounds	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
2107	360	37.10	13.31	9.62	16.00	76.03
1316	302	36.17	13.33	9.05	15.45	74.50
1215	234	36.10	13.20	11.05	11.96	72.31
907	204	34.60	13.70	10.40	11.55	70.25
Figures from Sinclair Packing Company, Cedar Rapids.						
2946	293	37.94	12.74	9.10	15.09	74.87
4067	236	36.86	13.52	6.58	15.04	72.00
1102	232	37.76	13.38	8.42	14.21	73.77
1615	232	38.02	13.29	8.14	13.89	73.34

The above figures do not include the small cuttings, tenderloins, tails, pig's feet, cheek meat, etc., which are practically alike for hogs within the weight limits mentioned above. When the small parts are added in, the dressing percentage is increased by about seven to nine per cent., making these hogs dress 83 to 85 per cent., total. The figures show a marked increase in the percentage of lard yield as the hog matures.

That the hog is by nature disposed to take on more fat than any of the other domestic animals is shown by the following table of analyses made at the Rothamsted (England) Experiment Station. After fasting from eighteen to twenty-four hours the animals were killed and the entire bodies analysed.

Animal	Age	Live weight	Protein	Fat	Mineral matter (ash)	Total dry substance	Water	Contents of stomach and intestines—moist
		Lbs.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fat pig		185	10.9	42.2	1.65	54.7	41.3	3.97
Fat sheep	15 mo.	127	12.2	35.6	2.81	50.6	43.4	6.02
Fat ox	4 yrs.	1416	14.5	30.1	3.92	48.5	45.5	5.98
Fat lamb	6 mo.	84	12.3	28.5	2.94	43.7	47.8	8.54
Fat calf	8–9 wks	258	15.2	14.8	3.80	33.8	63.0	3.17

These figures show why the corn crop has formed a closer alliance with hogs than with any other of our domestic animals. The hog requires more fattening food than other animals because he is naturally disposed to take on a very high degree of fatness, and, as has been mentioned, hog fat is far more valuable than the fat of cattle or sheep. Packers desire a covering of outside fat on the carcass of a lard hog that measures from two to six inches in thickness, the requirements varying according to the weight of the carcass.

3. **Quality.** — A carcass is said to have quality when the outlines are even and smooth, the head and shanks fine, the flesh firm, bright, and smooth grained, the fat white and evenly distributed over the carcass, and the skin smooth, thin, mellow, and free from wrinkles, blotches, or bruises. Coarse or extremely large shoulders, neck, and jowls show lack of quality and are indications of stagginess, and the carcasses of seedy sows grade low because of their coarse quality. Barrows and smooth, clear sows yield carcasses of the best quality.

4. **Weight.** — While it is true that packers find uses for carcasses of all weights ranging from 20 to 400 pounds, the most valuable carcasses are those weighing 200 to 220 pounds, provided the carcass is at the same time one of good shape, finish, and quality. Such carcasses come from hogs with a live weight of 235 to 260 pounds. Carcasses weighing 200 to 220 pounds yield loins of the proper size and best quality. The general statement may also be made that all carcasses should weigh heavy for their size, thus insuring a high degree of finish or fatness.

Bacon Carcasses.

The packing house classes the heavier and fatter carcasses as lard hog carcasses, while the lighter, thinner ones are cut up into the bacon or English cuts, so called because they are suitable for the English trade. The principal English cuts are Wiltshire sides, Cumberland sides, and long-cut hams. These cuts are also sold under several other names depending on some technical variations in the manner of preparing the side for the retail trade. The Wiltshire side comprises the

entire side (half the hog), minus the head, feet, shoulder blade, and hip bone. The belly is trimmed smooth and even. These sides average 40 to 70 pounds and are selected especially for thickness of lean meat and a light, even covering of fat from 1 to 2 inches thick, not exceeding $1\frac{1}{2}$ inches in the

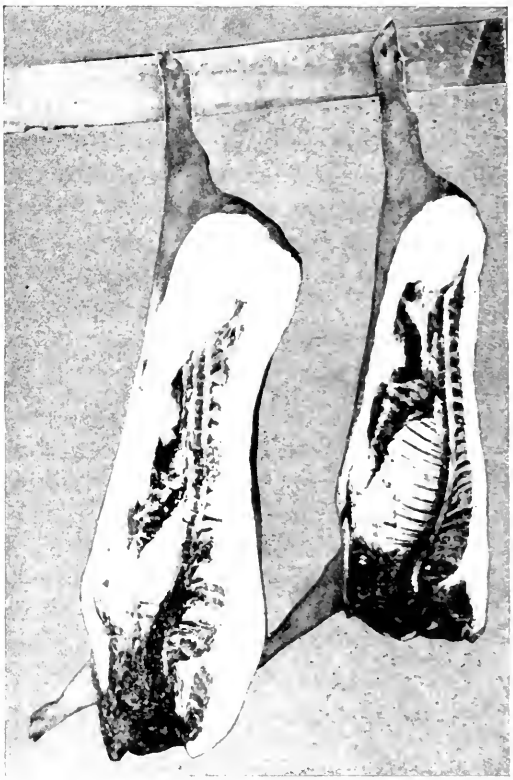


Fig. 70. Fat and Bacon Carcasses Compared.

Note the difference in size and especially the difference in fatness between the fat carcass on the left and the bacon carcass on the right.

best grades. They are made exclusively from choice, lean bacon hogs. The drawings which accompany this chapter show a bacon side and indicate its division into the long-cut ham and the long-cut middle or Cumberland.

Classification of Carcasses.

The classification and grading of hog carcasses is based on the uses to which they are adapted, or in other words, it is based on the products into which they can be converted. Therefore the shape, finish, quality, and weight determine where the carcass will classify and grade. The generally recognized classes and grades and their respective weights as given in Illinois bulletin No. 147 are as follows:

Smooth Heavy, or Heavy Loin Carcasses		240—400 lb
Butcher, or Light Loin Carcasses		160—240 lb
Packing Hog Carcasses	Heavy	240—400 lb
	Medium	200—240 lb
	Light	100—200 lb
Bacon Carcasses	Choice	120—160 lb
	Good	110—170 lb
	Common	90—110 lb
Shippers		100—200 lb
Pigs		20—100 lb

Smooth heavy, or heavy loin carcasses. — These are from prime, smooth hogs, either barrows or good clear (not seedy) sows. These carcasses weigh 240 to 400 pounds and have four to six inches of fat on the back. The flesh and fat must be deep, firm, and even, the flesh bright colored, the fat white, and the bones not coarse. As the name indicates, such carcasses are especially suitable for making heavy loins, the remainder of the side being made into a heavy fat back and dry-salt belly. These carcasses yield a very heavy ham. The per cent. of such carcasses is a very small part of the general supply.

Butcher, or light loin carcasses. — A large proportion of the fresh pork sold in retail markets is pork loins, which are cut into chops and roasts, and light loin carcasses are so named because these cuts can be obtained from them to best advantage. To yield loins of the proper size and quality, a hog carcass should weigh about 160 to 240 pounds and have the same shape, smoothness, and general quality previously described. Thick, firm flesh, smooth, soft skin, and solid, white fat are especially important. The covering of fat on the back should be two to four inches. Barrows and smooth clear sows furnish carcasses of this class. The weights most

preferred are 200 to 220 pounds. The carcass is cut up into the regular American or fat-hog cuts.

Packing hog carcasses.—About one-half of the carcasses in Chicago packing houses are of this class. They are carcasses of mixed hogs of all weights, which are too coarse in quality, rough in shape, and uneven in finish to be well adapted for fresh pork products or smoked meats and are therefore principally packed in such form as mess pork and dry-salt meats. The hams are sweet pickled and the shoulders made into picnics and Boston butts. The general statement may be made that packing carcasses are inferior carcasses weighing 100 pounds or more which are left after the best carcasses have been sorted out. They are graded heavy, medium, and light according to weight.

Heavy packing carcasses. — These are the carcasses of rough and seedy sows, coarse barrows, boars, and stags averaging 240 to 400 pounds. Common defects of this grade are thick, rough, and wrinkled skin, dark-colored and coarse-grained flesh, soft, oily fat, large bones, and carcass bruises.

Medium packing carcasses. — The only important distinction between this grade and the preceding one is weight. These carcasses weigh 200 to 240 pounds. They are inferior to butcher carcasses in shape, finish, and quality.

Light packing carcasses. — These weigh 100 to 200 pounds. They are too deficient in shape, quality, and finish to be classified as either bacon, butcher, or shipper carcasses. This grade comes mostly from light sows.

Mess pork, which is made from packing hog carcasses, is a simple method of packing cheap pork and was much used in the early days of the packing industry. It is prepared by cutting the side into strips about six inches wide and packing in salt brine in tight barrels (18x29 inches) at 200 pounds net weight of cured pork per barrel or 355 pounds gross. It is shipped principally to the Southern States, northern lumber camps, and South America. Dry-salt meats, the other common product of packing carcasses, are heavy sides, bellies, shoulders, fat backs, and jowls cured in dry salt, pumped with brine, and shipped in coarse salt. They are usually shipped

loose, but sometimes are put up in boxes containing 25 to 500 pounds.

Bacon carcasses.—These are suitable for sugar-cured, breakfast-bacon bellies and English meats. Such carcasses have long, deep, smooth sides with a light, even covering of fat. The hams should be full, but lean, and the shoulders light and smooth. The flesh must be firm and not "watery," the fat solid, and the carcass very smooth. These carcasses weigh 90 to 170 pounds. The most desirable weights are 120 to 150 pounds. Only a small percentage of Chicago carcasses are of this class.

Choice bacon carcasses. — The depth of back fat is from 1¼ to 2 inches. It must not vary more than ¼ to ⅜ of an inch over the back and shoulders. Only carcasses of barrows weighing 120 to 160 pounds grade here as a rule.

Good bacon carcasses. — These lack slightly in the essential points of the preceding grade. The thickness of back fat must be 1 to 2½ inches. The carcasses range in weight from 110 to 170 pounds and come not only from barrows but also from smooth, clear sows.

Common bacon carcasses. — These are decidedly lacking in the prime essentials of the class. They are usually light, unfinished carcasses from "skippy" or "skinny" hogs.

Shippers. — These are similar to butcher hog carcasses in shape and quality, but are lighter in weight and generally not so highly finished. Compared with bacon carcasses they are shorter and thicker bodied, with a deeper and less even covering of fat, heavier jowls, and are younger for their weights. Their chief use is for the fresh retail trade, and they must be fancy in quality. This is the only class of carcasses that is extensively sold as whole carcasses. They are shipped in carlots to eastern points, the greatest demand being in the winter months. They usually weigh 100 to 160 pounds.

Pigs. — These are carcasses of light, young hogs that are comparatively lean and light colored in flesh, with thin, soft skin, soft, red bones, and weighing from 20 to 100 pounds. They are dressed and sold like shippers. Roasting pigs are dressed suckling pigs which are fat and smooth. They are

sold like winter lambs direct to hotels and restaurants. The most desired weight is 15 to 20 pounds, but pigs weighing 30 pounds are used.

The Grades of Lard.

From one-tenth to one-third of the hog carcass is made into lard in large packing houses, the proportion varying with the relative price of lard and grade of hogs. Lard is sold under six different names representing differences in whiteness, grain, flavor, and keeping qualities. Lard is made from leaf fat, fat backs, and fat trimmings from ham, shoulder, belly, jowl, and head. Some hams trim fifteen per cent. The highest grade of lard is Kettle Rendered Leaf Lard, made from leaf fat. It is very white in color and finest in grain and flavor of all grades of lard. Then there is Kettle Rendered Lard made mostly from fat backs, with perhaps a small addition of leaf fat. Fat trimmings are also used at times. It ranks second only to the preceding grade. Neutral Lard is made from leaf or back fat at a lower temperature than is required in the manufacture of kettle rendered leaf lard. No. 1 Neutral Lard is made from leaf fat only. It is tasteless, free of acids and impurities, smooth grained, and remains unchanged in odor and color. No. 2 Neutral Lard is made from back fat. It is not as white in color nor as fine in grain as No. 1 and sells at a lower price. Ninety per cent. or more of the lard made at Chicago is known as Prime Steam Lard. It is made from fat trimmings and internal fats. It is darker colored and coarser grained than other grades and is the form in which hog fats can be most economically stored and shipped. It is refined before using. Then there is Refined Lard made from prime steam lard by a bleaching and stirring process. Also there is Compound Lard or Lard Compound, which is a mixture of lard, stearin or other animal fat, and vegetable oil, usually cottonseed oil.

Conclusions.

The following conclusions may be drawn from the study of the swine carcass and its various products:

1. In order to bring the highest market price, lard hogs must be fat and well tucked up in the underline.

2. The greatest demand is for 200- to 300-pound hogs, and hog growers usually obtain the most profit by fattening and selling their hogs at weights ranging from 250 to 300 pounds.

3. Barrows outsell sows because they carry less cheap meat on the underline.

4. No other animal equals the lard hog in its fat-storing tendency.

5. The production of lard hogs furnishes a logical channel of disposal for corn, because corn is a fattening food and lard brings a much higher price than tallow.

6. Any kind of a hog finds a buyer on the market, but the price paid depends on the kind of carcass the hog will yield.

7. The development of the packing industry has made an outlet for the plainer sorts of hogs which otherwise would be a drug upon the market.

8. No other kind of meat comes so nearly being manufactured by packers as does pork.

9. Indian corn and the American packing industry have combined to develop the American swine industry into a business of mammoth proportions. Corn, properly supplemented, makes pork economically, and pork finds ready sale because packers have discovered many ways of placing pork on the market in attractive and highly palatable form combined with most excellent keeping qualities.

CHAPTER XXII.

HOG MARKETS AND PORK PACKING—PAST AND PRESENT.

During the first half of the nineteenth century, Cincinnati was the leading pork-packing center of this continent, and this position was maintained until 1863, at which time Chicago took the lead. One by one, other western cities have crowded ahead of Cincinnati until now her rank is twentieth in the list of American hog-packing cities. That Cincinnati's supremacy was not a permanent one was due to the fact that until the West was settled, live-stock conditions were very unstable, and the logical packing center in 1850 was found to be too far to the east of the center of hog production as it existed twenty years later. With the settling of the cornbelt and the rapid extension of the hog's domain to the westward, Chicago was enabled, by virtue of her location and direct railway connections with the heart of the cornbelt, to gain and hold supremacy as a pork-packing center. The evolution of the gigantic pork-packing business of the United States may be told in brief by first reviewing the growth and development of the business at Cincinnati, and then following it to Chicago at the close of the Civil War.

Early packing at Cincinnati.—In 1833 Cincinnati packed 85,000 hogs. Five years later the number packed in the year had risen to 182,000 head. In 1843 no less than 250,000 hogs were consumed by the numerous packing establishments then doing a thriving business at Cincinnati, and the town was dubbed "Porkopolis," which name was formerly in general use, but is now nearly obsolete. Cincinnati slaughtered 360,000 hogs for packing purposes in 1853, and in 1863 the highest mark was reached, the number that year being 608,457. The demands of the army were largely accountable for the large number packed during the last mentioned year. Prior to the Civil War, Cincinnati was the center of the finest hog-raising region in the world, including the states of Kentucky, Ohio,

and Indiana. It was in this favorable environment and under the stimulus afforded by a large, near-by market that the Poland-China breed originated during the period mentioned. Although Chicago took the lead in the number of hogs packed following the war, Cincinnati continued to hold first place for a considerable time so far as the quality of hogs packed was concerned. In 1866 there were fifteen slaughter houses at Cincinnati, some of which employed as many as one hundred hands. One concern slaughtered 60,000 hogs during that year. Measured by the standards of the time, these Cincinnati packing establishments were considered to be gigantic in proportions. In the same year, Cincinnati produced 180,000 barrels of pork, 25,000,000 pounds of bacon, and 16,500,000 pounds of lard.

Development of packing at Chicago. — The earliest packing or slaughtering done in Chicago was in 1827; in that year Archibald Clybourn erected a slaughter house for the special purpose of supplying the garrison at Fort Dearborn. The trade was mostly local until 1833, when immigration set westward quite strongly, creating a larger demand. During 1835, Mr. Clybourn packed about 3,000 hogs, besides considerable beef, for which a ready market was at hand. This stock had to be picked up at long distances from Chicago and driven on foot to the city. Other men soon engaged in the business which took on larger proportions, the surplus product finding a market in the East. The slaughter houses were mostly located on the south branch of the Chicago river, and into it the offal and filth were drained, which in later years became a nuisance and was prohibited by the city. In 1863 there were 58 different establishments in Chicago doing a general packing business. During the winter of 1853-'54, Chicago packed 52,849 hogs, and in 1860-'61 the number packed was 231,335.

During the winter-packing season of 1863-'64, the rank of the largest packing centers and the number of hogs packed by each was as follows: (1) Chicago, 904,159; (2) Cincinnati, 400,000; (3) St. Louis, 200,000; (4) Louisville, 103,996.

Growth of American pork packing. — The pork-packing year ends March 1st and is divided into two seasons — the summer season of eight months, from March 1 to November 1,

and the winter season of four months, from November 1 to March 1. This system came into use before the days of artificial refrigeration, and, although such a designation is no longer necessary it is still adhered to by statisticans. Before 1873, summer packing was not practiced, but it began in September of that year when it is said to have reached the number of 505,500. The total number of hogs packed in the West during the winter season, and the cost of hogs per 100 pounds live weight, according to the Cincinnati Price Current's special reports since 1849 and estimates previously, were as follows:

Season	Number	Cost	Season	Number	Cost
1842–'43	675,000	.....	1879–'80	6,950,451	$4.18
1844–'45	790,000	$2.65	1884–'85	6,460,240	4.29
1849–'50	1,652,220	2.13	1889–'90	6,663,802	3.66
1854–'55	2,124,404	3.37	1894–'95	7,191,520	4.28
1859–'60	2,350,822	4.73	1899–'00	8,675,898	4.29
1864–'65	2,422,779	11.46	1904–'05	10,456,503	4.67
1869–'70	2,635,312	9.22	1909–'10	8,725,224	8.30
1874–'75	5,566,226	6.66	1914–'15	12,559,412	6.74

The number of hogs packed in the West during the calendar years, from 1845 to 1914, were as follows:

Year	*Number*	*Year*	*Number*
1845	781,000	1880	12,210,000
1850	1,652,000	1885	11,350,000
1855	2,124,000	1890	16,980,000
1860	2,350,000	1895	15,285,000
1865	2,451,000	1900	23,265,000
1870	2,635,000	1905	25,485,000
1875	6,485,000	1910	25,729,000
	1914	25,610,000	

Present leading hog-packing centers. — During the year 1914, swine were slaughtered under Federal meat inspection at 286 establishments in the United States located in 142 cities and towns. From the government reports of animals slaughtered under federal inspection, the following table is constructed, showing the present rank of the twenty largest hog-packing cities:

	City	*Number of hogs packed*		*City*	*Number of hogs packed*
1.	Chicago	5,917,396	11.	Sioux City	998,990
2.	Kansas City	2,415,591	12.	Buffalo	877,061
3.	Omaha	2,095,458	13.	Cleveland	795,004
4.	St. Joseph	1,715,970	14.	Jersey City	767,172
5.	Indianapolis	1,376,771	15.	Detroit	719,253
6.	Nat'l. Stock Yards, Ill.	1,331,530	16.	New York	713,420
7.	St. Louis	1,140,700	17.	Ottumwa	(*)
8.	Boston	1,095,544	18.	Baltimore	582,040
9.	St. Paul	1,091,723	19.	Philadelphia	563,427
10.	Milwaukee	1,049,176	20.	Cincinnati	535,908

*Figures not available at time of publication.

Chicago packing at present time.—The number of hogs packed at Chicago by the leading hog-packing firms in 1912, 1913, and 1914, and the total number packed at Chicago in each of these years was as follows:

	1914	*1913*	*1912*
Armour & Co.	1,063,700	1,325,900	1,340,900
Swift & Co.	674,200	928,700	1,060,800
Sulzberger & Sons	533,700	607,500	682,000
Morris & Co.	424,600	482,500	430,900
Anglo-American Co.	347,400	317,800	273,800
Boyd, Lunham & Co.	282,400	280,000	236,900
Hammond Co.	344,000	405,900	345,200
Western Packing Co.	453,700	394,400	311,000
Roberts & Oake	306,600	223,600	130,800
Miller & Hart	160,500	153,600	125,000
Independent Packing Co.	366,700	312,200	240,000
Brennan Packing Co.	222,300	216,800	174,700
All others	429,200	482,200	494,900
Totals	5,609,000	6,131,100	5,855,900

By-products from hog packing. — The Report of the Commissioner of Agriculture for 1866 contains an interesting account of the early hog-packing operations in this country. The following, written by Mr. Charles Cist, of Cincinnati, appeared in the report for that year:

"I have referred to the remarkable fact, that there was a period in the West when corn would not, in some sections, command six cents per bushel, and in others was of so little value as to be substituted for wood as fuel. Not less extraordinary is the fact, within the knowledge of hundreds now in Cincinnati, that in the early ages of pork packing, say in 1828,

there was so little demand for any portion of the hog, other than hams, shoulders, sides, and lard, that the heads, spareribs, neck pieces, backbone, etc., were regularly thrown into the Ohio river to get rid of them!" The same writer also says: "The slaughterers formerly received the gut fat for the whole of the labor of dressing, wagoning the hogs more than a mile to the pork houses free of expense to the owners. Every year, however, adds to the value of fat, heart, liver, etc., for food and the hoofs, hair, and other parts for manufacturing purposes. Six years since, from 10 to 25 cents per hog was paid as a bonus for the privilege of killing. This was later raised to 75 cents and even to $1.00."

In 1863, hog-packing products consisted of bristles, lard, mess pork, hams, shoulders, bacon, and lard oil used for making candles. The beginning of the immense packing-house by-products industry of modern times was described by an early writer as follows: "Since the Chicago river has ceased to be the sewer for all the offal from the slaughter and packing houses, the owners have been obliged to cart it off to the commons and open fields beyond the city limits at a very heavy expense to them. An enterprising firm has, however, contracted with all the principal firms the present season to carry it all away by the owners paying half the expenses. Instead, however, of carrying it off and throwing it away, they have commenced preparing it for fertilizers. They have provided centrifugal machines, into which they place the refuse from the lard and grease tanks, and throw out all the water, leaving only the solid parts, and that in a pulpy or pulverized condition. In this way they will prepare about three thousand tons the present season, all of which will be shipped east for the manufacture of commercial manures. Another concern is gathering all the bones it can pick up, from which are manufactured large quantities of animal charcoal, and such as are not suitable for that purpose are ground up and sent east, they having shipped the past season over three hundred tons of ground bones alone."

Packers estimate that practically 70 per cent. of the live hog is merchantable as fresh or cured meat. Slaughtering and handling involves a shrink of about 10 per cent., which includes the contents of stomach and intestines and loss of

weight by the carcass in cooling. The other 20 per cent. comprises tankage, blood, hair, bristles, grease, and fertilizer. A larger proportion of the hog is edible than of any other food animal, and the value of the by-products is correspondingly less.

Exports of pork products. — A good idea of the importance of American hog packing to European nations may be obtained from the following table, giving exports of pork products for the fiscal year ending June 30, 1913:

Pork Products	*Pounds*	*Value*
Bacon	156,675,310	$21,211,605
Hams and shoulders	157,709,316	20,708,882
Pork, canned	4,010,862	483,959
Pork, fresh	1,355,378	159,654
Pork, pickled	45,729,471	4,944,448
Lard	476,107,857	52,509,217
Lard compounds	73,754,400	7,070,967
Sausage	4,716,610	601,596
Sausage casings	40,013,760	5,466,661
Totals	960,072,964	$113,156,989

The only countries exporting hog products to any great extent besides America at the present time are Denmark and China. The United Kingdom is our largest customer, and until recently provided a practically free and unrestricted market for all of our products. Since January 1, 1909, some minor restrictions have been in force which have curtailed trade to some extent. Next to the United Kingdom, Germany is our most important customer. Germany's purchases, however, consist almost exclusively of lard. Trade in meats with Germany is not possible to any large extent, owing to the high duty imposed. France is a steady importer of lard, and also buys some fat backs, trade in the latter being interfered with by a high duty. We also sell a good many dried sausages to France where this product meets with much appreciation. Italy, Switzerland, Spain, Norway, Sweden, Denmark, Holland, the West Indies, Central America, all countries in South America, Asia, and Australia are buyers of hog products in some form. Some countries buy only the casings for sausage making, but all pay tribute to the American hog in one form or another.

Modern large hog markets.—The *Chicago Daily Farmers and Drovers Journal* reports the receipts of hogs at the thirteen principal markets of the country during 1914 as follows:

Markets	*Receipts*	*Markets*	*Receipts*
1. Chicago	6,618,166	11. Fort Worth	515,003
2. St. Louis	2,558,825	12. Oklahoma City	428,260
3. Kansas City	2,264,805	13. Wichita	418,213
4. Omaha	2,258,620		
5. Indianapolis	2,099,787	Total	25,112,146
6. Pittsburg	1,808,731	1913 total	26,837,217
7. St. Joseph	1,726,966	1912 total	26,239,753
8. St. Paul	1,589,821	1911 total	27,351,366
9. Buffalo	1,568,270	1910 total	20,014,283
10. Sioux City	1,256,679		

As shown by the above figures, Chicago receives more than twice as many hogs as any other market in the country. Of the 6,618,166 hogs received at the Chicago yards during 1914, 5,327,454 were slaughtered by Chicago packers and the remaining 1,290,712 were shipped out alive to other points for slaughter. Practically no hogs are taken out of the large

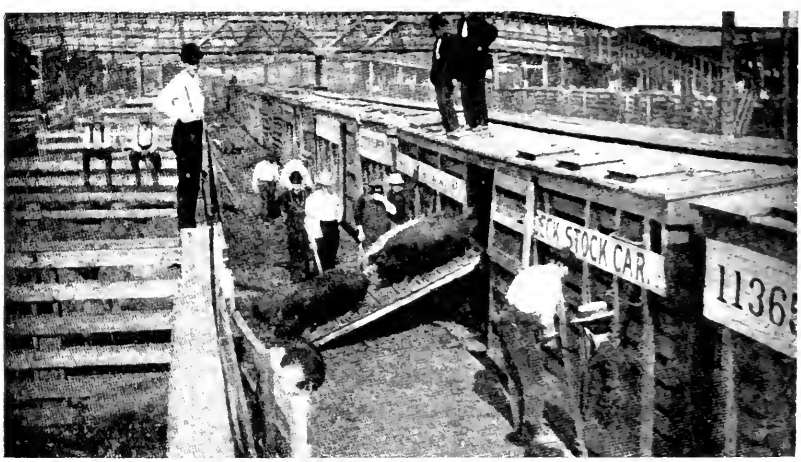


Fig. 71. Unloading Hogs at Chicago.

markets for feeding purposes on account of the danger of disease. In addition to the hogs included in the above figures, small packing firms at Chicago, located outside the yards, received and slaughtered 317,959 hogs during 1914.

The growth of the Chicago market is shown by the following list of receipts and shipments of hogs at that point during the years mentioned:

Year	Receipts	Shipments	Year	Receipts	Shipments
1858	540,486	192,013	1880	7,059,555	1,394,990
1860	392,864	227,164	1890	7,663,829	1,985,700
1866	961,746	482,875	1900	8,109,064	1,452,183
1870	1,693,158	924,453	1910	5,586,858	1,202,390
1875	3,912,110	1,582,643	1914	6,618,166	1,290,712

It is interesting to note that the advent of the refrigerator car, about 1875, had a marked effect on the proportionate number of hogs shipped. The largest number of hogs received at Chicago in a year was in 1898, when 8,817,114 head were received at the yards proper. If receipts by outside packing firms are included, the figure is raised to 9,363,451. The highest record for a month is credited to November, 1880, when 1,111,907 hogs were received at the yards and enough by outside packers to make the total 1,179,233. The record week was that ending November 20, 1880, when 300,488 were received at the yards, and 302,070 in all. On February 10, 1908, the largest day's receipts were recorded, the figures being 87,716 and 89,365 respectively.

The number of hogs marketed annually varies greatly. This fluctuation is caused partly by the ravages of disease, and partly by the fact that if an unexpected or temporary demand springs up, and higher prices rule, great numbers of hogs of inferior size and weight are rushed to market.

Some peculiarities of the hog crop. — The following table gives the monthly average weights of hogs at Chicago during the years from 1903 to 1914 inclusive. The highest monthly average of each year is given in black type, while the lowest monthly average is enclosed in parenthesis.

Year	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
January	(208)	206	213	217	223	215	(203)	210	226	212	226	(216)
February	209	(205)	(209)	(215)	222	212	204	213	230	217	230	224
March	215	206	211	218	228	212	206	218	239	218	240	233
April	222	208	216	221	234	219	212	227	241	227	242	233
May	227	214	219	226	235	218	216	239	**242**	232	242	236
June	231	221	222	226	236	217	219	242	236	235	**244**	237
July	235	226	228	231	240	222	225	246	233	239	243	244
August	248	239	236	241	250	**224**	**232**	255	239	**240**	233	**248**
September	**257**	**244**	**241**	**248**	**253**	219	**232**	**259**	224	235	222	242
October	241	230	234	237	235	(207)	227	253	212	226	209	229
November	228	232	230	229	(209)	213	225	232	208	222	(207)	218
December	219	228	221	225	214	211	214	224	213	223	213	226
Average	227	220	222	226	231	216	218	235	228	226	228	231

The above table shows that, as a rule, the hogs marketed in August and September are the heaviest of the year, while the smallest average weights usually occur in the months of January and February. This is due to the fact that the pig crop makes its annual appearance on the market in finished form during the first two months of the year, being held until the hog's share of the corn crop has been utilized in fattening him for the market. The heaviest weights are attained in August and September because of the absence from the market at that time of any considerable number of young hogs. Receipts are also fewer during August and September and include more aged animals, such as discarded sows, the result of culling down breeding stock after pigs are weaned and before winter begins. More hogs are marketed in winter than in summer, the heaviest marketing usually occurring in January. That the heaviest receipts occur in January and the smallest in September is explained by the close dependence of hogs on corn. Hog growers wait until the corn crop can be put on the backs of their hogs before marketing them. This explains the monthly fluctuation in receipts.

CHAPTER XXIII.

MARKET CLASSIFICATION OF SWINE.

At Chicago the charge for the yardage of hogs is eight cents per head. The commission charge for selling hogs is twenty cents per head. On straight carloads, however, the commission charge is $12.00 plus five cents per cwt. on all weight over 22,000 pounds. Public inspection of hogs costs twenty cents per car, no fee being charged on cars containing less than twenty head.

Following is the classification of swine as used on the principal markets and by newspapers reporting these markets:

Classes		*Sub-classes*	
Prime Heavy Hogs	350—500 lbs.	None	
Butcher Hogs	180—350 lbs.	Heavy Butchers	280—350 lbs.
		Medium Butchers	220—280 lbs.
		Light Butchers	180—220 lbs.
Packing Hogs	200—500 lbs.	Heavy Packing	300—500 lbs.
		Medium Packing	250—300 lbs.
		Mixed Packing	200—280 lbs.
Light Hogs	125—220 lbs.	Bacon: English	160—220 lbs.
		Bacon: United States	155—195 lbs.
		Light Mixed	150—220 lbs.
		Light Light	125—150 lbs.
Pigs	60—125 lbs.		
Roughs			
Stags			
Boars			
Miscellaneous		Roasting Pigs	15— 30 lbs.
		Feeders	
		Governments	
		Pen Holders	
		Dead Hogs	

The various sub-classes are graded prime, choice, good, medium, and common.

Prime Heavy Hogs.

This means a prime, heavy, fat-back hog, weighing from 350 to 500 pounds — the extreme of the fat or lard hog type. With the tendency of the market toward the lighter hogs, there are not so many of this class as formerly. Only the best

hogs of these weights classify here. They yield a heavy loin carcass.

Fig. 72. Prime Heavy Hogs.

Carload of Berkshires, Grand Champions at the 1913 International, fed and exhibited by Mr. E. D. King of Burlington, Kan. Average weight, 428 pounds. Note their smooth finish, good quality, and trim lines, combined with heavy weight.

Butcher Hogs.

Butcher hogs are principally barrows. Barrows sell more readily and at better prices than sows. In a drove of butcher

Fig. 73. Prime Butcher Hogs.

hogs there may be present a few good sows without detracting from the value of the drove. Good young sows are usually kept on the farm for breeding purposes, and poor young sows

and old sows will not take on the finish required in the butcher hog class. Butcher hogs yield light loin carcasses and are commonly used for the fresh meat trade. They may be slaughtered and consumed in the East, may be slaughtered locally and the meat consumed locally, or the carcasses may be shipped east. About twenty-five per cent. of the hogs coming to the Chicago market are of this class. They range in age, with good care and heavy feeding, from about six months for the light butchers to one year for the heavy butchers. With less feeding the age will be greater for hogs of the various weights. Except in weight, the three sub-classes of butcher hogs are practically the same.

Prime butcher hogs. — Hogs that will grade as prime butchers, either heavy, medium, or light, must be very good in quality, correct in form, and show evidence of ripeness in condition. The hog must show a high state of finish resulting from liberal grain feeding to maturity. Maturity is that stage

Fig. 74. Choice Butcher Hogs.

in the process of feeding where growth ceases and the animal takes on a fully developed form and appearance and a high state of finish. This may result at different ages and weights, thus giving us prime heavy hogs, and prime heavy, prime medium, and prime light butcher hogs ranging in weight from 500 down to 200 pounds.

Packing Hogs.

The hogs of this class are a poorer sort than butcher hogs, and it is here that we find old brood sows and all other hogs that are heavy enough for this class and not good enough to

classify as butcher hogs or as prime heavy hogs. However, it does not include the poorest classes, such as roughs, boars, and coarse stags. This is the class of hogs which, as the name indicates, is of particular importance and interest to the packer. The side pork from these hogs is used principally in the various processes of curing. It is made into mess pork, short-cut mess pork, dry-salt sides, and the hams and shoulders are cured. About forty per cent. of the hogs received at Chicago are of this class. They range in age from nine months upward. A 200-pound packing hog is usually an older hog than a 200-pound butcher hog. Packing hogs differ widely

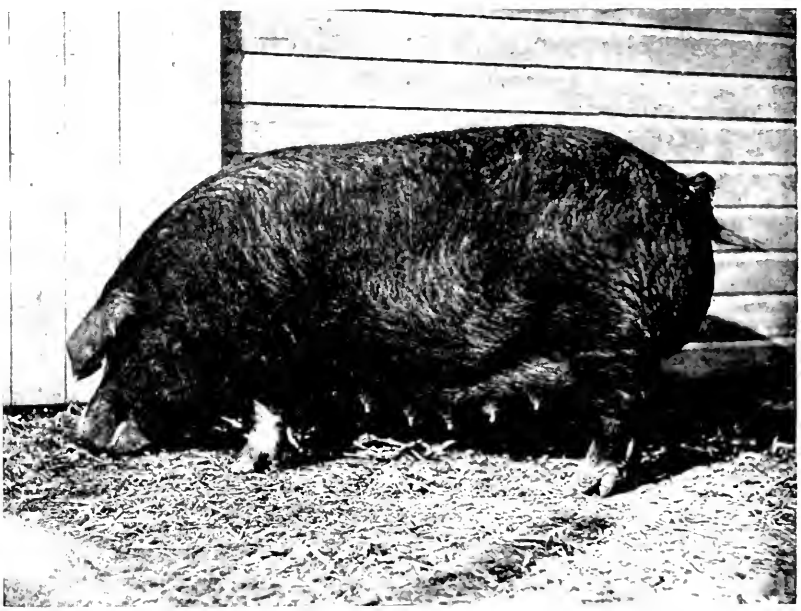


Fig. 75. Packing Sow.

in character. The class includes old sows that bear evidence of once having had pigs, but are fitted in very high condition; good packing hogs, either heavy or medium according to weight; barrows that are not well enough developed and not good enough in form, quality, and condition to go into the butcher hog class, and there may be a mixture of sows and barrows quite varying in quality and condition. Pregnant sows sell with a dockage of 40 pounds.

Sub-classes of packing hogs. — **Heavy packing** includes the heavy hogs of the packing hog class, and **medium packing** includes the lighter hogs. **Mixed packing** is a sub-class that is somewhat characteristic in itself, for it includes hogs coming from local buyers in the country, and represents hogs of different classes as well as different grades, as the name indicates. There may be heavy packing, medium packing, some light hogs, and even a few butcher hogs in the drove. Many such droves come to the market and are sold to the packer without sorting. In such cases the sorting is done after slaughtering when the carcasses are being cut, the heavy ones being sent one way and the lighter ones another. It is principally mixed packing hogs that furnish a field for operation to the speculator. He buys several carloads of these mixed packing hogs and sorts them into various classes and resells them.

Light Hogs.

The light hog class includes all hogs within the weight limits, 125 to 220 pounds, except roughs, stags, and boars, which form separate classes. About fifteen per cent. of all Chicago hogs are of this class. They range in age from five to eight months. Although alike in weight, hogs of this class vary a great deal in form, quality, and condition. Such being the case, the meat from them is prepared differently, thus making the sub-classes of more importance than in the two former classes. The sub-classes of light hogs are English bacon hogs, bacon hogs of the United States, light mixed hogs, and light-light hogs.

English bacon hogs.—The kind of a hog that is typical of this sub-class of light hogs has already been described in the chapter dealing with bacon hog type. The hog that is representative of this sub-class belongs primarily to Great Britain, Denmark, and Canada. Many hogs are sold on the Chicago and other markets for bacon purposes, but the majority of them are not of true bacon type. This hog must be long in body, deep in side, with comparatively narrow back, narrow and light hams and shoulders, and light muscular neck. As the side of the hog furnishes the best and most expensive cuts, it is desirable to have the side as well developed as possible in length and depth. This hog must have firm flesh, be well

covered with lean meat or muscle, and must not have an excess of external fat. The weight must be between 160 and 220 pounds, with weights between 175 and 190 pounds preferred. Such weights insure cuts that are most desirable as to size, flavor, and firmness. A hog smaller than 160 pounds would furnish a side of bacon that would be too thin, while a hog over 220 pounds would yield a side that would be too thick. A hog younger than is required to produce the desired weight would have too much water in its flesh, and the meat would not have proper "substance." When a hog is heavier than 220 pounds there is too much fat on the outside of the carcass and also intermixed with the lean, and there is also a tendency to lay on fat unevenly and in patches. Such a hog cannot produce good bacon.

Bacon hogs of the United States. — As there are only a few real bacon hogs produced in this country, the trade is supplied from the lighter hogs of the lard type which show a tendency toward the bacon type. In other words, this sub-class includes hogs selected from the light hog class that conform as nearly as possible to the bacon type. They weigh from 155 to 195 pounds, and range in age from six to eight months. The bacon made from them is inferior to that made from true bacon hogs and hence brings a lower price. About twenty per cent. of the light hogs that come to the Chicago market are of this sub-class.

Light mixed hogs. — About 55 per cent. of the light hogs coming to Chicago are of this class, and here we find somewhat of a miscellaneous class quite similar, except as to weight, to mixed packing hogs. This class contains hogs of the light butcher weights that are too poor in quality, form, and condition for butcher hogs. It also contains hogs of the same weights as bacon hogs, that are too much of the fat or lard type for bacon. This class, then, is made up of outcasts of two other classes of hogs; in one case it takes the poorer hogs and in the other case the better hogs, considered from the fat or lard hog standpoint. Hogs of this class are used principally for the fresh meat trade and weigh from 150 to 220 pounds. They range in age from five to seven months.

Light-light hogs.—About 25 per cent. of the light hogs coming to Chicago are of this sub-class. They range in weight

from 125 to 150 pounds, and in age from five to six months. They are called "light light" because they are the lightest of light hogs. They are used principally for the fresh meat trade. In the Buffalo market light hogs weighing from 130 to 180 pounds are called "Yorkers." They are so called because they find ready sale on the New York market and are very often shipped there from Buffalo. "Dairies" is another term used in Buffalo, and means hogs that have been fed on slops and refuse from dairies. The flesh of these hogs is not so firm nor will they dress out so well as corn-fed hogs.

Pigs.

Pigs, as they are considered on the market, range in weight from 60 to 125 pounds, and in age from 3½ to 6 months. All pigs within these limits classify here. They are used principally to supply the demand from the cheaper restaurants and lunch counters, and are in greatest demand in winter, being hard to preserve fresh in summer and too young to cure. About 10 per cent. of the hogs coming to the Chicago market are of this class.

Roughs.

In this class we find hogs of all sizes that are coarse, rough, and lacking in condition. The pork from these hogs is used for the cheaper class of trade for both packing and fresh meat purposes. In market reports, pigs and roughs are frequently classed together; not because they belong in the same class, but because they sell at about the same price.

Stags.

Stags are hogs that at one time were boars beyond the pig stage and were castrated. They sell with a dockage of 80 pounds. If they are of good quality and condition and do not show too much stagginess, they go in with the various grades of packing hogs. When they are coarse and staggy in appearance they are sold in the same class as boars.

Boars.

Boars are always sold in a class by themselves and bring from two to three dollars per cwt. less than the best hogs on the market at the same time. They sell without dockage. The pork is used to supply the cheaper class of trade and also for making sausage.

Miscellaneous.

Roasting Pigs.—These are from three to six weeks old and weigh from 15 to 30 pounds. They come to market in small numbers and only during holiday seasons. They are taken direct from their dams, dressed with head and feet on, and served like spring chickens or turkeys. The price varies greatly.

Feeders.—These are hogs bought on the market and taken back to the country to be further fed. However, very little of this is done, because the profit resulting from such undertakings is small and the danger of diseases such as hog cholera is great. Hogs are usually fitted for market in first hands.

Governments. — Before hogs are allowed to pass over the scales to be weighed out to the packer, the speculator, the shipper, or any one else who may choose to buy them, they must first pass the scrutiny of a government inspector. All hogs not considered sound in every respect are tagged by this inspector and retained for further examination. Badly pregnant sows, hogs with bunches, boils, etc., also hogs with cuts on the hams and shoulders are retained. These are called "Governments." They are usually bought up by a local dealer and taken to one of the smaller packing houses where they are slaughtered under the supervision of an inspector. If found to be affected so as to make the flesh unfit for human food, they are condemned and tanked. The tank is a large steam-tight receptacle, like a steam boiler, in which the carcass is converted into grease and fertilizer.

Pen holders.—The stock yards in Chicago are owned by the Union Stock Yard and Transit Company. This firm gets its revenue from the charges for yardage of stock, for weighing the stock, for feed, and for terminal switching. Commission men who sell the stock and speculators who handle part of it pay nothing for their privilege. They hold their respective positions by common consent and their respective pens by keeping hogs in them. These are called pen holders. They are long legged, poor in form, coarse in quality, thin in condition, and worth little money. They are kept simply for the one purpose of holding pens.

Dead hogs. — These are hogs that have been killed in transit. They are used in the manufacture of grease, soap, and fertilizer. If they weigh 100 pounds or over, they sell for $1.25 per cwt. If they weigh less, they are held in payment of the cost of handling and the shipper gets no return.

Hog Prices at Chicago.

The Chicago Live Stock World reviewed the Chicago hog market of 1914 as follows: "Hog supply all around the market circle in 1914 was extremely light, the logical result of devastation of Missouri Valley herds by cholera the previous year. Local receipts are close to a million less than last year. Year-end supply was swelled by a heavy December movement for which foot and mouth disease was to some extent responsible. Prices ruled high, especially during the first half of the year. After the European war broke out, the market suffered considerable vicissitude, due to closure of several important outlets for product, especially Germany and the South."

Market values of the various classes. — No detailed records are kept of the average prices made by the various market classes of hogs on the Chicago market. The following table compiled from reports published by the *Chicago Daily Farmers and Drovers Journal* gives the yearly average weight and yearly average prices of hogs marketed at Chicago from 1905 to 1914, and also the averages for the entire ten-year period.

Year	Average weight	Heavy packing hogs	Light hogs	Pigs	Mixed hogs	All classses
	Pounds					
1905	222	$5.25	$5.25	$4.90	$5.25	$5.25
1906	226	6.25	6.25	5.95	6.25	6.25
1907	232	6.05	6.15	5.75	6.15	6.10
1908	216	5.75	5.60	4.80	5.70	5.70
1909	218	7.45	7.25	6.55	7.25	7.35
1910	235	8.90	8.90	8.80	8.90	8.90
1911	228	6.70	6.70	6.05	6.70	6.70
1912	226	7.55	7.50	6.40	7.60	7.55
1913	228	8.20	8.45	7.35	8.50	8.35
1914	231	8.20	8.35	7.60	8.30	8.30
Ten year average	226	$7.05	$7.05	$6.40	$7.05	$7.05

CHAPTER XXIV.

BREEDING FOR THE MARKET.

Hog raising has always been a profitable and favorite department of farming in the United States. In colonial times pork production was a very simple matter. Hogs were allowed to run wild in the woods where they fed upon roots and natural grasses and fattened upon acorns and beech and hickory nuts, called "mast." The only expense to the farmer was the

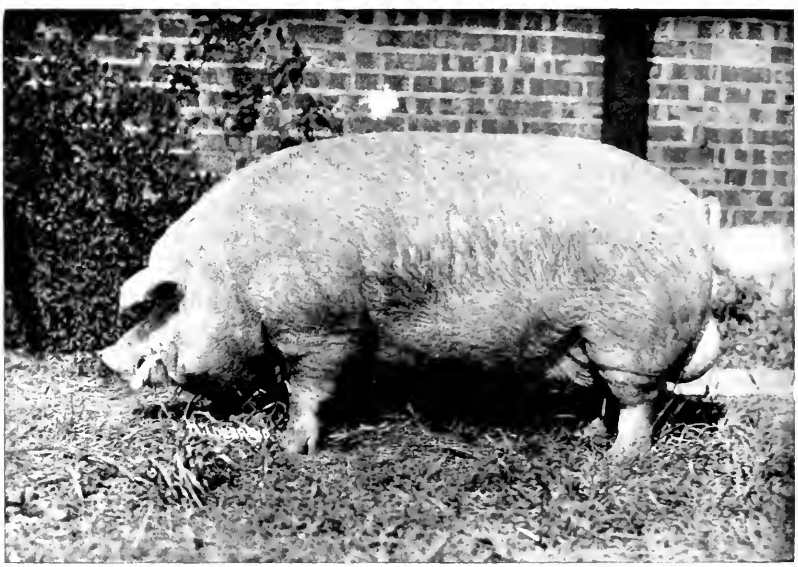


Fig. 76. Good Type in the Breeding Boar.

Chester White boar, Champion at the Iowa State Fair in 1913. Owned by Mr. A. B. Somerville of Monroe, Ia.

winter feeding of those too young for market and of those reserved for breeding purposes. Inasmuch as Indian corn was the feed used and as this cereal would not repay the expense of transportation to market until the introduction of railways, it cost very little to produce pork. Even after the organization of the national government and the settling up of the Middle

West it was the general impression among farmers that it cost nothing for a man to make his own pork, and for a long time large numbers of dressed hogs were sold in that section of the country at prices ranging from seventy-five cents to one dollar per cwt. and were considered sufficiently remunerative at these figures.

As greater areas came under cultivation and the natural forests became more restricted, it was found more profitable and convenient to feed hogs on corn than to turn them out into the woods, as they grew faster and took on more fat. It was at this stage in the development of the American swine industry that pork packing was commenced, and this gave a pronounced impetus to hog production. This was before the days of railroads, and hogs were taken overland in droves to the nearest packing point. Later, when the railroads came, a great saving was effected by eliminating losses due to the giving out of hogs on the route, and pork packing and hog raising received an impulse that has greatly helped to make pork one of the most important staples of the country.

To show the importance of the United States in the swine industry of the world it is only necessary to state that we have 38.4 per cent. of the hogs of the world. According to the latest available figures, the United States has 64,618,000 hogs. The leading countries are as follows:

United States	64,618,000	Columbia	2,300,000
Germany	21,924,000	Philippines	1,822,000
Austria-Hungary	14,540,000	Venezuela	1,618,000
European Russia	13,521,000	Denmark	1,468,000
France	6,904,000	Siberia	1,369,000
Canada	3,448,000	Belgium	1,349,000
United Kingdom	3,334,000	Formosa	1,308,000
Argentina	2,900,000	Netherlands	1,260,000
Spain	2,571,000	Portugal	1,111,000
Italy	2,508,000	Roumania	1,021,000

The hog census by continents is as follows:

North America	70,152,000	Africa	1,808,000
South America	7,322,000	Oceania	1,196,000
Europe	75,400,000		
Asia	5,584,000	Total	161,462,000

The distribution of hogs (on farms) in the United States on January 1, 1915, was as follows:

North Atlantic Division	2,551,000
South Atlantic Division	7,074,000
North Central, East of Mississippi River	15,812,000
North Central, West of Mississippi River	22,988,000
South Central Division	13,467,000
Far Western Division	2,726,000
Total	64,618,000

The ten leading states and the number of hogs in each in 1915 were as follows:

1. Iowa	8,720,000	6. Ohio	3,640,000
2. Illinois	4,358,000	7. Texas	2,880,000
3. Missouri	4,250,000	8. Kansas	2,656,000
4. Indiana	4,167,000	9. Wisconsin	2,255,000
5. Nebraska	3,809,000	10. Georgia	2,042,000

The states of the Mississippi valley play a very important part in the swine growing industry of the world. No other region is so favored as is the corn growing region of the United States.

When the United States was settled, swine were brought over from Europe, but conditions here, and especially in the cornbelt, were very different, and the character of the hog was changed to meet the demand as it developed under the different conditions. The new type of hog which was then originated was what is called the fat or lard hog. There were three principal reasons for its development. These were (1) the abundance and good fattening qualities of corn, (2) the home demand for cured meats, and (3) the foreign demand for cheap meats.

1. Corn is a plant native to America, and in the cornbelt can be produced with much less cost than can any of the other grains. It is a feed comparatively rich in carbohydrates and much lacking in protein. Carbohydrates are used in the animal body for building up fat and to furnish the fuel that is used in the production of physical energy. Protein is that part of a food material that is rich in nitrogen and is used principally to build up muscle or lean meat. Since corn is the

principal feed for swine in the United States, it is only the natural consequence that our hogs are of the fat or lard type.

2. In the earlier history of the United States, very few, if any, of the frontier sections had railroad facilities, so could not import fresh meats; neither had they facilities for local production of meats. Then again, these places, and especially the lumber camps, used a great deal of meat, and it had to be of such a nature that it could be hauled long distances on wagons and be capable of long storage after reaching its destination. The most satisfactory meat for this purpose was mess pork. There are two reasons why fat salt pork was better than lean salt pork. (a) Fat pork does not become so salty on being pickled as does lean pork. It is not so thoroughly penetrated by the salt, therefore it is more palatable after long storage than is lean pork, which also requires a larger quantity of salt, and is not so well preserved as is the fat pork. (b) Fat pork was better both from the employer's and the consumer's point of view, because on account of its fatty nature, it contains two and one-fourth times as much energy per unit of weight as does lean pork, therefore making a cheaper article on the bill of fare, also furnishing sufficient energy to the laborer who was toiling hard in cold winter weather. The following table giving analyses and fuel values of a number of common foods shows the high fuel value of pork products. It will also be noticed that the foods with the largest fat content have the highest fuel value.

Foods	Analyses	Refuse	Water	Protein	Fat	Carbohydrate	Ash	Fuel value per pound—calories*
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Lard, refined					100.0			4220
Back fat—hog	3		7.7	2.3	89.9		.1	3835
Salt pork	6		7.3	1.8	87.2		3.7	3715
Bacon, smoked	13	8.1	17.8	9.6	60.2		4.3	2720
Mess beef	2	10.5	33.0	10.7	39.9		5.9	1885
Oatmeal	13		7.2	15.6	7.3	68.0	1.9	1860
Starch						98.0		1825
Entire wheat flour	5		12.1	14.2	1.9	70.6	1.2	1660
Corn meal, bolted	9		12.9	8.9	2.2	75.1	.9	1655
Mutton loin, without kidney and tallow	15	14.2	40.5	12.8	31.9		.6	1585
Bread, white	108		35.4	9.5	1.2	52.8	1.1	1205
Beef loin, boneless strip	6		60.7	18.9	19.5		.9	1175
Ribs	28	20.2	44.9	13.6	20.6		.7	1120
Leg of lamb	4	13.8	50.3	15.3	19.7		.9	1115
Round	44	8.5	63.0	18.7	8.8		1.0	720
Hens' eggs		10.5	66.0	13.1	9.5		.9	645
Apples, fresh	10	25.0	61.5	.4	.4	12.4	.3	255
Vegetable soup	1		95.7	2.9		.5	.9	65

*Heat and muscular work are forms of force or energy. The energy is developed as the food is consumed in the body. The unit commonly used in this measurement is the calorie, the amount of heat which would raise the temperature of a pound of water 4 degrees F.

3. There was a foreign demand by the poorer classes of people for cheaper meats than could be supplied by their high-priced bacon industry. This cheaper meat could be supplied in the form of fat pork made from low-priced corn, and at the same time could be furnished at a profit.

From these various causes it is clearly evident that the fat or lard hog of the United States was produced not only because he could be produced more cheaply than the bacon hog, but also because there was a demand for just such a hog.

Some of the weights of hogs marketed at Cincinnati in the early days serve to show rather strikingly that market hogs, like market cattle, have undergone an evolution from im-

mense weights in the early days to the handy-weight market animal of the present time. In 1857 the following records of weights were made on the Cincinnati market:

Number of hogs	*Net weight*	*Average per hog*
3	2,301	710
5	3,200	640
7	5,040	720
22	8,866	403
50	18,750	375
52	19,604	377
320	104,000	325
657	200,355	305
1,116	361,846	324

In 1866 these weights were exceeded as shown in the following records for that year:

Number of hogs	*Net weight*	*Average per hog*
11	6,732	612
20	15,452	772
30	15,180	506
35	15,785	451
35	15,712	449
43	15,738	366
107	43,014	402
200	71,800	359
346	139,092	402
400	150,000	375
1,227	488,505	398

Of the lot of twenty included above it was said: "The lot of twenty, raised and fed for market in our county (Hamilton County, Ohio) has certainly no parallel in the wide world, none of the hogs exceeding 19 months in age, and generally running from 15 to 16 months old."

Wren and Schaffer of Middletown, Ohio, packed in 1870 a lot of thirty-eight Poland-China hogs averaging 613 pounds gross at 21 months old, all fattened by one man in Butler County. Following are records of a large number of hogs (Poland-Chinas) raised in Butler County, Ohio, and sold to packers in 1870:

Number of hogs	*Average Gross weight*	*Number of hogs*	*Average Gross weight*
80	574	20	501
40	516	45	536
38	570	75	493
48	513	60	490
42	517	40	713
40	504	12	773

There is record of one lot of 30 Poland-Chinas marketed in 1870 that averaged gross 384 pounds at eleven months of age, while another lot of ten of the same breed and age marketed in that year averaged 410 pounds gross.

The immense weights of earlier times were made possible by cheap corn, by the premium paid for heavy hogs by packers in those days, and by selecting hogs of great weight for breeding purposes. During late years the tendency has been to market handy-weight hogs, and fewer heavy hogs appear

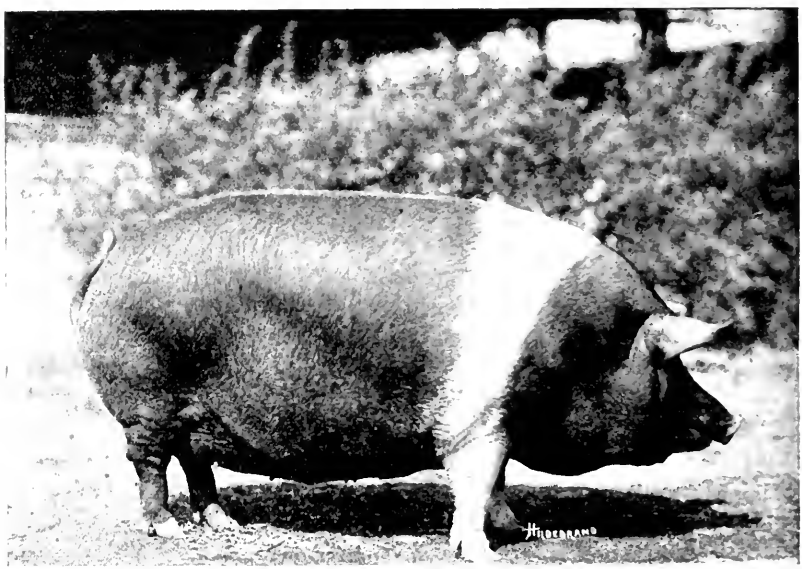


Fig. 77. Good Type in the Breeding Sow.

Hampshire sow, Gloria 2d, Champion at the Iowa State Fair in 1914. Owned by Mr. Russell Yates of Palo, Ia.

on the market each year. This change has been brought about by the high price of corn, by improved methods of packing which permit hogs of less fatness and lighter weight to find favor with packers, by the general tendency on the part of the consumer to favor light cuts, and by the growing demand for bacon in place of the old-fashioned, heavy salt meats. The breeder also has played a part in this change to the handy-weight market hog, by giving preference to hogs

of quality and smoothness over those of large size and tending toward roughness and lack of quality. In fact some breeds have actually deteriorated of late years because of the fact that most of the breeders have gone too far in the matter of securing quality and refinement in their animals and have failed to keep up enough size and constitution to suit the practical hog grower. This mistake is realized at the present time and today the effort is being made to get back on safer ground by breeding for all the size possible and yet maintain a proper degree of quality in the animal. The ideal is a medium-weight hog, or a hog slightly above what would be called medium weight, possessing desirable quality, smoothness, and symmetry.

At the present time the profitable stage for the grower to market lard hogs is between 250 and 300 pounds. Nevertheless, hogs used for breeding purposes should possess plenty of size along with desirable type and quality. If the breeding stock is of large size, the offspring will be growthy and will attain marketable weight in quick time. The man who is producing market hogs wants big, roomy sows with good length, such sows being more prolific and hence much more profitable than the compact type lacking in size. The boar should be of the same growthy sort as the sows, but in both sexes quality should be in evidence along with size. In breeding for the market, sows need not necessarily be purebred, though it is desirable that they should be, but the boar should in every instance be purebred. Attention should be given to color in order that uniformity of color may prevail among the animals finished for the market. This is secured by selecting sows which, if not purebred, are at least all high grades possessing the blood and characteristics of the same breed from which the boar is selected. By sticking to one breed, uniformity will prevail among the animals marketed, and this will sufficiently increase the price to more than repay for the extra time and trouble required in selecting breeding stock of the same type and color.

With no other kind of live stock is there practiced so much mixing of breeds and cross-breeding as in the breeding of hogs for the market. It is very commonly believed that

by crossing a boar of one breed upon sows of another breed, more vigorous and growthy offspring will result. While there is no serious criticism to be made against such a method so far as the first cross is concerned, it invariably happens that if this policy is followed up and further crossing and mixing is resorted to, a variety of shapes and colors is presented that is most unattractive as compared with a bunch of hogs possessing good uniformity. In the majority of cases it will be most profitable to pick out one of the standard breeds of hogs and stick to that breed year after year. If this is done there need be no lack of vigor in the offspring if the parent stock is selected with due care as to constitution and vigor.

PART FOUR.

HORSES.

INTRODUCTION.

For centuries the horse has been a faithful servant of man in the capacity of a burden bearer. "From remotest ages he has come with man, side by side, in the glory and achievements of the white race. In all the darings and doings of the Saxon, wherever countries were to be conquered, battles fought, and the banner of Britain carried round the world, wherever has been a footprint, there also was the hoof-beat." As compared with other domesticated animals, the horse is peculiar in his relation to man, for he is valuable on account of his ability to do work and not because he furnishes a tangible product useful as food or otherwise. It is his athletic ability which makes the horse useful.

None other of our domestic animals occupies as important a place in the economy of things as does the horse; if all the horses were suddenly taken from the nations of the world, agriculture, business, and commerce would be seriously impaired and we would soon be in a state of famine. Consider the vast number of horses in use on farms, on city streets, on country roads, in armies, and for numerous pleasure purposes, such as riding, driving, racing in harness and under saddle, hunting, and polo. We could give up any of the other domesticated animals with much less serious results, and this in spite of the advent and improvement of the automobile and motor truck and their wide use at the present time.

The horse may be said to be a locomotive which consumes hay and grain instead of coal. He is self-feeding, self-controlling, and self-reproducing, and is at the same time a very efficient motor. Farmers who use horses may be compared to the engineer who operates a motor. Farmers who breed horses may be compared to the manufacturer of motors. No man can manufacture or operate a motor with real success

unless he understands its construction, the importance of its various parts, their strength or weakness, and their relation to one another. No man can learn the construction of a motor by studying its exterior only; he must take it apart and study the various parts, and then put them together again. Then he must put it in motion and study the action of the various levers, pulleys, and springs, in order that he may know the location of weaknesses and at what points the most wear comes. Knowing these things, he can manufacture a motor of high efficiency, or, operating one, he can obtain from it the greatest amount of work with least danger of injuring the machine. Hence we see how important is a knowledge of the anatomy of the horse as a basis for the study of types of horses and the requirements and capabilities of each type.

It is not possible to develop a good judge of any kind of live stock by teaching simply what to look for in an animal. A mere description of parts or points is not sufficient. The student wants to know why certain things are desirable in an animal, and why certain other things are undesirable. He must know the "why" of each point if he is to value each point properly and put emphasis where it belongs. This is especially true in learning to judge horses. No matter how carefully the points to be looked for in feet and legs are described, the student cannot recognize the importance of these parts and know what constitutes a first-class foot and limb, unless he has a fairly good idea of their anatomy and physiology. In the pages which follow, the writer has, therefore, given considerable attention to some of the essential features of horse anatomy before entering upon a description of the various types and market classes of horses.

CHAPTER XXV.

BRIEF ANATOMICAL STUDY OF THE HORSE.

In all animal life the cell is the structural and functional unit. A tissue is a collection of similarly differentiated cells. A number of tissues grouped together form an organ. The body is an aggregation of organs. We feed a horse to produce tissue and to produce energy. The systems of organs are seven in number. They are (1) skeletal, (2) muscular, (3) digestive, (4) respiratory, (5) genito-urinary, (6) nervous, and (7) integumentary.

Skeletal system.—The skeletal system is important as it largely determines the conformation of the horse. The skeleton of the horse is composed of a number of bony segments, most of which exist in pairs. The divisions of the skeleton are (1) head, (2) neck, (3) trunk, and (4) limbs. The head consists of numerous bones, mostly flat, united by sutures which gradually undergo obliteration with age. The lower jaws are strong and in each jaw there are six molar teeth (24 in all). Twelve of these are temporary—three in each jaw, and known as the 1st, 2nd, and 3rd molars, while the 4th, 5th, and 6th are permanent. There are also six incisors in the upper and six in the lower jaw, all of which are temporary and are entirely replaced by the time the animal is 4½ years old.

The vertebral column is a chain of 54 to 56 irregular bones (vertebrae) extending from skull to end of tail. There are seven cervical (neck) vertebrae, 18 dorsal (back), 6 lumbar (loin), 5 sacral (croup), and 18 or 20 caudal (tail) vertebrae. From above, the spinal column exhibits a concave cervical curve, a convex dorsal curve, a nearly straight lumbar region, and the sacro-caudal curve is concave below. The 3rd, 4th, and 5th dorsal vertebrae have the highest spines which form the withers.

There are 18 pairs of ribs, 8 of which are true and 10 false. The 8 true pairs join the 8 segments of the sternum or

breast bone. The 7th or 8th ribs are longest. There is no collar bone (clavicle) as in man, and the fore limbs are not attached to the trunk but are connected by intervening muscles. The hind limbs are united to the trunk by the pelvic girdle which, in reality, is composed of three segments on each side.

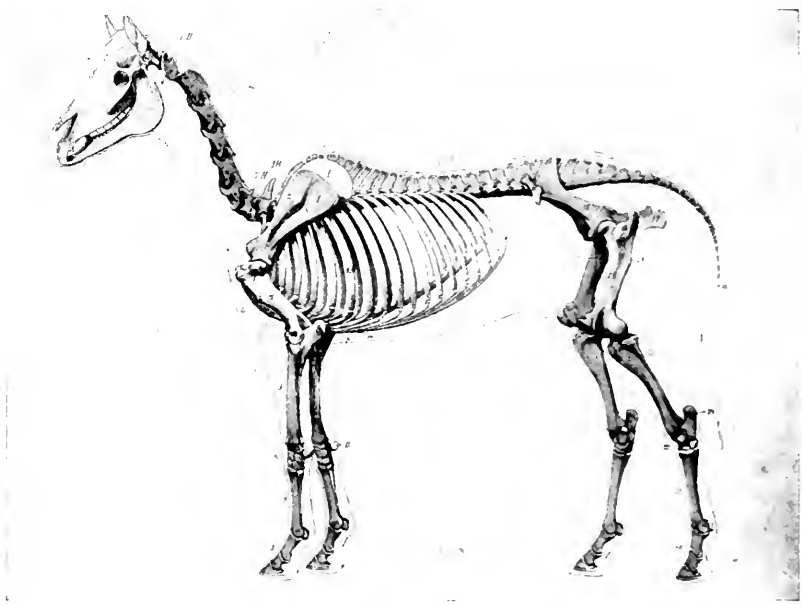


Fig. 78. Skeleton of the Horse.

This illustration shows the location of the bones, and the degree to which the skeleton and the muscle influence the form.

Muscular system.—The horse comprises a great number of systems of levers represented in the bones and joints, each supplied with a system of muscles which furnish the power. Muscles exert a force in only one way, and that by shortening, giving a pull. For this reason muscles are arranged in pairs, as illustrated by the biceps and triceps which move the forearm in man. The flexor muscles are always inside the joint and the extensors outside. The theory has been advanced that the shortening of muscles is due to a change in the form of the muscular cell from an elongated form to one nearly round when stimulated by nerve action. Muscles act through

very short distances and upon the short end of levers composing the animal frame. Acting in this way, speed and distance are gained with a corresponding reduction in the magnitude of the force. Because muscles are able to act only through very short distances, it is necessary for them to act upon the short end of the levers in order that sufficiently rapid movement may be gained.

The muscular system obtains its maximum development in the horse, and upon the excellence of this, beauty of conformation largely depends. Especially is this latter true of the neck and hindquarters. The muscles of the back and loin are the largest in the body. There are no muscles below the knees and hocks—only their tendinous prolongations. The first muscle under the skin almost covers the entire body and is the one that enables the animal to shake flies or any irritating foreign substance off its skin.

Digestive system.—The tongue is small as compared with that of the ox. The gullet is long and has a very small opening into the stomach. The capacity of the stomach is small, holding between 3 and 4 gallons, while the stomach of the ox holds 30 to 40 gallons. But the small size of the organ is compensated for by the large size and capacity of the intestines which hold twice that of the ox. The large intestine has a capacity of about 20 gallons, and the small one 12 gallons. The liver is large, as are also the kidneys.

Respiratory system.—The respiratory organs are well developed, and comprise the nasal cavities, the larynx, the trachea, the bronchial tubes, and lungs. The heart is large and four chambered, and the blood vessels are large and have strong, thick walls. Thus is the horse well fitted for his athletic life.

Nervous system.—The nervous system is well developed and comprises the brain and spinal cord. There are 12 pairs of nerves which take origin from these structures.

Integumentary system.—The hair or coat is shed in the spring and autumn, except that of the mane and tail which is permanent. There are both sweat glands and sebaceous glands

in the skin, but the former are practically absent from the limbs.

In judging horses, the judge takes into consideration many matters relating to the structure and interior of the animal, as well as the exterior. A wide, deep middle and a broad muzzle, for example, indicate great digestive capacity; a large nostril, windpipe, and chest show capacity for respiration; a silky coat and fine skin are normal qualties of the integument, while alertness and gracefulness of movement are evidences of good nervous control.

The horse differs from a mere machine in that he is largely capable of guiding his own movements without aid from his driver. Training accomplishes much in this regard, but the less a horse is possessed of intelligence and nervous control, the less he is automatic as a motor, and the more he becomes dependent upon his driver.

Anatomy of the Fore Limb.

From the top downward, the bones of the fore limb are as indicated in the accompanying diagram. The fore limb is

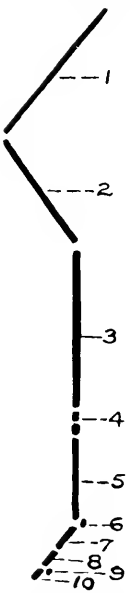


Fig. 79. Bones of the Fore Leg.

1, Scapula; 2, humerus; 3, radius and ulna; 4, seven or eight carpal bones; 5, cannon bone and two splint bones; 6, two sesamoid bones; 7, large pastern bone; 8, small pastern bone; 9, navicular bone; 10, coffin bone.

composed of a scapula (or shoulder blade) which is articulated to the humerous (or arm) by a ball-and-socket joint, and the

arm in turn articulates with the radius by a hinge joint. The lower end of the radius rests upon the upper row of the carpal bones of which there are 7 or 8 in the horse, corresponding to the wrist in man. Below the carpus (knee) is the large metacarpal (or cannon) bone, and articulated with the back of it are two slender rods of bones—the small metacarpal (or splint) bones. The lower end of the large cannon bone forms a hinge with the first phalanx (or large pastern bone), which is followed by the second phalanx (or small pastern bone), and then the third phalanx (or coffin bone), the two last named being enclosed within the hoof. In addition to these, at the articulation between the cannon and the large pastern bone are

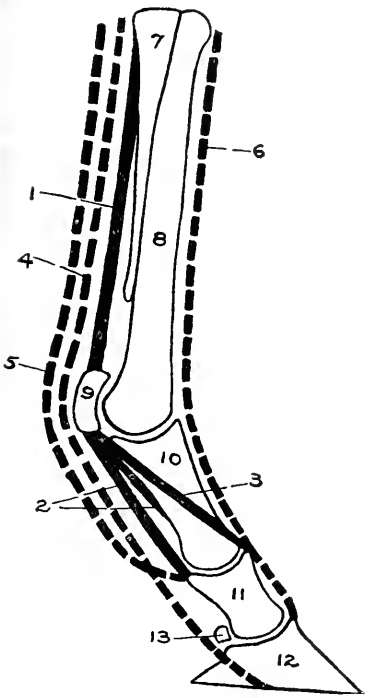


Fig. 80. Fore Leg from Knee to Ground.

Showing the bones, ligaments, and tendons. 1, Suspensory ligament; 2, inferior sesamoid ligaments; 3, branch of suspensory ligament; 4, flexor tendon of foot; 5, flexor tendon of pastern; 6, extensor tendon; 7, splint bone; 8, cannon bone; 9, sesamoid bones; 10, large pastern bone; 11, small pastern bone; 12, coffin bone; 13, navicular bone.

two small bones, known as the sesamoids, while at the back of the coffin joint there is a small bow-shaped bone, known as the navicular, which is frequently the seat of disease.

The bones are held together by ligaments. Tendons are similar in character to ligaments, but differ in that they join muscle to bone.

The scapula, humerus, the radius and ulna are enclosed in heavy muscles which move them. There are no muscles about the knee and the parts below. Instead, long tendons pass down from the muscles above, thus connecting the power with the levers of the lower part of the limb. Hence there are only bones and tendons below the forearm, together with some very important ligaments which hold the bones in proper relation to one another. These ligaments are very strong elastic cords. The lower limb moves when the muscles exert a pull on their tendons, which are likewise strong and elastic. The tendons and ligaments of the fore limb are shown in the accompanying drawing. The long ligament from fetlock to knee is the suspensory ligament. It supports the fetlock.

Anatomy of the Hind Limb.

The hind limb consists of the femur (or thigh bone) which is the largest in the body and articulates below with the tibia and also with the patella (or knee cap). The hock is composed

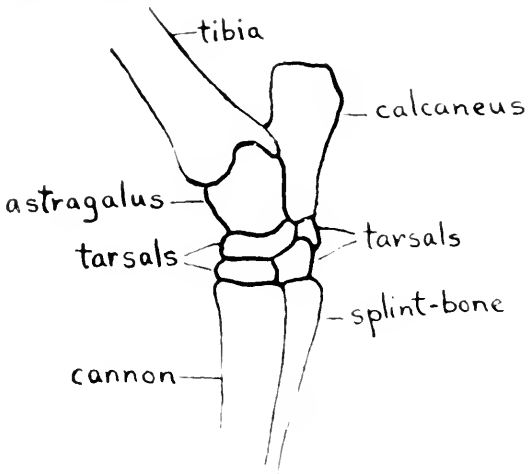


Fig. 81. Bones of the Hock.

of six bones which may be divided into two sets, each having a purpose of its own. One group of four small bones (tarsals), arranged in two rows and resting on the head of the cannon, are united together and to adjacent bones by short, powerful ligaments, and so close is the union that the movement of one

bone upon another is reduced to a simple gliding action of very limited degree. Though slight, this movement is of much importance in breaking the jar communicated to this joint in the act of progression. Above the small tarsal bones are two larger bones, the astragalus and calcaneus, as shown in the accompanying drawing.

To the calcaneus is attached the strong tendon known as the tendon of Achilles. By means of it the muscles above exert a powerful pull upon the hock joint, producing extension of the joint. This is the principal means of the horse's propulsion. The knob-like end of the calcaneus (to which the tendon attaches) forms the point of the hock. In some instances the pull upon the hock has been great enough to produce a fracture of this bone.

Sometimes a diseased condition is brought about by the ossification into one mass of some or all of the bones of the hock. This is called a bone spavin and is a serious unsoundness because it destroys the important gliding action of the tarsals and stiffens the joint.

The parts below the hock are similar in structure to those below the knee.

The skeletons of man and horse compared show striking similarity, and at some points rather marked variation and difference in proportionment of parts. There are seven or eight bones in the knee of the horse. The horse's knee corresponds to man's wrist. The bones below the horse's knee correspond to those beyond man's wrist. Following is a comparison of the bones and parts of the fore and hind limbs of the horse with the arm and leg of man.

Fore Limb of Horse		Arm of Man	
Parts	*Bones*	*Parts*	*Bones*
Shoulder	Scapula	Shoulder	Scapula and clavicle
Arm	Humerus	Arm	Humerus
Forearm	Radius and ulna	Forearm	Radius and ulna
Knee	7 or 8 carpals	Wrist	7 carpals
Cannon	3 metacarpals	Palm	5 metacarpals
Pastern and foot	1st, 2nd, and 3rd phalanx	Fingers	Thumb—2 bones Other fingers—3 bones
Hoof		Finger nails	

Hind Limb of Horse		Leg of Man	
Parts	*Bones*	*Parts*	*Bones*
Croup	Ilium, ischium, and pubis	Pelvis	Ilium, ischium, and pubis
Thigh	Femur	Thigh	Femur
Stifle	Patella	Knee	Patella
Gaskin	Tibia and fibula	Calf	Tibia and fibula
Hock	6 tarsals	Ankle	8 tarsals
Cannon	3 metatarsals	Instep	5 metatarsals
Pastern and foot	1st, 2nd, and 3rd phalanx	Toes	Great toe—2 bones Other toes—3 bones
Hoof		Toe nails	

The following drawing makes clear the comparison between the hind limb of the horse and the foot of man.

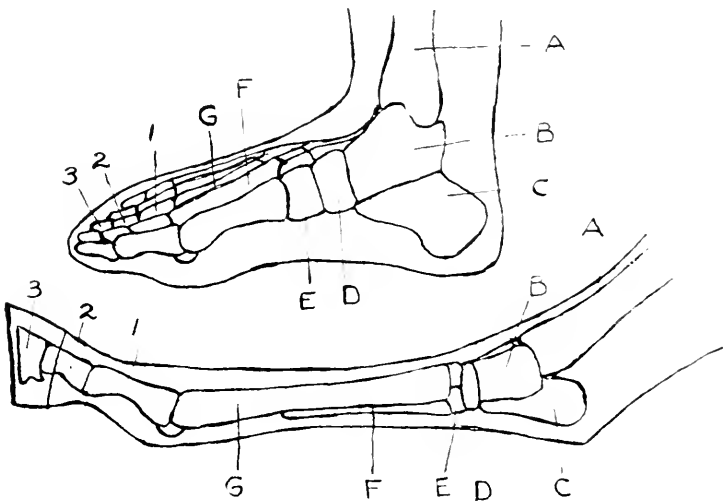


Fig. 82. Man and Horse Compared.

Bones of the human foot and hind leg of horse compared.—From Axe's *The Horse.* A, Tibia; B, astragalus; C, calcaneus; D and E, small tarsals; F and G, metatarsals; 1, 2, and 3, first, second, and third phalanges.

Anatomy of the Foot.

The foot is not a mere block of horn, but is a composite structure made up of particular parts, each with a certain work to perform. There is an old saying, very full of truth, "No foot, no horse." Therefore a knowledge of the structure of the foot is very essential to the student of the horse.

The exterior of the foot may be divided into five parts, each including one-fifth of the circumference. These are the toe, laterals, and quarters.

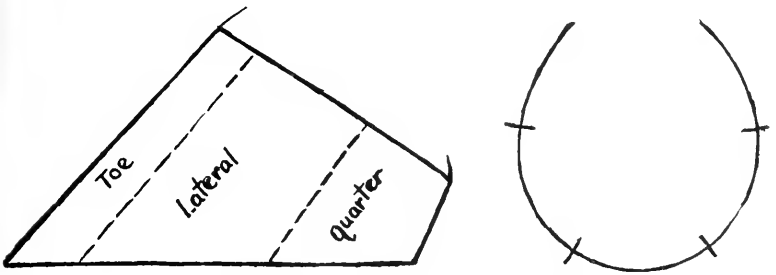


Fig. 83. Exterior of the Hoof.
Showing division into toe, laterals, and quarters.

From the interior outward, the parts of the foot are the coffin bone, lower end of the small pastern bone, navicular bone, extensor tendon, flexor tendon, suspensory ligament, inferior sesamoid ligaments, lateral cartilages, plantar cushion, pododerm or foot-skin, and the hoof. The foot also has its blood vessels and nerves.

Bones.—The bones of the foot and pastern are four in number, three of which—the long pastern, short pastern, and coffin bone—placed end to end form a continuous straight column passing downward and forward from the fetlock joint to the ground. A small accessory bone, the navicular bone, lies crosswise in the foot behind the coffin joint, enlarging the joint surface. The short pastern projects about 1¼ inches above the hoof and extends about an equal distance into it.

Tendons and ligaments.—The extensor tendon of the toe passes down the front of the pastern and attaches to the coffin bone just below the edge of the hair. The outer branch of the suspensory ligament attaches to the tendon a short distance above this point. The flexor tendon of the foot passes down between the heels, glides over the under surface of the navicular bone, and attaches to the under surface of the coffin bone. The bones of the foot are held together by powerful short ligaments.

Lateral cartilages and plantar cushion.—The elastic tissues of the foot include the lateral cartilages and the plantar

cushion. The lateral cartilages are two plates of gristle, one on either side of the foot, extending from the wings of the coffin bone backward to the heels and upward to a distance of an inch or more above the edge of the hair, where they may usually be felt by the fingers. When sound, these plates are elastic and yield readily to moderate finger pressure, but from various causes they may undergo ossification, in which condition they are hard and unyielding and are called sidebones.

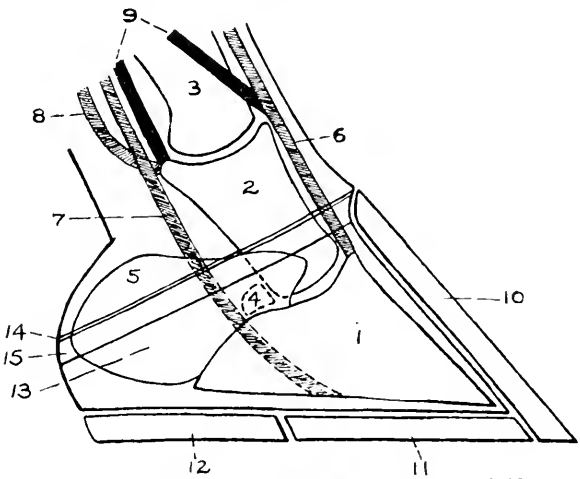


Fig. 84. Diagram Showing Structure of Foot.

1, Coffin bone; 2, small pastern bone; 3, large pastern bone; 4, navicular bone; 5, lateral cartilage; 6, extensor tendon; 7, flexor tendon of foot; 8, flexor tendon of pastern; 9, branches of suspensory ligament; 10, wall; 11, sole; 12, frog; 13, indicates location of plantar cushion between the lateral cartilages; 14, perioplic ring; 15, coronary cushion.

The plantar cushion is a wedge-shaped mass of tough, elastic, fibro-fatty tissue filling all the space between the lateral cartilages, forming the fleshy heels, and serving as a buffer to disperse shocks. It extends forward underneath the navicular bone and flexor tendon, and protects these structures from injurious pressure from below.

Pododerm (or foot-skin).—The pododerm or horn-producing membrane is merely a continuation of the derm, or true skin. It covers the foot inside the hoof, just as a sock covers the human foot inside the shoe. It differs from the ordinary external or "hair" skin in having no sweat or oil glands, but,

like it, is richly supplied with blood vessels and sensitive nerves. The functions of the pododerm are to produce the hoof and unite it firmly to the foot.

The hoof and how it grows.—The horny shell, called the hoof, which covers and protects the foot, is made up of three parts, (1) the wall and bars, (2) the sole, and (3) the frog.

Each part of the hoof is grown by some particular part or parts of the pododerm. In general it may be said that the horn of the hoof is made up of tubules or shafts of horn which grow from papillae the same as does hair. These tubules are cemented together by non-tubular matter corresponding to dandruff exfoliated by the skin. In fact, so pronounced is the similarity in growth of horn and hair that coarse hair, es-

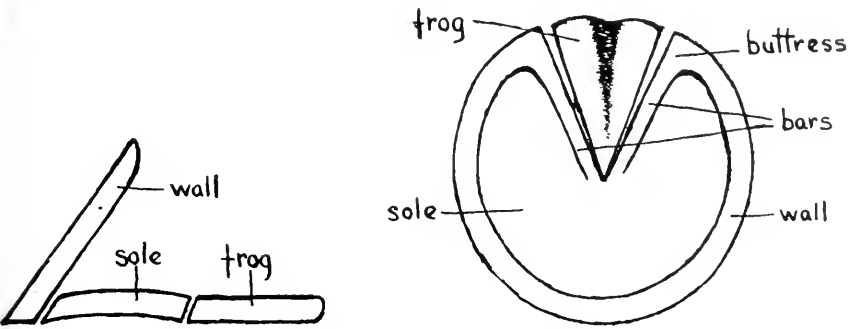


Fig. 85. The Parts of the Hoof.

pecially on the legs and coronet, is associated with horn of coarse texture. Therefore the more coarse and brittle the hair about the coronet, the more porous, brittle, and weak will be the formation of the horny hoof.

The wall horn consists of three layers known as (1) the outer or perioplic layer, (2) the middle or coronary layer, and (3) the inner or laminous layer. The perioplic layer is very thin. It is varnish-like in appearance and forms the surface or crust of the wall. Its function is to preserve the moisture of the foot and to absorb moisture. A horse working in sand or dust usually has this outer layer worn away. The coronary layer forms the real basis of the wall. At the heels it is deflected forward to form the bars of the hoof. The angle between the wall and bar is thickened and is called the buttress.

The function of the bars is to react against contraction of the heels. The laminous layer of the wall horn is not tubular. It is called laminous because it has the appearance of the leaves of a book. There are 500 to 600 of these laminae which extend from the top of the hoof to the sole. It is less thick than the coronary layer, but, like it, is deflected forward at the heels to help form the bars.

Growth of the wall.—At the lower edge of the pastern, running along the edge of the hair from one heel around the toe to the other heel, is a narrow ridge of pododerm, 1/16 to 1/8 of an inch wide, called the perioplic ring. It consists of papillae, which are microscopic nobs or nodules, and from each papilla a shaft of horn grows downward, forming the periople of the wall. Like the periople, the coronary layer grows downward from a band of pododerm at the top of the hoof. This band is called the coronary cushion, and it lies just below and parallel to the perioplic ring. At the heels it is deflected forward where it produces the horn of the bars. The laminous horn is produced by that part of the pododerm known as the fleshy laminae; these laminae extend up and down between the coronary cushion and the sole. The fleshy laminae of the pododerm and the laminous layer of the wall horn dovetail together, thus holding the hoof securely to the foot.

The sole horn is circular in shape except that it is notched at the rear where it receives the bars and horny frog. It is naturally concave below and is bounded at its edge by the wall and bars. It is very brittle, non-elastic, and easily penetrated. The sole horn is produced by the fleshy sole, which is that portion of the pododerm covering the entire under surface of the foot excepting the fleshy frog and bars.

The horny frog does not come in contact with the sole horn except at its apex. It is tough, elastic, and rather soft horn. The upper part of the horny frog has an elevation or ridge and on the bottom there is a corresponding notch or groove. The horny frog grows from the fleshy frog, which is that part of the pododerm just above the horny frog.

The preceding discussion of the parts of the hoof and pododerm may be summarized as follows:

1. Wall { Perioplic layer, produced by perioplic ring.
Coronary layer, produced by coronary cushion.
Laminous layer, produced by fleshy laminae.
2. Sole, produced by fleshy sole.
3. Frog, produced by fleshy frog.

All parts of the hoof grow downward and forward with equal rapidity, the rate of growth being largely dependent upon the amount of blood supplied to the pododerm. Abundant and regular exercise, good grooming, moistness and suppleness of the hoof, going barefoot, plenty of good food, and at proper intervals removing the over-growth of the hoof and regulating the bearing surface—all these, by increasing the volume and improving the quality of blood flowing into the pododerm, favor the rapid growth of horn of good quality. Lack of exercise, dryness of the horn, and excessive length of the hoof hinder growth.

The average rate of growth is about one-third of an inch a month. Hind hoofs grow faster than fore hoofs and unshod ones faster than shod ones. In mares and geldings the horn grows faster than in stallions. On an average the time required to grow the wall from coronet to ground is 11 to 13 months for the toe wall, 6 to 7 months for the laterals, and 3 to 4 months for the quarters. Irregular growth often occurs. This is almost always due to an improper distribution of the body weight over the hoof,—that is, an unbalanced foot. One authority on this subject says:—"If breeders were more generally cognizant of the power of overgrown and unbalanced hoofs to divert the lower bones of young legs from their proper direction, we might hope to see fewer knock-kneed, splay-footed, pigeon-toed, cow-hocked, interfering, and paddling horses."

Characteristics of a healthy foot.—A healthy foot is equally warm at all parts, and is not tender under pressure with the hands. The coronet is soft and elastic at all points and does not project beyond the surface of the wall. The wall is straight from coronet to ground, so that a straight-edge laid against the wall from coronet to ground parallel to the direction of the horn tubules will touch at every point. The wall should be covered with the outer varnish-like layer of

horn called the periople, and should show no cracks or clefts. Every hoof shows "ring formation," but the rings should not be strongly marked and should always run parallel to the coronet. Strongly marked rings are evidence of a weak hoof, but when limited to a part of the wall are evidence of previous local inflammation. The bulbs of the heels should be full, rounded, and of equal height. The sole should be well hollowed out, the frog well developed, the cleft of the frog broad and shallow, the spaces between the bars and the frog wide and shallow, the bars straight from buttress toward the point of the frog, and the buttresses themselves so far apart as not to press against the frog. A hoof cannot be considered healthy if it presents reddish, discolored horn, cracks in the wall, bars, or frog, thrush of the frog, contraction or displacement of the heels. The lateral cartilages should yield readily to finger pressure. Some horsemen object to a white hoof, believing it to be less durable, but a white hoof is as good as a dark-colored one. Horn of good quality is fine grained and tough, while poor horn is coarse grained and either too mellow and friable or hard and brittle.

CHAPTER XXVI.

SOME IMPORTANT FACTS CONCERNING THE HORSE.

Base of support.—The horse's legs are his base of support, just as the table legs support the table. The longer the legs, the less stable the base of support. The smaller the base of support, the less stable it will be. The less stable the base of support, the greater the speed of the horse; while the greater the stability, the greater the power for draft. The base of support of any object will be most stable when it comes directly beneath the center of weight. In horses the center of weight is far forward, lying immediately behind

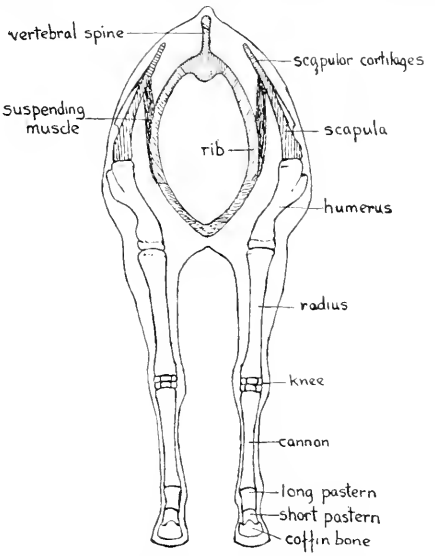


Fig. 86. Attachment of Fore Leg to Body.

Cross section through chest, showing the bones of the fore leg and the muscular attachment of leg to body. From Axe's *The Horse.*

the shoulders. Thus the fore limbs support much more of the weight of the horse than do the hind limbs, in fact it is the function of the forequarters to support, and of the hindquarters to propel. This is the more clearly shown when we

examine the anatomy of the horse, for we find that the hind legs are attached to the trunk by the strong ball-and-socket joint, while the fore limbs are not directly attached to the trunk but are connected by intervening muscles which form a sort of sling which suspends the body between the two fore legs. The muscle attaching the fore limb to the trunk is called the serratus magnus. It is an enormous triangular muscle which originates on the upper part of the internal surface of the shoulder blade and spreads out like a fan on the sides of the chest and neck and ends on the cervical vertebrae and first eight or nine ribs. The drawing presented herewith shows a front view of the muscular attachment of the scapula to the neck and trunk.

When the horse is standing, the base of support is represented by a rectangle the corners of which are the horse's feet. In the walk, the base of support is triangular, for then only three feet touch the ground. In the trot or pace, only two feet touch the ground, and the base of support will be represented by a line. In the run or gallop, the base of support is a point. Thus as speed increases there is a corresponding decrease in stability.

The horse in motion.—We have seen that the horse is rather unstable because the center of weight lies almost over the fore legs. Hence the fore legs answer the purpose simply of a support to the horse's weight when he is in motion. If we could replace the fore legs with a wheel, we would have an equally efficient motor, for that is exactly what the fore legs represent—simply a wheel with two spokes, each leg representing one spoke of a rimless wheel.

When a man walks, he leans forward in order to throw the center of his weight ahead of his base of support. This causes him to begin to fall forward, and indeed he would fall if he did not advance his foot and so bring his base of support once more under, or nearly under, the center of weight. Walking is simply a succession of interrupted falls. The same is true of the horse. In walking he pushes backward against the ground with his hind feet and causes his center of weight to tip forward. The result is that he begins to fall, and if he did not advance a fore foot he would land on his head. By

stepping forward he again assumes his equilibrium and immediately tips his weight forward again by propelling with his hind legs. Walking is simply the repetition of this performance over and over again.

In the trot and the gallop or run, there is the same backward thrust with the hind feet and the same recovery with the fore feet, but the thrust is much greater, the stride is longer, and the shock and effort in the recovery are increased in proportion.

In 1897, Tod Sloan, a famous American jockey, went to England to ride. He practiced the same seat which all American jockeys use and with which all Americans are familiar. Its peculiar feature is that the jockey sits as far forward on the horse as possible. When Sloan appeared on English race courses he was severely ridiculed, for at that time English jockeys were not familiar with our methods and it was thought Sloan was trying to attract attention to himself by adopting a ridiculous position on his horse. Race-going people laughed at him until it was noticed that he was enjoying unusual success at winning races. Sloan rode twenty winners during his first season in England, forty-three the next, and in 1899 he was first past the post with no fewer than one hundred and eight horses. In the same year, two other Americans, the brothers Lester and Johnny Reiff, also had eighty-two victories to their credit. The methods of these American jockeys were soon copied by most of the English riders, but the Americans continued to pile up a remarkable record of successes, culminating in three successive Derby triumphs—Lester Reiff's in 1901, Martin's in 1902, and Maher's in 1903. During eight years ending in 1905, the eight or nine American jockeys who appeared in England for one or more seasons divided among them, in retainers, winning fees, and etceteras, fully a million dollars. Their work made a new chapter in English turf history.

No sooner had Sloan shown ability to win consistently than people began trying to find out the secret of his success. They could see that he carried himself as far forward on his horse as possible, and so these questions arose:—Does a man seated near the neck of a horse enable the animal to travel

faster than one seated near the tail? If so, why? As for the first question, Sloan gave it a practical answer by his consistent winnings. The second question was also finally answered.

A horse to move forward at all must thrust at the earth, and the chief force of this thrust comes from his hind legs. If the center of weight of horse and rider is just over, or close to, the thrusting power, naturally it diminishes the efficiency for speed, for instead of thrusting the horse forward, a large portion of the muscular energy is wasted in lifting the weight of the jockey at every stride. The drawing below and the words which follow will make this clear.

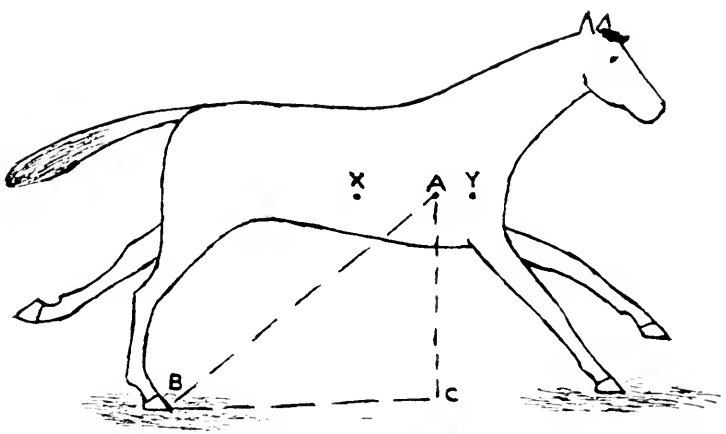


Fig. 87. The Horse in Motion.

Drawn from a snapshot of a galloping horse. A, The center of weight; AB the line of thrust; ABC, the angle of thrust; Y, the center of weight when rider is over neck of horse; X, center of weight when rider sits near the tail.

The farther forward the center of weight is, the longer is the line from hind foot to center of weight, called the line of thrust, and the more nearly will this line approach the horizontal. As a horse has to raise himself vertically with each bound, it is naturally a matter of very great importance whether he has to lift a dead weight or a weight which throws forward. A jockey on the horse's neck adds to the forward weight, and this moves the center of weight still further forward and places still more weight on the fore legs and equal-

ly less on the hind legs. It is like hanging heavy weights on the front part of a mill wheel. Or, again, the longer the lever, the easier to raise the weight; so the longer the angle of thrust, the easier and therefore the faster the horse will go, for his power will then be utilized almost exclusively in a horizontal thrust resulting in speed, and little of his energy will be consumed in simply raising weight to let it fall again. It is the same as a man pushing a wheelbarrow; if the load is near the handles it must be raised at each step, while if the load is over or near the wheel the man does not expend so much energy in a lift at each step, but can use all his force at pushing straight ahead.

Where the wear comes.—From what has been said concerning the function of the fore limbs in supporting most of the horse's weight, we can readily understand that the horse is more apt to tire, exhaust, and ruin his fore legs than his hind ones. It is common to see men driving their horses at speed when going down hill, thinking that the horse is doing little or nothing because the vehicle follows without having to be pulled. This is a decided error, for in going down hill still more weight is thrown on the fore legs, and if the animal is made to descend at speed he hammers his fore legs severely. Hence he often stumbles and falls when thus travelling.

Because of the hammering to which the fore legs and feet of the horse are subjected, and because of the great strain coming upon the hock joint due to its prominent part in propulsion, the feet and legs constitute a most vital part in every type of horse, in some more than in others. For this reason a good knowledge of the anatomy of the foot and leg is very necessary to anyone who desires to become a judge of horses.

Hoof mechanism.—When the horse places his foot on the ground, expansion occurs, especially at the heels. When the foot is raised there is contraction. The navicular bone supports one-third of the weight of the column of bones above. The navicular bone is supported by the tendon, the tendon by the plantar cushion, and the plantar cushion by the frogs. The plantar cushion, being soft, transmits force or motion in all directions more or less equally (as a liquid). It cannot

move downward to any great degree, hence it spreads or diffuses laterally, and so the heels expand. When the horse places his foot on the ground there occurs:—(1) Contraction of the hoof at the toe-wall coronet; (2) sinking of the sole, especially at its branches; (3) expansion of the heels; (4) sinking of the bulbs of the heels. These four movements constitute what is known as the "hoof mechanism." The health of the foot is dependent on the normal and free hoof mechanism, and it should not be hindered by improper shoeing or other causes. Hoof mechanism breaks concussion and assists circulation. Concussion is shock and counter-shock. These shocks must de diffused, and this is cared for laterally in the foot by its changes in form.

Absorption of concussion.—Every step at the walk or trot means a big concussion between the ground and the front foot of the horse. Were it not for certain arrangements for the absorption of this shock or jar, the horse would soon be made worthless. Hoof mechanism is, as we have seen, one of the means of scattering the shock, acting in much the same way as a pneumatic tire on a vehicle. Another safeguard is found in a sloping pastern, which acts in much the same manner as the spring under a carriage. Then there is the angle between humerus and forearm, and also between scapula and humerus, which also act as springs. A sloping shoulder is useful in the same way.

If you have ever ridden in a farm wagon over a rough road, standing on your heels, you can appreciate the tremendous wear which comes on the legs of a horse with poor feet, straight pasterns, and straight shoulders. Then if you shifted your weight to your toes and bent your knees slightly, you found that your teeth stopped chattering and your hat remained on your head. In other words, your change in position changed the column of bones supporting your weight from a straight, vertical column to a broken one with angles which acted as springs and absorbed the jar. It is just so with a horse having good feet and nicely sloping shoulders and pasterns.

Conformation as concerned in progression.—A line around the hoof on the ground gives the area of the base of support

of that leg. If the center of the base of support of the leg is not directly under the center of the weight falling on that leg, the side of the foot nearest the point directly under the center of weight will be compelled to do more than its share of the work. Therefore the leg of the horse should be so set that the center of the base of support comes directly under the center of the weight it bears. The fore legs should be so placed under the body that, when viewed from in front, a perpendicular line dropped from the point of the shoulder

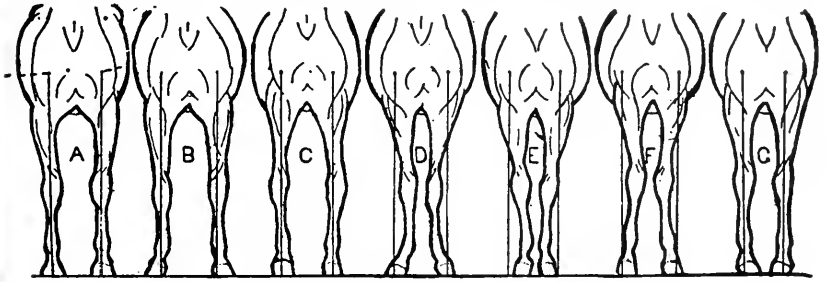


Fig. 88. Front View of Fore Legs.

A vertical line downward from the point of the shoulder should fall upon the center of the knee, cannon, pastern, and foot. A, Ideal position; B, toes out; C, bow legged; D, narrow chested and toes out; E, stands close; F, knock kneed; G, pigeon toed.

will divide the leg and foot into lateral halves. When viewed from the side, a perpendicular line dropped from the middle of the forearm where it joins the body should divide the leg from body to fetlock into lateral halves and strike the ground just back of the heel.

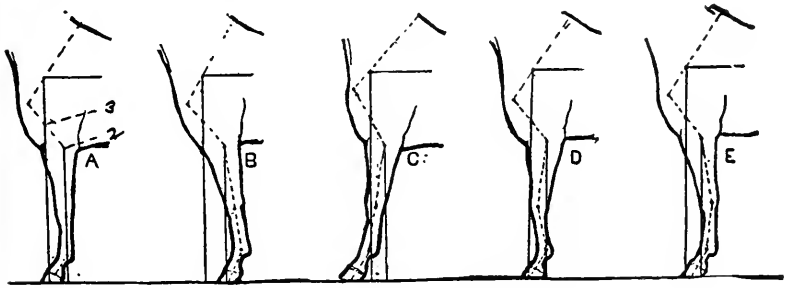


Fig. 89. Side View of Fore Legs.

A vertical line downward from the center of the elbow joint should fall upon the center of the knee and fetlock joints and meet the ground back of the heel. A, Ideal position; B, camped under; C, camped out; D, knee sprung; E, calf kneed.

When the horse assumes his natural position, the hind legs should be so placed that, when viewed from the rear, a perpendicular line dropped from the point of the buttock will divide the leg and foot into lateral halves; and when viewed from the side, this line should touch the rear edge of the cannon from hock point to fetlock and meet the ground some little distance back of the heel.

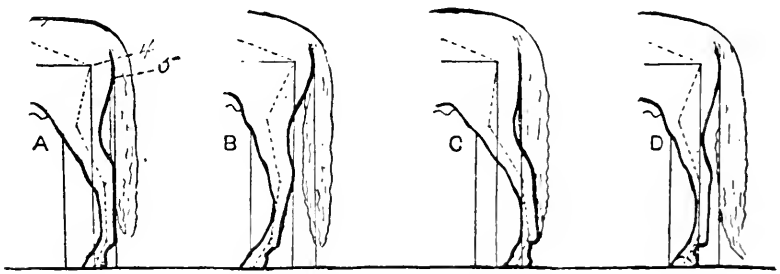


Fig. 90. Side View of Hind Legs.

A vertical line downward from the point of the buttock should touch the rear edge of the cannon from hock to fetlock and meet the ground some little distance behind the heel. A, Ideal position; B, stands under; C, camped out; D, hind leg too straight.

The direction and slope of the axis of pastern and foot are very important. When a limb is viewed from the front or side, the axis of the pastern and the axis of the foot should be identical. As viewed from in front, the toe should point directly forward. This insures an even distribution of weight

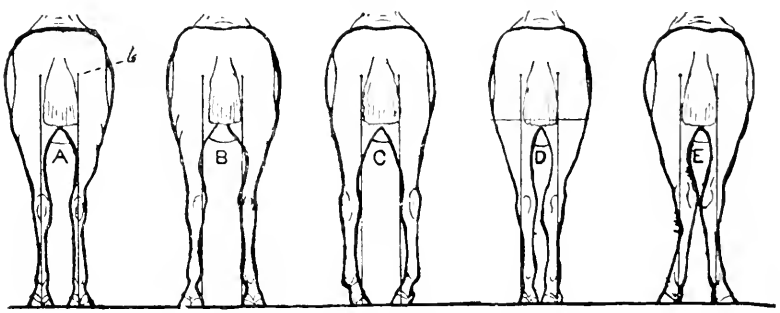


Fig. 91. Rear View of Hind Legs.

A vertical line downward from the point of the buttock should fall upon the center of the hock, cannon, pastern, and foot. A, Ideal position; B, stands wide; C, bow legged; D, stands close; E, cow hocked.

to both sides of the foot and also trueness of action. As viewed from the side, the axis of the pastern and foot should meet the ground at an angle of 45 degrees. This angle affords the best combination of strength and springiness.

When moving toward or from you, the feet of the horse should appear to have only one motion, which should be vertically up and down. This is very essential in every type of horse. Height of action in any type should be great enough to clear the ground by a reasonable distance, so as to prevent stumbling and insure length of stride. The carriage horse is required to go higher than this for reasons which will be explained in connection with the description of that type. The essentials of perfect flight of foot are (1) straight line action, (2) long stride, and (3) foot should be picked up with snap. Defects in conformation and placing of feet and legs result in defects in action. Only when the legs are correctly proportioned and properly placed can good action result. Correctness of action depends also upon temperament, strength of muscling, height over withers as compared with height over hips, and general symmetry and proportionment of parts. The most common defects in the shape and position of the legs are shown in the accompanying drawings.

A horse that is "base wide" or "toe wide" in front, swings the leg inward when in action. A "base narrow" or "toe narrow" conformation results in the horse swinging his feet outward, or "paddling" as it is called. (See accompanying drawings.) Horses that naturally stand wide at the hocks will travel the same way (wide), which is very undesirable. When the hind legs are bowed outward, they spread still further outward when the weight comes upon them in action, and usually the foot leaves the ground with a twisting motion which wears out shoes and is otherwise undesirable. Any deviation from trueness in the flight of the foot not only wastes energy, but the horse is endangered from nearby objects, or may strike himself, called interfering.

Viewed from the side, a nicely sloping foot and pastern leave the ground easily and describe the arc of a circle at every step. Straight or stubby pasterns and feet result in a short, stubby way of going that is stilted and non-elastic. A too-

sloping pastern and foot are not nicely carried, but are brought out straight to a point in front and then slapped upon the ground. (See accompanying drawings.) Other defects of action will be discussed in connection with the various types of horses.

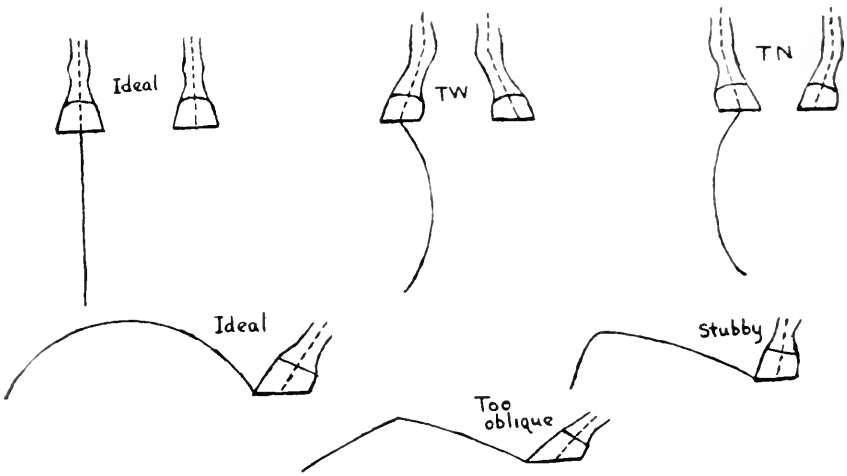


Fig. 92. Defects in Fore Legs and Their Effect on Action.

Determination of age from the teeth.—The age of the horse is easily determined up to and including the fifth year by an examination of the incisors, of which there are six in the upper jaw and six in the lower. All of these incisors are temporary up to two years of age, but by the time the animal has reached the age of 2½ to 3 years the middle pair above and below have been replaced by permanent incisors. These are broader, heavier teeth than the temporary or milk teeth, and they also have a rough and rather corrugated surface, whereas the surface of the temporary teeth is smooth. At 3½ to 4 years, two more permanent incisors, known as the intermediate pair, appear in each jaw, thus making four permanents above and below. At 4½ to 5 years, the corner pair above and below are displaced by permanents, and the horse may be said to have reached maturity. After five years the age is not so easily determined nor are the indications so accurate. An examination of the wearing surfaces of new

permanent teeth discloses a black cup or depression of long, oval shape in the end of each tooth. The rims of these cups disappear through wear, and finally the teeth are worn down until the depression is entirely obliterated. The black cups disappear in fairly regular order. Thus, at 6 years they have disappeared from the middle pair of incisors of the lower jaw; at 7 years from the intermediate pair below, and at 8 years all of the lower incisors have lost these marks as a rule. At 9 years the cups are usually worn from the middle pair above; at 10 from the intermediates above, and at 11 the corner pair above is also clear.

Following eleven years of age, there are only general indications to rely upon. The horseman knows that the teeth change from oval to three-sided with age, and that they become longer and project forward more and more each year. In animals twenty to thirty years old, these features are very marked.

Mere description here will not enable the student to determine age from the teeth. Actual practice and the study of many mouths is necessary in order that the would-be judge may master this interesting and useful art.

CHAPTER XXVII.

ORIGIN OF THE TYPES OF HORSES.

The history of the horse dates back to 4000 B. C. Several wild species existed in Europe and Asia from very remote times, but it was in Asia Minor and Egypt that the horse was first domesticated and made to serve man. He was taken thence to Greece, Rome, and Arabia; thence to more remote parts of Europe and Asia, particularly to Spain, France, and England; and thence to America and Australia.

For a long time the horses used by the early European tribes and nations were small, semi-wild animals, and no effort was made to improve them by breeding. They were simply native wild horses, captured, tamed, and put to use, and their size and strength was not great enough to permit them to be ridden, but instead they were used principally in warfare, harnessed to chariots. However, there were horses of black color and much greater size and weight native to the region in Western Europe now called Flanders, and these were taken south and east, just as the horses of Asia Minor and Egypt were taken north and west. The infusion of the blood of this larger horse increased the size of European horses and made them suitable for riding and other purposes. Better feed and care also contributed to this result.

The development and progress of the horse was parallel with the development of civilization and a prominent factor in it. The horse was first used for military purposes; next, in ceremonies, both religious and civil; third, in the agricultural and commercial pursuits of nations; fourth, in connection with the pastimes and sports of nations.

First saddle horse —The Arabian horse was the first breed of live stock originated by man. This horse is a saddle type and was developed by the nomadic tribes of the desert for use in warfare. The exact origin is unknown, but the great age of the breed is shown by a legend which says that it is descended from five mares in the stud of King Solomon. It seems to have descended directly from the wild Libyan horse

native to Northern Africa—most excellent of all known wild varieties of the horse. The Arabian has for centuries possessed such exquisite quality, refinement, intelligence, spirit, docility, and beauty as to make him universally admired and famous. He was taken to England at the close of the seventeenth century and was used in founding the English Thoroughbred and also the Norfolk Trotter which later became the Hackney. In Russia he helped produce the Orloff Trotter, and the Percheron breed of France is also thought to owe much of its excellence to Arab blood in its foundation. Inasmuch as the Yorkshire Coach Horse, Cleveland Bay, American Trotting Horse, American Saddle Horse, and the Morgan are all sprung largely from the Thoroughbred, every breed of light horses carries the blood of the Arab in greater or less degree.

Turk, Barb, and Spanish horses.—The Turk, or Turkish horse, found in portions of European Turkey, but principally in Asia Minor, was of considerable importance in the seventeenth century, but it has deteriorated very much since then. The Barb is a native of the Barbary States, whence its name. It is found in its greatest perfection among the Moors, who introduced the Barb blood into Spain during their rule in that country, and so improved the Spanish horse that for several centuries it occupied the first place throughout Europe. Spanish horses of this stock brought to America by the Spaniards are regarded as the progenitors of the wild horses once common to Mexico and California.

Origin of the running horse.—In later times, England became the center of horse breeding and the nursery of most of the present-day breeds. One of the first types of horses developed in England was the running horse, the sport of racing having been fostered there from an early date. Long before an Arabian, Barb, or Turk stallion set foot on English soil, a strain of running horses of considerable excellence had been developed, hence the Oriental stallions which were later imported cannot be given more than half the credit for founding the running horse or Thoroughbred. The Thoroughbred therefore owes his origin jointly to the native running mares of England and to the Arabian, Barb, and Turk stallions imported at the close of the seventeenth century.

The Great Horse or War Horse.—The first type of English horse was the "Great Horse" or "War Horse" used during the Crusades and up to about the year 1600 to carry the warriors clad in their suits of heavy armor. A knight in heavy armor, together with the armor for his horse, weighed about 400 pounds, hence the necessity for a big, strong horse. The native English horse was small, and in order to increase the size and strength, Flemish stallions were imported from Normandy, and for nearly 500 years English breeders centered their attention on the matter of size. With the appearance of gunpowder and firearms in warfare, armor was made useless and the heavy war horse gave way to much lighter animals with more speed.

Origin of draft type.—When displaced in warfare, the ponderous war horse did not become extinct, but was put to work at tilling the soil. Prior to this, field labor had been performed solely by oxen, and the ox continued in use as a draft animal even after horses were introduced for farm work. The war horse thus became an agricultural horse and in time was utilized as the foundation of the British draft breeds—the Shire and Clydesdale—just as the Percheron breed was built up from the heavy diligence horses used in France in the early days when roads were deep in mud. The railroad later displaced the diligence horse and he found a place on the farm. When a demand arose from cities for a horse suited to moving heavy freight through the streets, these agricultural horses in England, Scotland, France, and Belgium were bred larger, heavier, and better to meet the new demand, and thus originated the draft breeds as we know them today—Shire, Clydesdale, Percheron, and Belgian. This occurred in the first part of the nineteenth century. The Suffolk horse is usually classed as a drafter also, but is in fact an agricultural horse.

The hunter.—Fox hunting in England dates back to early times, and there has long existed a demand for a type of horse specially adapted to this sport. Strange to say, no breed of hunters has ever been developed, the demand being supplied by Thoroughbreds showing the type desired and also by half-

bred horses (sired by Thoroughbred stallions and out of common mares) possessing hunter type.

The carriage horse.—The modern type of carriage horse originated less than fifty years ago. Prior to this, there was a succession of types dating from the time the most primitive carriages came into use centuries ago. Hence the term carriage horse may be used in a restricted sense or in a broad general sense, and the carriage horse may be said to be an ancient type or a modern one, according as the term is used. The primitive carriage horse was a semi-wild pony, and he was harnessed to a couple of long poles, fixed at one end to the pony's neck, the other end dragging on the ground beneath the load. Next in the evolution of the modern carriage came the sledge, and later came a sledge mounted on rollers. In time the rollers were improved to the present form of an axle and wheels. All this was before the Christian era. Centuries more elapsed before anything deserving the name of carriage was built.

Carriages were first used by the nobility of England about the beginning of the thirteenth century, but the roads were so bad and the vehicles so heavy that they were of little service until the end of the sixteenth century. It was about 1660 that the present custom of driving for pleasure and show in Hyde Park, London, was established. But it was not until more recent times that driving became a real pleasure, for carriage springs were not invented until about 1665 and in their first form appear to have been crude and inefficient. Toward the middle of the eighteenth century, great and rapid improvement was begun in highways, vehicles, and horses, so that the rate of travel was increased from 4 or 5 to 12 miles per hour. Then came the railway, displacing the road coach and consigning the carriage horse to the realm of pastime and pleasure exclusively.

The first English carriage horse was the old black cart horse, or shire horse as he was called, heavy, ungainly, with a big head and shaggy fetlocks. He was descended from the old-time war horse, and hence was of Flemish blood. They were so slow that the footmen could easily go ahead when necessary and engage lodging at the next inn. As highways

were improved and carriages made lighter, the cart horse was crossed with the Thoroughbred in order to secure lighter and faster animals for carriage use. In this way originated the Cleveland Bay and Yorkshire Coach Horse—two breeds of heavy carriage horses. The carriage horse as we know him today is comparatively a new type in both Europe and America. He is a medium-sized animal with outstanding beauty and attractiveness in both form and action. The demand for such a horse did not arise until city streets were improved and carriages made elegant and comfortable, so that driving became a real pleasure rather than a painful necessity. Increase in wealth during the past half-century and the creation of a larger leisure class of people have also assisted in giving rise to the demand for this special type of horse. From what was called the Norfolk Trotter, which was a fast-trotting, plain, serviceable, moderate-sized horse formerly used by English farmers as a road horse (and used by them under saddle), there was developed in England the Hackney, which is today the only true breed of carriage horses. The Norfolk Trotter originated at about the same time as the Thoroughbred, being the result of crossing Arabian and other Oriental sires on mares showing aptitude for the trotting gait, just as the Thoroughbred resulted from the crossing of these same sires on native running mares of proven ability on the turf. Although the Hackney is the only breed of carriage horses, other breeds not infrequently produce individuals of this type which help to supply the demand.

The polo pony.—The game of polo was introduced into England in 1874, and to America two years later. This sport calls for an active, rugged pony of about 14.2 hands, and those which best serve the purpose are small-sized or dwarf Thoroughbred horses. A breed of polo ponies is now being developed in England.

The horse in America.—From an equine standpoint, history repeats itself to a considerable degree in America and also records the creation of at least two new and distinct types of horses. There were no horses on this continent at the time of its discovery, hence American horse history dates from 1492. The first horses were brought to this continent by Cortes and

Ferdinand De Soto. Cortes used but few horses in his conquest of Mexico, some of which undoubtedly became the progenitors of the wild horse of the western plains. Similarly, horses abandoned by De Soto near the Texas border no doubt survived and were the principal foundation of the American wild horse.

In colonial times, the most common type of horse was a small saddle horse measuring not more than 14 hands. These were the descendants of the small, unimproved European horses brought over by the first settlers and were of no particular breed or breeding. This little colonial saddle horse was indispensable as a utility animal, being practically the sole means of transportation in those early times. He was likewise a source of amusement and recreation, being used in running matches of short distances. For this latter purpose, however, the little saddler soon gave way to the English Thoroughbred imported quite extensively by the early settlers of the Carolinas and Virginia.

Field labor was performed by oxen, except in Pennsylvania and New York where Flemish horses had been introduced from Holland. This Flemish horse was, as we have already seen, a large and rather ungainly animal, and when the colonies expanded westward, this horse was used to haul freight over the mountains from eastern ports to Pittsburg and Wheeling. It required 12,000 wagons annually, each pulled by four or six horses, driven tandem, to carry on the vast freighting business which developed, and the freight bill amounted to $1,500,000 in a year. The wagons were called Conestoga wagons, and the horses were given the same name. With the coming of the railroad and the river boat, the Conestoga horses and wagons were quickly displaced and no further efforts were made to breed heavy horses in America until very recent times. The blood of the Conestoga was absorbed into the common stock of the country and the type became extinct. Thus we see that colonial horse stocks were of three types only—(1) the little saddle horse, (2) the Thoroughbred, and (3) the Conestoga.

Origin of the roadster type.—With the opening of roadways, vehicles were quickly brought into use, so quickly indeed

that the so-called roads over which they were driven were little more than clearings through the woods with here and there a "corduroy" of logs to make passable some marshy spot. The roads were first improved in the more thickly settled parts of the country, and it was thus about Philadelphia that the roadster type of horse was originated at the beginning of the nineteenth century in response to the demand for a horse suitable for road driving and harness racing. The American trotting horse or roadster was derived from four sources: (1) the English Thoroughbred, (2) the Norfolk Trotter, (3) the Arab and Barb, and (4) certain pacers of mixed breeding. By selecting and breeding for speed at the trot, the American Trotter has been developed and today may be called a true breed, although the individuals composing it show considerable divergence in type. In Vermont the Morgan horse was developed. The Morgans descended from one horse, Justin Morgan, whose sire was a Thoroughbred, but whose dam was of unknown breeding. While often regarded as a distinct breed, they really constitute one family of the American Trotter.

American Saddle Horse.—At the time roads were being improved in the East, Kentucky and the West were still a country of bridle paths only. The blue-grass region of Kentucky is splendidly adapted to the production of light horses, and it was principally in that state and Missouri that the American Saddle Horse breed originated and developed. Kentucky was settled in 1775, and as early as 1802 it was said that "almost all of the inhabitants employ themselves in training and ameliorating the breed of horses." The American Saddle Horse originated from crosses of the Thoroughbred upon pacers of mixed breeding which had been brought from Canada. Considerable Morgan blood entered into the making of the breed also. Starting with these materials, a type of saddle horse possessing great intelligence and beauty was established. These horses are taught five or more distinct gaits, and as a result of years of selection and breeding, there is today a natural inclination on the part of the American Saddle Horse to show these gaits, which include not only the walk, trot, and canter, but also the rack, running walk, fox trot, and slow pace.

The general-purpose horse.—When the railway displaced the Conestoga horse, many farmers attempted to produce what was styled "the horse of all work." By this was meant a general-purpose horse useful to wagon, plow, or under saddle. The early agricultural papers were full of advice to farmers that such a type be bred, and fair associations encouraged the movement by offering prizes for this class of horses. From 1840 to 1850 the "horse of all work" was the horse of the day. About 1850, the first draft stallions were imported from Europe, but they were not brought over with the idea of producing draft horses in this country, but to breed to the small native mares, with which this country was well supplied, in order to produce a general-purpose horse. Prior to this there were some attempts to produce such a horse by crossing the Thoroughbred and the Conestoga, but the progeny possessed most of the defects of both parents and were utterly unsuited for farm use or anything else. By 1870, breeders had come to realize that there is more profit in producing specialized types of horses useful for special purposes, rather than a single general-purpose type not capable of doing anything well. Thus, although articles still appear occasionally in farm papers advising the production of a general-purpose horse, and although some county fair associations persist in offering prizes for this ancient type, the general-purpose horse died a natural death a half-century ago. Let him rest in peace.

The draft type in America.—About 1870, there arose a strong demand from cities for a heavy horse, and since that date hundreds of Percheron, Belgian, Shire, and Clydesdale stallions and mares have been imported to America annually for the purpose of breeding heavy horses fitted for the work of moving heavy loads over city streets—in other words, draft horses. America developed no draft breed of her own. After the Conestoga disappeared we had no heavy horses to use as a foundation for such a breed, and when the demand arose in this country several European countries had draft breeds ready formed which we borrowed from them.

The carriage horse in America.—In America, as in England, the modern carriage horse is a recent addition to our types of horses. The more wealthy families among

the early settlers of the Carolinas and Virginia kept coaches for use on state and social occasions, but the so-called roads were so miserable that driving was in no wise a pleasure. Most of the carriages in use in the early days were stage coaches which did the work now done by railways. Crosses of the Flemish horse of New York and Pennsylvania with the little colonial saddle horse gave the well-knit, sizeable horses required on these early coaches. With the growth of towns and cities, carriages became common, but the horses used would not today be classed as carriage horses although they were of a serviceable kind. Driving for pleasure and pastime, which of late years has been so popular with city people, did not begin until after the Civil War, in fact it was not until 1880 that the modern type of carriage horse came into use. From that date forward, there was a large and increasing demand for smoothly-turned, high-stepping, well-mannered horses, weighing from 1,000 to 1,200 pounds. The animals which supplied this demand were for the most part recruited from the ranks of the American Trotter and American Saddle Horse, although our very choicest carriage animals have been English Hackneys. Since 1900, the automobile has displaced a great many carriage horses, especially those of mediocre quality, but there still exists a strong demand for top-notch carriage animals for which good prices are paid.

Effect of mechanical inventions on horse types.—The invention of firearms resulted in a change in the type of the cavalry horse from the old-time heavy war horse to a lighter animal with more speed. The displaced type did not become extinct, but was put to use in the fields. The invention of the railway and steamboat and the building of canals restricted the horse's field of usefulness by displacing the stage coaches and the Conestoga horses and wagons. The Conestoga type then became extinct, being mingled and absorbed into the common stock of the country. In France the diligence horse was gradually developed into the Percheron breed. The application of electric power to street railways in 1888 closed a channel of disposal for thousands of cheap horses such as were used on the old-time horse cars, and the perfection of the bicycle and the fad for cycling which followed led many to believe a

horseless age was at hand. But the street car horse was not a profitable animal to produce, and many who took up the bicycle never owned a horse anyway. Horses came into greater demand and brought higher prices than ever before.

Next came the automobile and the motor truck, and again a horseless age was predicted. But in the face of $250,000,000 expended for automobiles in 1910, prices for horses were the highest in history. It is a fact that the automobile is the strongest mechanical competitor the horse has had to meet, and while it is impossible at this time to say with exactness what the effects will be on horse production, enough time has elapsed to show that the horse yet has an important place on city streets and on roadways, as well as on the farm. The automobile and the motor truck are not only doing work that is also done by horses, but they are doing work which the horse cannot do. In other words, the auto has to a large extent created its own necessity. There is, on the other hand, a vast amount of horse work of various kinds which cannot be done by motors. The horse and the auto each occupy fields of their own, the margins of which overlap to some extent, and here competition between the horse and motor is keen. The carriage horse has felt this competition most. The man who formerly kept a pair of carriage horses only because he needed them, and not because he had a liking for a horse or found pleasure in driving, was quick to take up the auto because it did the work quicker, even if at greater cost. As a rule, such men did not buy a fancy class of horses, and hence their change to the auto is not as serious a loss to the breeder as might be thought. The market for the high-class carriage horse has been restricted, but remains good.

Many large business firms have sold their draft horses and installed motor trucks, only to discover that the short haul may be made more economically with horses, and they have therefore reinstated horse equipment along with their motor trucks. The horse's place in the realm of sport is undisturbed by the automobile. Saddle horses, including the hunter and polo pony, are in greater demand than ever before, while harness racing continues to prosper throughout the country.

Classification of the breeds.—The various breeds of horses may be classified according to type as follows, mention also being made of the place of origin of each breed:

Draft Type	
Percheron	France
Belgian	Belgium
Shire	England
Clydesdale	Scotland
Suffolk	England

Carriage Type	
Hackney	England
Cleveland Bay	England
Yorkshire Coach	England
French Coach	France
German Coach	Germany

Roadster Type	
American Trotter	United States
Morgan	United States
Orloff Trotter	Russia

Saddle Type	
American Saddle Horse	United States
Thoroughbred	England
Arabian	Arabia

CHAPTER XXVIII.

DRAFT TYPE.

The first question which presents itself is — What is a draft horse? A draft horse is a horse adapted to the work of pulling heavy loads at a walk. The farmer who produces draft geldings for sale looks to the city for a purchaser, for in the cities the greatest demand is found, and the big, heavy drafter there finds ready sale at a good figure. The conditions of street traffic in large cities demand the hauling of the largest possible loads. Distances are great and delays waste much time. At street crossings, bridges, and at railway crossings, minutes are lost that in a day count up to hours. At sidings and warehouses, it is a lucky chance if a team can get up to its door or car without waiting for one or more wagons to be loaded or unloaded ahead of it. There is thus a natural tendency for teamsters to haul big loads in order to move the freight, and this makes big horses necessary. Furthermore, big wagons, big loads, and big horses enable merchants to move the goods with less equipment and fewer drivers, and lessen expenditures for shoeing, feed, stabling, harness, and repairs. There is thus a tendency toward big horses and big loads in all cases where quick delivery is not imperative, and where loading and unloading are done at one or a few points. The heavy loading of wagons has gone so far that many cities have placed restrictions upon the size of loads, in order to protect draft animals from abuse. In Chicago, the maximum load for a single horse or mule is 3,500 pounds, and when two or more horses are hitched together, the maximum is 4,000 pounds per animal.

We must bear in mind that the drafter is not only adapted to pulling heavy loads at a slow gait, but that this work is done on hard pavements in the city. The draft horse not only does the hardest kind of work required of horses, but he works under conditions which put his feet and legs to a severe test. The drafter may be said to be the real business horse, where-

as the carriage horse, roadster, and saddle horse are largely used for pleasure purposes.

In order to do the work required of him, the draft horse must possess the following qualifications—(1) weight, (2) strength, (3) true, snappy action, (4) endurance and durability, (5) feeding capacity, and (6) good disposition.

Weight. — This is decidedly essential. The heavier the horse, the more adhesion he has to the ground. When a horse is working in harness, the traces tend to lift the fore feet off the ground, and for this reason a heavy horse is able to use his weight to good advantage. In stage-coach days it was a common trick for the driver to throw a bag of meal across a horses' back, or get upon a horse himself, in case the coach got into a place where a hard pull was necessary. By so doing, his team was often able to start the load without other assistance. The added weight produced more adhesion between the feet and the ground, thus enabling the animal to exert all his strength at a pull, instead of uselessly scratching gravel when trying to start. When pulling, horses invariably extend their heads well to the front, thus again showing that the traces tend to lift a horse up in front as he pulls.

A man of 200 pounds weight can easily outpull a man of 150 pounds in a tug-of-war, for the reason just explained. If the 150-pound man take another man upon his shoulders and back, however, he can defeat his opponent who outweighs him by 50 pounds. The man on the shoulders of the 150-pound contestant adds nothing to the muscular power at that end of the rope, but rather lessens it; but the added weight and the increase in adhesion permit the full strength of muscles to be more nearly exerted, and the 200-pound man is readily defeated.

The horse moves a load by (1) simply leaning against the collar, and (2) by muscular strength. Thus, weight has a second advantage in that it takes the place of some of the muscular energy, for the weight of a heavy horse more nearly offsets the weight of the load than does the weight of a smaller horse, and every extra pound thrown against the collar means a corresponding reduction in muscular force required in moving the load. Then, too, as a rule, the larger the horse, the stronger he will be.

To sum up, weight in the draft horse has three values—(1) It gives the feet more adhesion with the pavement or ground, so that the muscular power may be applied to the collar, (2) by offsetting some of the weight of the load, it lessens the amount of muscular exertion required, and (3) as a rule, the heavier the horse, the stronger he will be. Some horses make up for a lack of weight by their superior ambition and courage.

Strength.—This is a matter of muscling. Draft horses must be very muscular throughout, especially in the hindquarters. When judging drafters, fat should not be mistaken for muscle.

Action.—Action that is straight and true insures conservation of energy and sure-footedness. The action should also be snappy; this enables the animal to get over the ground rapidly, and shows a willing disposition. Action is also valuable as an index to the way the horse is put together; true action can result only from proper placing of the limbs, in fact, from a proper proportionment of all parts, and their proper relation to one another. Correct action, showing trueness, snap, and length of stride, results from a rather rare combination of proper structure, muscling, and temperament. Therefore, good action is not only valuable in itself, but is good evidence of merit in the entire make-up of the horse.

Endurance and durability.—Endurance means the ability to do the day's work without fagging. Durability means the ability to work day after day without breaking down under the strain. Endurance is concerned mostly with wind, muscling, and feeding capacity, while durability depends mostly upon the feet and legs. Some first-hand horses last but six months, or even less, on city streets. Others last as long as fifteen years, and, in some cases, even longer. If a draft horse goes to pieces quickly when put to work, he is a considerable loss to the owner. Feet and legs are the parts most liable to prove defective. Lack of wind is a common fault. The horse with a short rib seldom stands up to hard labor very long. Buyers refuse to invest much money in horses that are shallow bodied and cut up high in the flank, such animals being poor feeders.

Feeding capacity.—The horse is comparable to a locomotive. He consumes hay and grain for fuel. Other things equal, the greater the amount of fuel consumed, the greater the work that can be done. The drafter should be a good feeder.

Disposition.—To be of greatest usefulness, a draft horse must be a prompt, willing worker that will be pleasant to handle, active, and quick to respond to commands, yet quiet and docile.

DETAILED DESCRIPTION OF THE TYPE.

General appearance.—The form of the draft horse is low set, broad, deep, massive, compact, symmetrical, and stylish. He should have a short back and a long underline. He must weigh not less than 1,600 pounds, and ton horses are the sort to keep in mind as draft horses. Weights over a ton are not uncommon. It has been estimated, on the basis of weights and prices for horses at the large markets, that every 100 pounds above 1,500 adds $25.00 to the horse's value. As to height, drafters usually stand from 16 to 17 hands at the withers. The height over the hips should be no greater than at the withers, as this detracts from the symmetrical appearance, throws more weight upon the forequarters, and makes the action stilted and heavy. Although the short-legged horse is more powerful, the horse with slightly more length of leg will take a longer stride, and may therefore be more useful. Some buyers also prefer a certain degree of height in the drafter because they use wagons with a high top or cover, and a short-legged horse would not be in harmony with such vehicles. At this point, it may be mentioned that a great many firms desire horses which are not only able to do their work successfully, but which also have considerable style and beauty of conformation that will attract attention on the streets and help to advertise the firm and its business. To this end, a great deal of money is invested in vehicles nicely designed and ornamented, which are horsed with animals that add to, rather than detract from, the appearance of the turnout. Buyers keep the vehicle in mind when buying horses.

Quality and substance, as shown in hair, hoofs, bone, and joints, should be preeminent. Substance refers to the size

of bone and size and weight of horse, while quality refers to the fineness of texture of all parts. Quality associated with substance insures good wearing qualities. Quality is shown in bone that is hard and smooth, joints that are large, well defined, and clean-cut, and cannons and pasterns that are entirely free from meatiness. The cannons of some draft

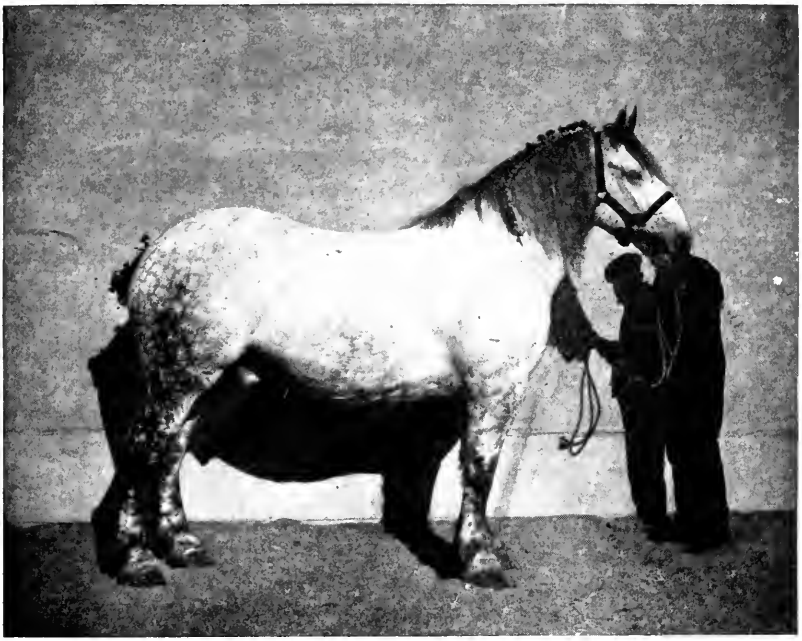


Fig. 93. The Draft Type.

Big Jim, four times champion draft gelding at the International. Mr. J. H. S. Johnstone of the *Live Stock World*, wrote the following regarding Big Jim when announcing his death in 1910: "There never was a prouder stepper in harness, and there never was a big one that held himself together and went at this work in a more sprightly manner. His size was immense—2,385 pounds—and not one of his competitors ever approached him in that regard. Personally I do not expect to see his like again."

breeds have more or less long hair, called "feather." If it is silky, and "pily," rather than coarse and curly, it indicates quality, for fine hair seldom covers rough, coarse bone. The entire coat, including the mane and tail, also indicates quality if the hair is soft and fine. The horse with quality will have

hoofs of fine texture which will wear well, and his joints are less subject to bony diseases.

Head.—The head should be lean, and proportionate to size of body. A pony head is not the right sort for a draft horse, and a barrel head indicates coarseness and lack of breediness. Every line and feature should be distinct,—there should be a chiseled appearance that indicates character, quality, and good breeding. Great width between the eyes and a broad, full forehead show intelligence. The eye should be large, bright, clear, and very prominent, to insure good vision, for the horse should be able to see where he is stepping. The nose and muzzle should be broad, indicating a good feeder. The nostrils should be large (but not permanently distended), to provide easy breathing. Trim lips that are thin show quality and refinement. Strong cheeks and jaws that are wide across underneath provide good grinding ability for proper mastication. The ears should be of fine texture and medium size, and should be set well up toward the poll and carried alert. Ears set down on the side of the head and carried in a lopping fashion decidedly injure the appearance. The expression of the eye and the carriage of the ear are good evidences of the temperament and disposition. The head should be of medium length, and, as viewed in profile, the face line should be rather straight. A Roman face indicates a strong, determined will, and is not desirable.

Neck.—The neck of the draft horse should be at least medium long, and should be very muscular, with some degree of crest or arch to the top. The crest should be pronounced in the stallion, but not so excessive as to break over to one side. At the junction with the body, the neck should be very deep, but at the throttle it should be very trim and rather cut up underneath, with no fullness or thickness there to bring pressure on the windpipe. The head and neck should be carried well up, to insure good vision, lighten the forehand, and improve the appearance.

Shoulders.—The shoulders should be very deep, muscular, and have much slope. An upright shoulder results in transmission of shock, and also in shortness of stride. A sloping, muscular shoulder that is laid in snugly is conducive

to good action. Frequently, the shoulders are too open and prominent, so that the horse does not stand over his legs as he should. Such horses do not take a straight stride, but swing their legs outward when in action.

Withers.—The tops of the shoulder blades should come well together and should be heavily muscled, to form withers that are somewhat rounding, rather than sharp as in the lighter kinds of horses.

Breast and chest.—The breast should be very wide and very muscular. The chest should be full, wide, and deep, to provide room for heart and lungs. The horse is an athlete, and large lungs and good heart action are very essential. A contracted heart-girth shows lack of constitution. There is no such thing as too much heart-girth or chest capacity.

Arm.—The arm should be very muscular, and should be thrown forward to give slope to the shoulder.

Forearm.—The forearm should be powerfully muscled, so that as viewed from the side it appears very broad next to the body, tapering to the knee. No muscles are present below the knees and hocks, hence strength of action depends upon the muscles above these joints. A short forearm is therefore usually associated with poorer action than a somewhat longer one, which affords room for longer muscles.

Knee.—The knee must be broad from every point of view, and must be deep from top to bottom. This provides a large joint, indicating strength. The knee must also be straight, so as to set the leg straight below the body. There must be no meatiness about the knee or any of the joints or parts below, for, as has been stated, all muscles end above the knee and are attached to the parts below by tendons. Meatiness about the knee and lower limb interferes with the working of the tendons, and lessens the free and easy flexion of the joints. Hence the knee should be clean-cut, flat across the front, and well defined. This is essential.

Cannons.—The cannons should be short and clean, with the tendons large and set well back from the bone. As viewed from the side, there should be good width, and the cannon should be flat instead of round. As one passes the hand along the cannon bone, it should feel smooth, hard, and dense. The

skin covering it should be fine, and the hair silky. To the hand, the cannon should have the same feel as a smooth hickory stick covered with fine cloth. Between the bone and the tendon there should be well-marked depressions or grooves. Meatiness about the cannons is as objectionable as it is about the joints, and for similar reasons. The cannons furnish one of the best means of determining quality. Clean, flat, smooth cannons have bone that is composed of fine cells, and is flinty in character. Coarse, rough bone is porous and spongy, with large cells. Too much refinement of bone is often found in the draft horse. On the other hand, large bone is frequently found which is very lacking in quality. There should be a combination of substance with quality. It is possible to make up in quality a certain lack of substance, but not the contrary.

Fetlock joint.—The fetlock joint should be wide from front to back, clean-cut, and well defined.

Pasterns.—The pasterns should be oblique to relieve concussion, and should show reasonable length. A slope of about forty-five degrees is desired. More slope than this tends toward weakness. The pasterns should show plenty of substance, yet be clean-cut, and should spread out or expand at the lower end into wide, round, open hoof-heads or coronets.

Feet.—The old saying, "No foot, no horse," is as full of truth today as it ever was. A draft horse of excellence in all respects except feet is as worthless as a fine building on a flimsy foundation. When it is considered to what great stress the foot of the draft horse is subjected, the wonder is that feet last as long as they do on hard pavements. Driven against cobblestones and brick by the great weight of the body above, the fore feet undergo repeated shocks which soon batter to pieces feet that are defective. The foot should be large, to afford a large bearing surface. When viewed from front or side, the axis of the foot should coincide with the axis of the pastern. The hoof should appear dense, waxy, and smooth, indicating toughness and durability. The form of the hoof should be round. Inasmuch as the wall of the hoof grows out from the coronet or hoof-head, the size and shape of the foot will depend largely upon the size and shape of the hoof-head, which should therefore be large and round. The sole should

be concave, as this means strength. Flatness of sole is a common fault among draft horses. The bars should be strong, to insure against contraction of the heels, and the frog should be large and elastic. The heels should be very wide and fairly high, and the fore feet should be uniform in size and shape. The position of the feet and limbs should be as described in Chapter XXVI.

Ribs.—The ribs should be well sprung and deep, giving a wide, deep body. Such a conformation provides a strong middle-piece, gives the necessary weight to the animal, and indicates good digestive capacity, as well as ample room for heart and lungs. The distance from the last rib to the hip should be short, and the flank should be deep. Horsemen speak of a deep, full flank as a "good bread basket," and in certain sections of the country where a business is made of feeding drafters for market, great care is taken to select animals for feeding that have deep, full middles, for the other kind are poor feeders and cannot easily be made fat. The horse that is cut up high in the flank is said to be "wasp-waisted," "tucked-up," or "washy." When put to work, such horses show lack of endurance or stamina, for they do not consume enough feed to replace the energy expended in doing hard labor; hence they become very thin in flesh, and are unable to do hard work for many days in succession. The middle of the draft horse in good flesh should be very large, and as round as a dollar.

Back.—The back forms the connection between the seat of power, which is in the hindquarters, and the point of application of this power, which is the shoulder. A short, rather straight, broad back that is heavily muscled affords the strongest conformation. A short, wide back is not only more rigid than a long, narrow one, but also brings the power closer to the collar; it is therefore much desired because of its mechanical advantage over the long, rangy conformation.

Loin.—The loin is often called the "coupling." It lies just in front of the hips, and includes those vertebrae which have no ribs below them. The loin, like the back, should be short, broad, and heavily muscled.

Hips.—Beginning with the hips and continuing throughout the hindquarters, we are dealing with the location of those

muscles which furnish power for draft, hence we want an appearance of great massiveness everywhere. It used to be thought that the draft horse did his work simply by falling against the collar, thus bringing his weight to bear, and consequently that his forequarters ought to be as heavy as possible; it was no harm if his shoulders were straight, and as for his hindquarters, it did not matter much what they were. But this idea has been exploded and it is now known that he pulls by muscle more than by weight, and much more by the muscles of his hindquarters than by those of his forequarters. So we want the hips of the drafter to be wide and heavily muscled.

Croup.—A very broad and long croup gives the greatest area for the laying on of muscle. It should also be fairly level from hips to setting on of tail. A steep croup not only detracts from the appearance, but is also usually associated with shortness of croup, weakness of coupling, and crooked hind legs. The croup should be covered with heavy, massive muscles.

Tail.—The tail should be attached high, and should be full haired and well carried. Stallions and mares imported from Europe almost always have been docked, this being a fairly accurate means of identifying such animals.

Thighs.—The thighs should be very wide and should bulge with muscle, and the quarters should be very deep and heavy. The stifle should likewise be heavily muscled, and there should be great width through the hindquarters from stifle to stifle. Viewed from the side, the thigh should be very wide from stifle to end of body.

Gaskins.—The gaskins, like the forearms, should be very wide and bulging with muscle.

Hock.—Suppose we have a pair of ton horses hitched to a big load. When the word is given to start, the horses extend and lower their heads, lean against the collar, crouch down behind by bringing their hind feet forward and flexing their hocks, and then the pull of the powerful muscles of the hindquarters extends the hock joint and straightens the hind leg, thus bringing great pressure against the collar, and the

load moves. The point to be remembered is that an enormous strain comes upon the hock, and if there is any weakness in that joint it is certain to cause trouble. The hock must be large, clean-cut, wide both ways, and deep, and the point of the hock should be prominent. It should be straight from top to bottom. A crooked hock, which places the hind foot too far forward, with sloping cannons, is called a "sickled hock." Fleshiness and puffs are distinctly objectionable. Thick, meaty hocks are too common in draft horses. A lean appearance, so that every angle and line of the joint is apparent, is very much desired.

Cannons, pasterns, and feet.—The requirements for hind cannons, pasterns, and feet are identical with those described in connection with the forequarters. However, the hind cannons are always longer and usually broader than the front ones. Also, the hind pasterns are seldom so sloping, and the hind feet are not quite so large or round. There is less concussion behind than in front, but the stress is much greater at the pull, hence it is proper that hind pasterns and feet be a little more erect, in order to provide the necessary strength of conformation.

From what has been said above, the value of a straight hind limb, as viewed from behind, is emphasized. If the horse is "bow legged," his legs will prove weak when the strain is put upon them. Walking on a crooked hind leg is comparable to driving a bent nail. The force of the hammer bends the nail, instead of driving it into the wood, and a crooked hind leg bows outward, instead of remaining rigid and transmitting full force against the collar.

Symmetry.—Now that the details of the drafter's conformation have been described, a word may be added regarding symmetry or proportionment of parts. The fact is that some horses are good in their various parts, yet fail to present a good appearance. What they lack is symmetry. The head may be good, and the neck may be good also, but the two may be joined at an angle which injures the appearance. The neck may not rise from the shoulders as it should. The feet may be good, but may be either too large or too small to be in proportion to the size and weight of the animal. The top line

from head to tail may be an irregular line full of angles, whereas it should be gracefully curved. The hips may be wide, which is desirable, yet they should not be wide out of all proportion to the rest of the body, so as to be ragged and prominent. Seemingly small factors such as these may or may not affect the horse's usefulness for work, but frequently they constitute the difference between a plain animal and one of show-yard character, between which there is a great difference in price. One horse looks as though he were made up of a lot of different-sized parts which do not fit well together, while the other seems cast from a carefully prepared mould.

Fig. 94. Heavy Drafters in Harness.

This is the famous team of grays which was invincible at the leading shows a few years ago. They were shown in both the United States and Great Britain. Owned by Armour & Company of Chicago.

Standing in natural position, the symmetrical horse carries his head and neck well up, so that the face line, shoulder, and pastern all slope at nearly the same angle; the croup is fairly level from hips to tail, the tail is set high, and all parts of his conformation are so proportioned as to give him a well-balanced appearance.

On the matter of type.—To present the best appearance, the drafter should not be over-drafty in type; that is, shortness of leg and compactness and width of body should not be carried to the extreme. This type of horse is sometimes referred to as the "Poland-China drafter." A certain degree of length of

limb, length of neck, and length of underline is necessary, not only for the sake of looks, but also because it actually makes the horse more useful. He takes a longer step, and will do more work in a day than the extremely pudgy type of horse. On the other hand, we certainly do not want a horse that is all length and style. We must aim at the middle ground, selecting for as much style as may be had without sacrifice of any of those qualities which make the draft horse useful for his kind of work.

Action.—The action of the draft horse should be true, snappy, and bold. As you see him going or coming, the movement of the limbs should be straight in the line of motion, the feet being carried true, with no paddling or irregularity of gait. Walking away from you, he should move with enough snap to give you the flash of his shoe at every step. As you view him in action from the side, he should show length of stride and enough height of action to clear the ground safely at each step. High knee action is not essential; in fact, carriage horse action in a draft horse means useless expenditure of energy. However, there should be a strong, free movement of knees and hocks, without dragging or stiffness. The walk is the real gait of the draft horse, and an active, snappy, springy walk, with trueness and length of stride, is the prime essential so far as action is concerned. The horse should walk like a soldier. However, the trot often magnifies defects in gait so that they are more easily seen, and in show and sale rings drafters are shown at both gaits. The stride in the trot should be long, true, springy, steady, and business-like, with a certain degree of height of action to insure against stumbling. Horsemen like a bold way of going that indicates willingness and courage in the horse.

In action, the hocks should pass close together, so close in fact that they nearly brush each other. Some horses go so wide behind that a wheelbarrow could be put between the hind legs and scarcely touch them. Any tendency to spraddle behind is one of the greatest, if not the greatest, defect which the drafter can exhibit, so far as action is concerned.

The study of action is one requiring close attention. The observer must take into consideration every movement of the

horse. Attention must be given not only to the movement of the feet and legs, but also to the carriage of the head and neck and the entire body. The head should be carried well up, giving a stylish appearance and a good outlook, and the top of the horse should be carried level and true, without any rolling or wobbling motion from side to side. The front and hindquarters should act in unison, and the legs should be kept well under the body as the horse travels, showing no tendency to drag the hind legs, and especially the hocks, out behind the body. When kept up underneath as they should be, and when all the motions of the horse are smooth and in unison, we say that he moves in a collected manner. As before stated, perfection in action can result only when there is a combination of proper conformation and strength, and a willing disposition.

Common defects in the action of draft horses are (1) going wide at the hocks, (2) swinging the fore legs outward, called "paddling," (3) swinging in, (4) striking supporting leg with foot of striding leg, called "interfering," (5) twisting striding leg around in front of supporting leg, called "winding," "plaiting," or "rope walking," (6) short, stubby stride (7) low, skimming action, called "daisy cutting," (8) unsteadiness of gait, (9) striking sole or heels of fore foot with toe of hind foot, called "forging," (10) excessive lateral shoulder motion, called "rolling," (11) lack of energy or snap, and (12) lameness.

Color.—It is commonly said that a good horse cannot have a bad color. By this is meant that color is disregarded if the horse suits otherwise. Some colors, however, are very generally disliked, and still other colors are not liked by some persons. For instance, duns, flea-bitten grays, white horses, very light grays, and spotted horses are universally discounted, either because they are hard to groom, hard to match, or because the color is unsightly. Dark solid colors, such as black, brown, bay, very dark or steel gray, and dark chestnut, are given preference. Dark dappled grays are well liked by buyers, and some firms will accept no other color because the flash gray color attracts attention to their turnouts. White markings, including blaze faces, white ankles, and white stockings, are valued by some firms for the same reason. It is not uncom-

mon for business houses to adopt some color as a sort of trademark, on account of the advertising value. However, color is of less importance in draft horses than in any other type. This is true because the drafter is a business horse, whereas other types are valued mostly for pleasure purposes.

Finish.—The term "finish" refers to fatness and to the condition of the coat. The horse market discriminates in price to a considerable degree between the fat drafter and the thin one, and it is surprising what an improvement is made in some horses by the addition of fat. Fatness adds to the weight, improves the form and spirit, and provides the necessary reserve store of energy to carry the horse through the first few weeks in the city during adjustment to city sights, sounds, loads, pavements, stables, and other new conditions. Although fatness is important in the horse for sale or show, the judge must learn to distinguish between fat and muscle. The coat should be well groomed, so as to give the animal a sleek appearance.

CHAPTER XXIX.

THE CARRIAGE OR HEAVY-HARNESS HORSE.

The modern carriage horse is almost exclusively a pleasure horse. His name implies his use. He is put before various kinds of pleasure vehicles, ranging from the light runabout to the heavy coach. Because he wears heavy leather, in contrast to the harness worn by the roadster, he is also called the

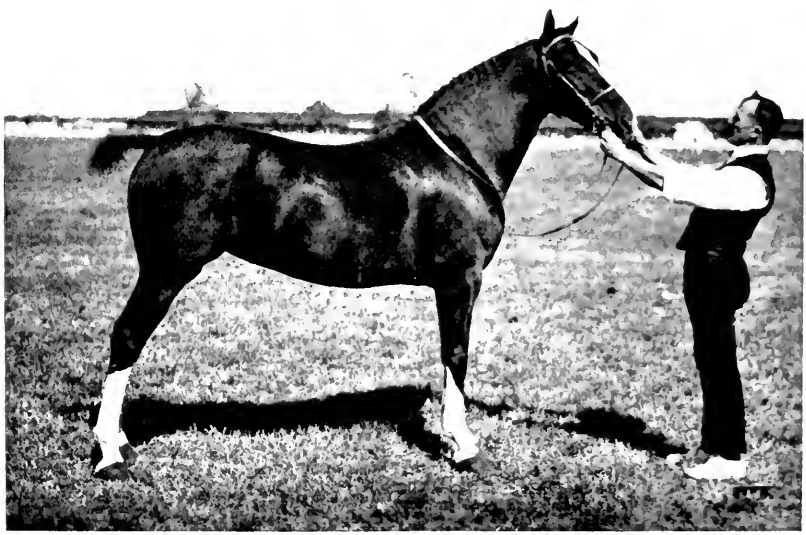


Fig. 95. Carriage or Heavy-Harness Type.

Hackney mare, Queen of Diamonds, imported and owned by the Truman Pioneer Stud Farm of Bushnell, Ill.

heavy-harness horse. Thus we may say that the carriage horse is one specially fitted for work in heavy harness, before vehicles designed for pleasure purposes and used for carrying people. It is apparent that there should be a wide range in the size and weight of carriage horses, in order to meet the

widely varying demands of the various vehicles and uses to which this horse is put. In other respects, all carriage horses are very nearly alike.

The value of the carriage horse is determined by (1) beauty of conformation, (2) action, (3) manners, (4) temperament, (5) color, (6) endurance and durability.

Beauty of conformation.—The conformation of the carriage horse must show beauty, style, symmetry, and finish. Being a pleasure horse, it is the ability not only to do certain work which determines value, but to do this work gracefully, and to present, while standing or in action, a picture of pleasing appearance. Everything is sidetracked for appearance in the breeding of this horse. Attractiveness of form is not restricted to any one type of horse, but it brings the highest price when found in the carriage horse. The value of the drafter is very largely measured by the amount of work he can do; the value of the light-harness horse is measured by his speed; the value of the saddle horse depends not only upon his appearance, but also upon his knowledge of the gaits and his ability to carry his rider with comfort and ease; the value of the carriage horse depends chiefly upon his appearance and general attractiveness of form and action.

Action.—Here again, beauty is the thing sought at the expense of other qualities. The carriage horse must not only go level, true, and collected, but he must go very high — the higher the better. With this end in view, he is bred, fed, shod, trained, bitted, and driven with a view to securing as much height of action as possible — not because it makes him more useful for his work, but because it makes him more pleasing to look upon. A certain degree of height of action is necessary in all horses, in order to secure length of stride and to prevent stumbling; such action signifies freedom of movement of joints and muscles, and indicates willingness and spirit. But the carriage horse is asked to go higher than this, even though it means added wear and tear on feet and legs, and a great amount of energy to accomplish the result. Beauty is given first consideration.

Manners. — Working oftentimes in crowded streets, where driving requires considerable care, it is easily apparent that,

with proper conformation, action, and durability, the carriage horse will not furnish real pleasure unless he has manners. Furthermore, if he fails to respond to commands, possesses a strong will that rebels at these commands, or fails to act

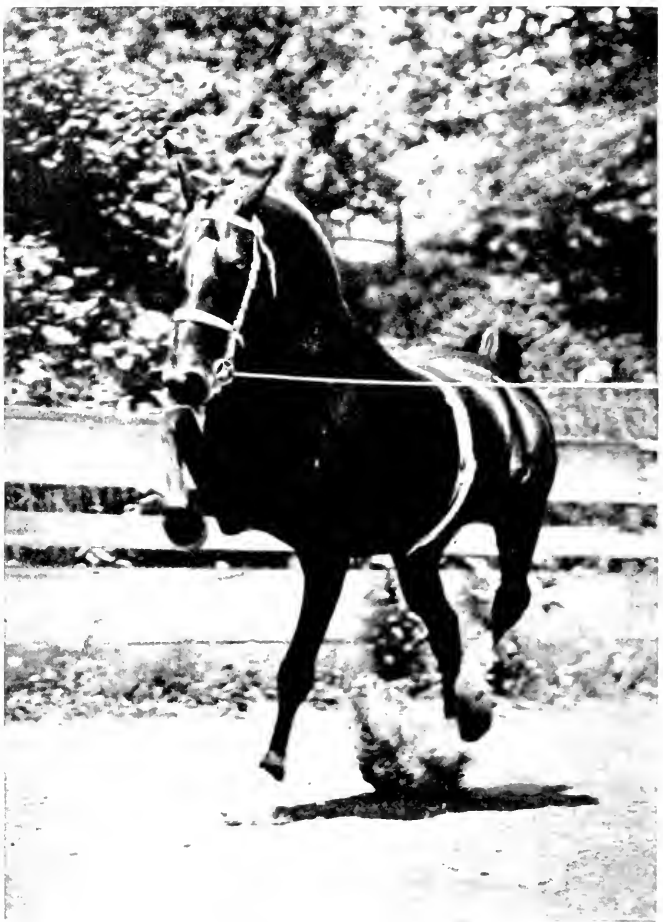


Fig. 96. The Heavy-Harness Type in Action.

Hackney pony, Irvington Model, bred and owned by Mr. W. D. Henry of Sewickley, Pa.

quickly, his lack of manners may result disastrously to the occupants of the carriage. In most cases, the carriage horse is not expected to stand without hitching, or to be as trust-

worthy in an emergency as an old "family horse," but he must be so thoroughly trained and familiar with the commands of his driver that the execution of whatever is asked will be done involuntarily, unhesitatingly, and instantly. Every command of word, whip, or rein must be received intelligently, and intelligently acted upon by the horse.

Temperament.—The sanguine or nervous temperament is the one desired in carriage horses, for without it we cannot expect that degree of action which is required, nor that quickness of response to commands which is essential. There are other types of horses which should possess the sanguine temperament to even a greater degree than the heavy-harness horse; these are the speed types, the trotter and the runner.

Color. — With the possible exception of the saddle horse, color is of more importance in heavy-harness horses than in any other type. The dark solid colors are preferred, as being in proper accord with the elegant vehicles drawn by this horse. White ankles are often favored, because a horse so marked has his action emphasized and easily seen. Grays, roans, and light colors are heavily discounted or even rejected, except for certain special restricted uses, such as sporting tandems, road fours, or cross-matched pairs, and in horses for ladies' use, even the white markings are discriminated against. True elegance and good taste are wanted, and this excludes colors that are flashy and calculated to attract undue attention.

Endurance and durability.—The carriage horse is required to make only short trips at a moderate pace. Endurance is not so essential, therefore, as in other types. However, durability, which means wearing quality, is of great importance. The extremely high action which is required makes necessary the best of feet and legs. Durability is almost entirely dependent upon the amount and quality of bone, and the structure and texture of feet.

We may make a final summing up of the foregoing points by saying that the carriage horse is one specially fitted to work before pleasure vehicles, over short distances, at a moderate pace, wearing heavy leather; and that to be in keeping with the handsome and expensive vehicles which he moves, he must show beauty and attractiveness of form and action that

will add to, rather than detract from, the appearance of the turnout.

DETAILED DESCRIPTION OF THE TYPE.

General appearance. — Compactness and fullness of form are required, in order that the horse may fill his harness properly and be in proper keeping with the vehicles before which he is put. He must possess great smoothness of conformation, with all his lines curving rather than angular. He must appear

Fig. 97. The Carriage Horse in Harness.

Compare this picture with Fig. 100, and note the difference in height of action, type of vehicle, and weight of harness. This is the noted Hackney mare, Bountiful, owned by Judge W. H. Moore of Chicago.

snugly put together. Although it is not desired that he stand on very short legs, it is essential that he be not leggy, or what is termed "weedy," in appearance. Medium length of leg is required, to give proper action and lend him style and symmetry. The height ranges from 14 to 16.1 hands, and the weight from 900 to 1,300 pounds. As previously stated, size and weight are of rather minor importance. There is a mistaken idea prevalent among farmers that this horse should stand rather high, and weigh 1,250 pounds and upward. It is

true that big horses that are good ones are harder to find than smaller ones, and hence size is of some importance. Nevertheless, an animal of desirable carriage horse conformation, style, and action will bring a good price no matter what his inches or weight; the demand is steady, both for those of largest size and those so small as to be called ponies. Hence, carriage horse type refers to a certain kind of conformation and action, and the question of size and weight is of small importance in all except breeding animals. However, we shall consider only heights above 14 hands as carriage horses; those below that height are ponies. The greatest demand is for horses standing from 15 to 16 hands. Quality is indicated in bone, feet, skin, hair, head, and smoothness of form. As the subject of quality has been fully discussed in connection with draft horse type, lengthy description is unnecessary here. Quality is valuable in the carriage horse because it assures durability, and because refinement and smoothness add beauty to the horse.

Head. — The head should be lean, with every feature clean-cut and sharply defined. The forehead should be broad, and the eyes should be large, prominent, and set out on the corners of the head. Strong jaws and a wide muzzle are desired, yet the muzzle must be refined, the lips thin, and the entire head free from any appearance of coarseness. The nostrils should be large. The ears should be fine and placed close together near the poll, turning in slightly at the tips. The attachment with the neck must be clean-cut and graceful. The appearance of the head should indicate intelligence, alertness, and quality.

Neck. — Length of neck is very essential. It should be gracefully arched and bear considerable muscle,—enough muscle to lend fullness and strength, but not so much as to give an appearance of heaviness or coarseness. The upper border of the neck should be fine along its entire length. Ewe necks are very unattractive and undesirable. The neck should blend nicely with the shoulders. The shape and carriage of the head and neck have much to do with making the animal a real carriage horse, or a plain, inferior sort. Without a high-class front, no horse can qualify as a heavy-harness horse of superior type.

Shoulders. — Long, snugly laid shoulders, that have a decided slope and are well muscled, are wanted. The withers should show refinement.

Chest. — The chest should be moderately wide and very deep. The breast should be carried out prominently, and be rather muscular.

Middle. — The middle of the horse should be round as a stick, short on top, and long below. This calls for long, well-arched ribs. The back, and especially the loin, should be thickly muscled and short, giving strength and a smooth, finished appearance. Depth of flank is essential, for the sake of appearance and keeping qualities.

Hips. — The hips should not be prominent. They should be smoothly covered with muscle. Prominent hips in the carriage horse are decidedly faulty, because they detract from the smoothness of form which is so much desired.

Croup. — A long, level, fairly broad, smoothly and heavily muscled croup is the most attractive and the best indication of strength. A short, steep croup, commonly designated a "goose rump," is very objectionable. The tail should be attached high and carried out from the quarters. Carriage horses usually have the tail docked and set.

Thighs and quarters. — Full, muscular development gives the desired plumpness of form and necessary strength. The gaskins should be strongly muscled and long, so that the distance from hip to hock will be great as compared with the distance from hock to ground.

Legs. — Superior quality of bone, associated with substance, should be evident in the cannons. The arm should be very muscular. The forearm should be muscular and long. The knee must be wide both ways, deep, and flat across the front. It should be clearly defined in all its lines, which means an absence of meatiness. The hocks should be wide from front to rear, broad across the front from side to side, and deep from top to bottom. The point of the hock should be prominent, and the rear edge of the joint below the point should be straight, or very slightly incurving. Roughness or coarseness of bone about this joint, puffiness, or meatiness are looked upon with suspicion as indicating weakness. The cannons, both

front and rear, as viewed from the side, should be short, broad, and flat, with the grooves between the cannon bone and tendons easily seen and felt. The broad, flat appearance results when the tendons are placed well back from the bone, and when the legs are free from meatiness. Smooth, hard, flinty bone and well-developed tendons are necessary. Straight, strong fetlock joints are essential. The pasterns should slope at an angle of 45 degrees, and be long enough to give elasticity of stride, yet show sufficient substance to insure strength. Proper position of the legs is of greater importance in this type than in draft horses. So much of the value of the horse depends upon action, and so much of action depends upon proper position of the legs and feet, that great attention should be given to this point. The legs must come straight down and the toes point straight ahead, to insure true action.

Feet. — The size of the foot should be proportionate to the size of the horse. Roundness and size of hoof-head, width at the heels, and height at both heel and toe are important. The discussion regarding the sole, bars, frog, denseness of horn, etc., as given in connection with draft horse type, applies here with equal force.

Action. — The requirements of action in the carriage horse are—(1) trueness, (2) height, (3) length of stride, (4) collection, (5) elasticity, (6) boldness and power, (7) gracefulness of movement, and (8) moderate speed. The walk must be snappy, quick, and business-like to a marked degree. But it is at the trot that action is wholly revealed. The flight of each foot must be in a straight line, parallel to the direction of motion of the horse. The fore foot is carried forward and high up, as if following the rim of a rolling wheel, and the stride is long. The foot meets the ground easily and without apparent jar, in fact, the step appears elastic, and the meeting with the ground seems to send the foot on again as though it were made of India rubber. The foot, pastern, cannon, and forearm cannot accomplish this alone. There must also be freedom of action of the arm and shoulder. Every movement must show grace and style, and the whole attitude of the horse should be one of combined courage and power.

Proper folding of the knee meets only half of the requirement. Associated with this, there should be decided flexing

of the hock. The hind foot will leave the ground with snap and free movement of pastern; at the same time, the hock will be carried, not backward, but upward toward the dock, to accomplish which the hock must be flexed very decidedly, and, when in this position, the leg swings far forward and the foot is let down to the ground. If the action of the hind leg is as described, the hind foot clears the ground by considerable distance, and the hocks do not drag out behind the horse. Many

Fig. 98. Sensational Action.

Little Ruby, a Champion Hackney Pony stallion, owned in England.

heavy-harness horses swing the hind legs back and forth with but slight flexing of the hocks. Such action has a straggling appearance that is in marked contrast to the high and collected action of a horse posessing proper action. There should also be unison of movement between fore and hind limbs.

As pointed out in the description of the draft horse, excellence of action results only when there is a combination of proper conformation of body and limbs, correct position of

limbs, strength of muscle, proper temperament, and abundant spirit. Action is so valuable in the heavy-harness horse that breeders and dealers often resort to artificial means to secure it in horses which are deficient in their movement. Heavy shoes produce height of action. Drugs and intoxicants are sometimes given to put spirit into the horse; these have only a temporary effect, and when used at all are mostly used with show horses. Short chains are sometimes fastened to the feet of young horses, to teach them to lift their feet high. Exercising over rough or freshly plowed ground, or in straw, is also a common practice, to induce lifting of the knees and hocks. The toe is allowed to grow out long, requiring more energy on the part of the horse in breaking over as he takes a stride, so that when he does break over, the extra force tends to carry the foot higher and farther away. Action produced by any such methods as these is known as artificial action, in contrast to natural action bred in the horse. Artificial action is usually discovered without difficulty. The practiced eye detects that the horse is not doing his work with ease and pleasure. There seems to be a straining of muscles, a "tied up" way of going, and a lack of steadiness that is never seen in the natural actor. Artificial action results in quick tiring of the horse; it is not an unusual spectacle to see such horses come into the show ring with high action which rapidly disappears until the legs drag, if the horse is called upon to do much work, while the natural actor goes high from start to finish.

On the other hand, no matter how natural it may be for a horse to go high, he still requires proper shoeing, bitting, training, and driving, in order that his inherent ability may be developed. Even after the horse is "made," as the saying goes, if he is placed in the hands of an inexperienced reinsman, unskilled in driving heavy-harness horses, the result will be an absolute failure. The trained carriage horse responds superbly when under the guidance of the master reinsman, who, by means of word, whip, and rein, telegraphs the signals with which the horse has become familiar, and to which he instinctively responds with certain desired movements. In the hands of a novice, however, he makes a poor showing.

Speed.—This is not important in heavy-harness horses; only a moderate degree of speed is wanted.

CHAPTER XXX.

THE ROADSTER OR LIGHT-HARNESS HORSE.

The roadster or light-harness horse is distinctly an American type, or strictly speaking, it is a breed—the American Trotter or Standardbred. Such names as American roadster, gentleman's roadster, and trotter are also applied to this type. The light-harness horse is a pleasure horse exclusively; his domain includes the regular race tracks, where he is used for professional racing, and also the city speedways, snowpaths, and roadways, where amateur racing and road driving are indulged in by men who admire the trotting horse and seek recreation in the open air. There are many men too heavy to ride who turn to the roadster as the next best means of getting fresh air and exercise from the use of horses.

The light-harness type and the sport of harness racing originated in and about Philadelphia at the beginning of the nineteenth century, at which time roads were improved and made suitable for pleasure driving. This type is the result of Yankee skill and genius applied to horse breeding. With all his faults, the American Trotter is a wonderful production, and closely rivals the running horse in point of speed. Large numbers are exported to Europe each year, especially to Russia, Germany, and Austria, where harness racing is becoming more and more popular each season.

This type is styled "light-harness type" because, on both road and track, the horse works in light-weight harness that is quite in contrast to the heavy leather worn by the heavy-harness horse. The harness is light because the vehicles to which this horse is put are very light in weight. In professional racing, the bike sulky is used, which weighs from 27 to 35 pounds; in matinee racing, the vehicle used is a light speed wagon, having four wheels but of the same general construction as the sulky, and weighing only 65 to 68 pounds. On the road, the hitch is to a light wagon weighing about 175 pounds, which may have a top much like the common piano-

box buggy. For snow racing, a specially constructed speed sleigh is used, weighing a little less than 100 pounds.

Undoubtedly, every American realizes the largeness of the demand for this type of horse for professional racing, but the large demand for this horse for use in amateur racing is not so generally known. There are many men in cities and elsewhere who find great pleasure in holding the reins over a horse with speed. In almost every city and town of prominence are driving clubs whose membership is made up of business and professional men. Weekly matinee racing is conducted by such clubs during the summer and fall, and, in some cases, during the winter months as well. This is purely from love of the sport, the prizes being ribbons and silver trophies, and not purses as in professional racing. Hundreds of good horses, many of them holders of world's records, have been purchased by men who never compete for cash prizes; for example, Lou Dillon, The Harvester, and Uhlan are owned by Mr. C. K. G. Billings who never races his horses for money.

The value of the light-harness horse is based upon (1) speed, (2) stamina or endurance, (3) durability, and (4) beauty of conformation.

Speed. — Whether in use on or off the track, the light-harness horse is prized almost exclusively for speed. We Americans are said to be possessed of a great deal of nervous energy, and to insist upon speed in everything. Our ships, railway trains, street cars, and automobiles are required to travel faster than those of any other people. Likewise, among our horses, we have placed more emphasis upon speed than have other nations. The American Trotter is a result of the admiration of Americans for speed wherever it is found. For racing purposes, the roadster is required to show 2:30 speed at the trot, or 2:25 at the pace, before he is considered a light-harness horse in the true sense of the word; for road use he should be able to do ten miles within an hour. A light-harness horse without speed is as useless for the purpose intended as a drafter without size, or a carriage horse without action and beauty. The ability to "get there" is the thing for which this horse is bred and trained. The world's trotting record is now 1:58 (which means one minute and fifty-eight seconds for the

mile) and is held by Uhlan, a gelding. The world's pacing record is 1:55¼, held by the stallion Dan Patch. The world's trotting and pacing records and the years when they were established are as follows:

Trotting		*Pacing*	
1 mile—Uhlan (1912)	1:58	Dan Patch (1905)	1:55¼
3 miles—The Harvester (1910)	4:15¼	Dan Patch (1903)	4:17
2 miles—Nightingale (1893)	6:55½	Almont (1908)	6:50
4 miles—Polly G. (1899)	9:58	Joe Jefferson (1891)	10:10
5 miles—Zombro (1902)	12:24	Professor (1907)	12:25¾
Stallion—The Harvester (1910)	2:01	Dan Patch (1905)	1:55¼
Mare—Lou Dillion (1903)	1:58½	Dariel (1903)	2:00½
Gelding—Uhlan (1912)	1:58	Frank Bogash, Jr. (1914)	1:59¼
Yearling—Airdale (1912)	2:5[illegible]	Frank Perry (1911)	2:15
Two-year-old—Peter Volo (1913)	2:04½	Directly (1894)	2:07¾
Three-year-old—Peter Volo (1914)	2:03½	Anna Bradford (1914)	2:00¾
Four-year-old—Etawah (1914)	2:03¼	William (1914)	2:00
Five-year-old—Lou Dillion (1903)	1:58½	Braden Direct (1913)	2:01½
Under saddle—Country Jay (1909)	2:08¼	Kruger (1907)	2:12
Pair—Uhlan and Lewis Forrest (1909)	2:03¼	Minor Heir and George Gano (1912)	2:02

Stamina or endurance. — Most racing, both amateur and professional, is at mile heats over half-mile or mile tracks. Some races are two in three, and some three in five, heats. Not until some horse has succeeded in winning the necessary two or three heats is the race decided. For this reason, some races extend into very gruelling contests. Some horses show a wonderful burst of speed for a quarter of a mile or so, and then quit. These horses are said to "lack bottom," by which is meant a lack of stamina or endurance. Stamina means ability to go a mile at speed, and to repeat the mile, two, three, or more times, with intermissions of only 25 minutes. To accomplish this requires heart and lungs of the first order, together with long, firm muscles over all parts. On the speedway and snowpath, there is a great deal of brush racing, that is, racing over short distances of varying lengths, depending on the wishes of the drivers and the ease or difficulty in passing opponents. This is usually not so severe as a regular racing program, provided the horse has been properly conditioned and trained. A great many horses which are possessed of more stamina than speed depend on their ability to wear down their more speedy rivals, in order to win a heat or race. This they do by repeated scoring for a start, or through the good fortune of having a race extended out to extra heats—what is termed a split-heat race. Other horses, with more speed

than stamina, must be driven to win from the start of the race, avoiding unnecessary scoring in an endeavor to capture the required number of heats in short order.

Durability. — It is readily apparent that the work required of the light-harness horse is of such a nature as demands the best of feet and legs. This type of horse has a decided advantage over the carriage horse and drafter, in that he works on a much more yielding footing, yet the high rate of speed puts his feet and legs to a very severe test, and many horses with speed and stamina have their usefulness and value greatly lessened because of failure to keep sound when called upon to go through a strenuous racing campaign or do a large amount of work on the road. Some very noted horses and some families of trotters have been notably lacking in this respect.

Beauty of conformation is a comparatively small factor in determining the value of roadsters. Some breeders have placed considerable emphasis on the matter of looks and attractiveness, but in general it may be said that beauty in the roadster, while appreciated whenever it occurs, is of as small account as it is in the draft horse. Some horsemen might maintain that it is even less important in the roadster. These statements must be modified, however, in so far as roadsters strictly for road driving are concerned; for such use, speed is not so important as endurance and the ability to make a long drive in creditable time, and in selecting horses for this work considerable attention is given also to the appearance of the horse. A big, strong, well-made horse, with quality, a well-carried head and tail, light mouth, good manners, excellent feet and legs, and a long stride, is the sort best suited for road driving. For the various kinds of racing, however, speed, stamina, and durability are the almost exclusive requirements.

DETAILED DESCRIPTION OF THE TYPE.

General appearance. — There is wide variation in the general appearance of the light-harness horse. "They come in all shapes, and go in all forms." This is a result of breeding for speed alone. Speed is the only characteristic which all light-

harness horses possess with reasonable uniformity. To be sure, selection and breeding for speed have resulted in fixing a sort of general type upon this horse. Certain things are necessary in the conformation of the horse to enable him to go fast. Acknowledging this, there is yet opportunity for rather wide differences in appearance. Beauty has been almost ignored; speed is the great essential. Beauty is preferred only

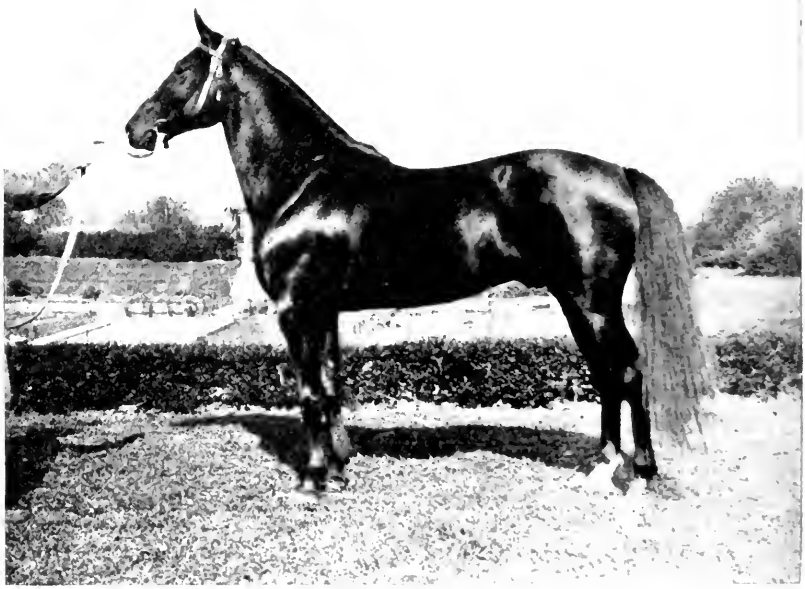


Fig. 99. Roadster or Light-Harness Type.

Azoff, 2, 2:14¼; son of Peter the Great 2:07¼ and Dolly Worthy 2:27¼, by Axworthy 2:15½. Owned at Thompson Farm, Libertyville, Ill., Hon. John R. Thompson, Proprietor.

when the speed is equal. Even in selecting animals for breeding purposes, the basis of selection has been speed almost to the exclusion of other qualities. S. W. Parlin, Editor of the *American Horse Breeder*, has the following to say on the subject of breeding trotters: "When choosing between two animals for breeding purposes, one of which is a very attractive

animal, but known to be lacking in inheritance from animals that were race winners at some gait, and a less attractive one, that has a rich speed inheritance on both sides, it will always be safer to take the less attractive one that has the richer inheritance."

The above outlined practice, while correct enough in breeding for speed, is responsible for the wide variation in appearance found among light-harness horses. A few breeders have bred for beauty and speed combined. Mr. C. J. Hamlin, who during his lifetime maintained a world-famous breeding and training plant at East Aurora, N. Y., used to say—"When you go into a ball room, you would rather choose as a partner a beautiful woman who can dance well than a homely one who can dance equally well." He used this illustration to show his attitude in the production of the roadster. Mr. Hamlin successfully combined speed with size, soundness, style, and elegance of form.

In breeding for speed alone, certain other characters are bound to be impressed also. Characters are seldom transmitted singly. Often there is an association of them found always in company, and these are called correlated characters. Speed in the light-harness horse is associated or correlated with refinement, endurance, and courage. Size, symmetry, and beauty are not correlated with speed except in the most general way. The light-harness horse varies in weight from 800 to 1,250 pounds, and in height from 14.2 to 16.1. Weights from 950 to 1150 pounds and heights from 15 to 16 hands are most common. This type is rather upstanding, leggy, long, deep, narrow, and angular. Selection and breeding for speed have resulted in a refined race of horses. Quality is shown by clean, smooth, dense bone; sharply defined tendons and joints; fine skin and hair; small ears; fine-haired mane and tail; hoofs of smooth, dense horn; and a chiseled, clean-cut, blooded-looking head. The temperament must be decidedly sanguine, which brings courage, willingness, and promptness, with no sluggishness.

Head. — The head should be clean-cut and straight, with a fine muzzle, large nostrils, and thin, trim lips. The eyes should be prominent, rather large, full, clear, bright, with a

thin lid. The forehead should be high, broad, and full. The ears should be fine, pointed, set close, and carried alert.

Neck. — A long, lean neck, with a fine throttle, is desired. Ewe necks are common. A straight neck, or one with slight arch, is preferable.

Shoulders. — Long, smooth, sloping shoulders, fitted close together, and forming high, refined withers at the top, are most desirable.

Middle. — A deep rib, without much arch, is associated with desirable light-harness type. The chest gets its capacity from depth, rather than from width. A straight, medium-short, well-muscled back and loin are essential. The underline is long, and the flanks should be well let down.

Hips. — The hips should be fairly wide, but smooth. This type does not present as smooth a hip as does the carriage horse. A little prominence of hip is not very objectionable, but if this is so pronounced as to give a rough appearance it is undesirable.

Croup. — A long, level, fairly broad, muscular croup is best suited to this type. Defective croups are common. The tail should be attached high and well carried.

Thighs and quarters. — Long, muscular thighs give speed. Well-muscled quarters are necessary for strength.

Legs. — Length of leg is necessary for speed, yet there should be proper proportion between length of leg and size of horse. A shallow body set up high on very long legs is not a good type. Yet it is just as essential that the light-harness horse have length of leg to secure speed, as it is that the draft horse have a short leg to secure greatest power. However, the length must come above the knees and hocks as much as possible; short cannons are just as essential here as in other types. The arm should be short, muscular, and carried well forward, while the forearm should be very long and broad, with a nice tapering to the knee. This gives room for the attachment of the long muscles associated with speed. The knees must be clean-cut, bony, straight, broad, deep, and strongly supported. The cannons must be as short as possible, broad, with large, clean tendons set well back from the bone.

Straight, wide fetlock joints and strong, sloping pasterns of good length are very necessary. The fore leg must be straight, and the toe should point directly forward, to insure trueness of action. A long, broad, muscular gaskin is even more essential than a long, well-muscled forearm. This brings the hocks far below the point of the buttock, which is essential in securing speed. Clean-cut hocks that are wide, deep, smooth, bony, with prominent point, and well supported below are very necessary. The hind legs must be straight under the horse, with the toes pointing straight ahead. Sickle-shaped hind legs are rather too common.

Feet. — The best of feet are necessary. Although this type is usually afforded an easy footing, nevertheless the tremendous concussion puts the feet to severe strain when the horse travels at speed. At high speed, a stride of 19 or 20 feet is attained. Imagine the force of the backward thrust of the ground when a 1000-pound horse strides 20 feet in less than half a second, as is the case when the horse is trotting at a two-minute gait. The feet should be uniform in size, point straight forward, and slope at the same angle as the pastern. The horn of the hoof should be dense and smooth, the sole should be concave, the bars strong, the frog large and elastic, and the heel wide and open.

Gait. — Both pacers and trotters are found among light-harness horses. These gaits differ from each other in that the pace is a lateral motion, while the trotter moves diagonally. A change of a few ounces in the weight of a shoe often transforms the gait. Many horses hold records at both gaits. The pacing gait is about three seconds faster for the mile than the trot, but it is not so popular with horsemen as the trotting gait. With the pace there is very often associated a decided rolling of the body, which is disliked. The natural pacer also frequently possesses a steep croup, short underline, and sickle-shaped hind leg.

Action. — The walk should be true, elastic, quick, and regular. The trot, in order to be fast without undue tiring of the horse, must be straight and true, with regular, even, long stride. Height of action is of little importance; in fact, the less knee and hock action the better. It is only important

that the foot clear the ground, accompanied by enough action of knee and hock to secure length of stride. There should be no hitching or unsteadiness of gait, and no great tendency to break when going at speed. The legs should move like clockwork, and the whole appearance of the horse when in motion should be that of a carefully planned machine, able to travel at greatest speed with least expenditure of energy. It is apparent that much of the success of the light-harness horse depends upon his action, and action, in turn, is dependent

Fig. 100. The Light-Harness Horse in Action.

The Harvester 2:01, Champion trotting stallion, driven by Mr. Ed. Geers. Owned by Mr. C. K. G. Billings of New York City.

largely upon the placing of the legs. Defects in conformation result in knee knocking, speedy cutting, over-reaching, and other faults of action.

Common defects in the action of light-harness horses are (1) swinging the fore feet inward, instead of carrying them straight away, (2) a stride in which extension is more marked than flexion, and when the foot is placed on the ground the heels strike first, called "pointing," (3) pause in flight of foot before foot reaches ground, called "dwelling," (4) striking sole or heels of fore foot with toe of hind foot, called "forging,"

(5) striking supporting leg with foot of striding leg, called "interfering," (6) hitting front of hind foot above or at line of hair against toe of fore foot as it breaks over, called "scalping," (7) the spreading trotter at speed hits hind leg above scalping mark against the outside of the breaking over fore foot, called "speedy cutting," and (8) "cross-firing," a fault in pacers corresponding to forging in trotters.

Condition. — The condition of the light-harness horse is in marked contrast to the types previously described. When in desirable racing condition, there seems to be a total absence of fat from the muscles. The muscles are hard and firm, and there is a clean-cut appearance which indicates proper racing trim. This gives the horse a sinewy aspect.

Color. — Taking a very large number of light-harness horses with records of 2:30 or beter, or from ancestors with records of 2:30 or better, — in other words, standardbred trotters, — the colors per thousand horses are as follows: — 605 bays, 140 chestnuts, 130 browns, 85 blacks, 25 grays, 13 roans, and 2 duns. The first four colors — bay, chestnut, brown, and black — are liked best. Grays, roans, and duns are not popular colors. However, color is of minor importance, speed being the great and almost exclusive requirement.

The misfits. — It is a well-known fact that many horses bred and developed for light-harness purposes do not show the necessary 2:30 or better speed. These may be called the misfits, for in breeding any type of animals there is a certain percentage of offspring which fails to exhibit the desired characteristics, whatever these may be. What becomes of the great number of light-harness-bred horses which lack the prime essential — speed? Among them, a few will show good carriage horse conformation, and so it is that horses of light-harness breeding are quite often docked and made over into heavy-harness horses; some very good show horses have come from this source — mere accidents in breeding. Those which lack beauty as well as speed must be sold at a loss to the breeder. These find their way into all sorts of work, such as filling the demand for cheap driving horses, delivery wagon horses, and other demands for cheap horses. When horse cars were in use on street railways, many misfit trotters were disposed of for such work.

CHAPTER XXXI.

THE SADDLE HORSE.

Any horse used for riding might be called a saddle horse. But there is a certain type of horse best suited to carrying a man in safety and comfort, and this is the type to bear in mind when thinking of saddle horses. The horse of all pioneer peoples is the saddler. In new countries, before the opening of roads, the saddle horse is of greatest usefulness. When the country becomes settled and roadways are opened and improved, other types of horses quickly appear, and there is less and less real necessity for the saddle horse; but the saddler never disappears from any community, because he is highly prized as a horse for pleasure and recreation.

When roads were being opened in the states along the eastern seaboard, and the roadster began to gain popularity, Kentucky, Missouri, and the West were yet a country of bridle paths, and there the saddle horse was held in high esteem. In 1818, a traveller through the Kentucky blue-grass region reported that "the horse, 'noble and generous,' is the favorite animal of the Kentuckian, by whom he is pampered with unceasing attention. Every person of wealth has from ten to thirty, of good size and condition, upon which he lavishes his corn with a wasteful profusion." Besides Kentucky and Missouri, the states of Virginia and Tennessee have been intimately connected with saddle horse development in America. These four states produce many excellent saddle animals annually.

Today, saddle horses are used in a business way by the cavalry of the United States Army and National Guard, by the mounted police of the larger cities, by cattle drovers in rural districts, by cattle buyers and salesmen at the large live-stock markets, by ranchers in the West, and by overseers and managers of large plantations and farms in the South, East, and Central West. However, the high prices for saddle horses are paid by people to whom the saddler is a pleasure horse. In

city parks and on country roads are to be seen many excellent saddle horses, used strictly for pleasure and recreation.

All good saddle horses possess a general type which we may call "saddle type," but the uses made of saddle horses are so varied that several varieties or sub-types of the saddle horse exist, each possessing a distinct type of its own. The most important of these sub-types are (1) the five-gaited saddler, (2) the walk, trot, canter horse, (3) the hunter, and (4) the polo pony. All of these are pleasure horses. The running horse or race horse, the cavalry horse, and the mustang are other saddle sub-types adapted to certain special uses, but the following discussion is confined to the four sub-types first mentioned. A brief description of the cavalry horse will be found in the chapter dealing with market classes of horses.

The Five-Gaited Saddle Horse.

The five-gaited saddle horse is also known as the American Saddle Horse, this being the name of the breed which supplies practically all horses of the gaited class. To classify as a five-gaited horse, the saddler must have at least five gaits, four of which must be the walk, trot, canter, and rack; in addition to these four, the horse must have one or more of three slow gaits — the running walk, fox trot, and slow pace.

The gaited saddler is the horse that has made Kentucky and Missouri famous. In his native home he is looked upon with reverence, and bred and trained with great care. Dozens of uses are made of him. If a call is made upon a neighbor, be it formal or informal in nature, this horse is brought into service. If it is desired to simply promenade, or to obtain healthful out-of-door exercise, there is the always-present saddle horse useful for the purpose. He carries his master to church, to school, and to war; on neighborhood visits, and on long journeys across country. Wherever and whenever the Kentuckian or Missourian may go on horseback he does so, and, instinctively, when thinking of these people, one thinks of them as mounted on gaited horses.

General appearance. — The gaited horse wears a natural mane and tail, in contrast to the other types of saddle horses. The breeders of this type lay stress upon loftiness of carriage,

airiness of movement, refinement, intelligence, docility with high spirit and courage, — withal, great beauty in every detail of conformation, without any sacrifice of those qualities which insure durability and creditable performance of the work demanded of a saddle horse. A leading Kentucky breeder presents the points of the typical five-gaited saddle horse in the following brief paragraph*: —

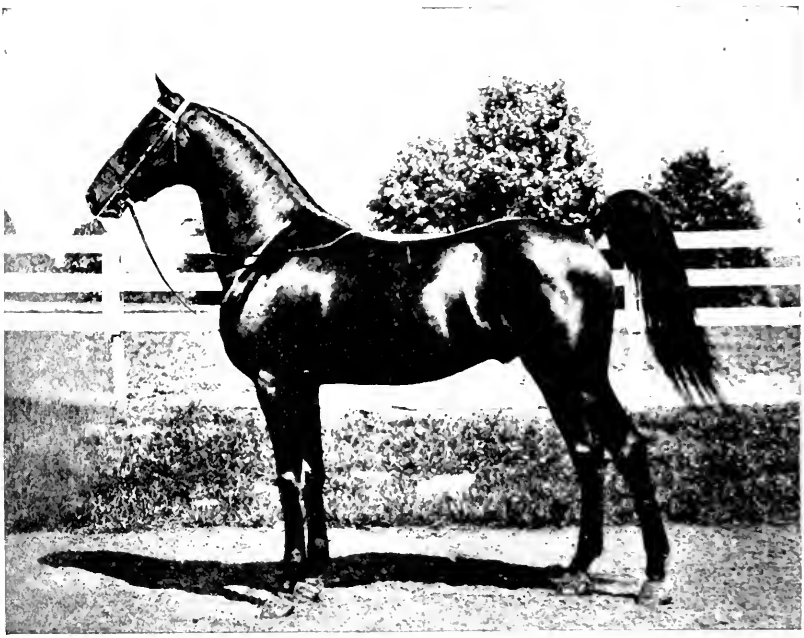


Fig. 101. Five-Gaited Saddle Horse.

The noted prize-winning stallion, Kentucky's Choice. Owned by Mrs. R. Tasker Lowndes of Danville, Ky.

"The typical saddle horse does not differ materially from other light horses in conformation. The characteristics peculiar to the type are a long, clean neck, sloping pasterns and shoulders, withers moderately high and narrow, a short and compactly coupled back, smoothly turned quarters, and a well-set, high-carried tail. In action there should be promptness, ease, and precision in going from gait to gait, and absolute

*Bit Spur, September, 1912, p. 22.

straightness and evenness in each. The rack should be smooth, swift, and without side motion of the body or legs, the trot should be fast and without offensive flashiness, the canter should be slow with no increasing speed, the flat-footed walk should be springy and reasonably fast, while the running walk, or fox trot, should be easy and comfortable and equal to about five miles an hour."

Fig. 102. The Saddle Horse in Action.

Edna May, undefeated five-gaited mare, ridden by Mr. Mat S. Cohen of Lexington, Ky. Owned by Mrs. R. Tasker Lowndes of Danville, Ky. This picture shows correct degree of knee and hock action and proper carriage of head and tail.

Gaits. — In a wild state the natural gaits of the horse were three in number — the walk, trot, and gallop or run. Some authorities also include the pacing gait as one of the natural gaits of the horse, and there is good evidence in support of this contention. Under domestication these gaits have been

variously modified and additions made for saddle purposes. These additions and modifications are largely the result of the selection for breeding purposes of those animals most readily acquiring the desired gaits when trained to them. The gaits desired in the five-gaited type of saddle horse are as follows:

Walk. — The flat-footed walk should be springy, regular, and reasonably fast.

Trot. — This is a diagonal gait, the off fore foot and near hind foot striking the ground together, the body being then propelled forward from this support and sustained by the near fore foot and off hind foot. It is a "two-beat" gait. The trot should be fast, with only moderate height of action, offensive flashiness being undesirable. Many otherwise excellent saddle horses cannot trot well, "pointing" and coming down on their heels, instead of exhibiting a good square trot.

Canter. — The canter is a restrained gallop. It is slower than the gallop and easier to ride. The horse easily acquires this gait. It should be slow, with no increasing speed. The canter is not considered perfect until the horse can perform it at a rate no faster than a fast walk. To "canter all day in the shade of an apple tree" is a well-known saying. A well-trained horse will change lead in the canter, and start with either foot leading, at the will of the rider.

Rack. — This is a four-beat gait, each foot meeting the ground singly, all the intervals being equal. Hence it is sometimes called "single foot." This gait may be distinguished by the ear alone, because the foot-falls are rapid enough to produce a characteristic musical clatter. The rack is taught by urging the horse with the whip or spurs and restraining by the curb. This breaks up the movement of a slow gait, and the restraint is sufficient to prevent a free trot or canter, so that the horse flies into a rapid four-beat gait. The rack is easy for the rider, hard for the horse. It is showy, and some horses can perform it at great speed. This gait has been officially named the "rack" by the American Saddle Horse Breeders' Association, hence the name "single foot" should not be used. It should be smooth, swift, and without side motion of the body or legs.

Slow pace. — The slow pace is the true pace so modified that the impact on the ground of the two feet on a side is broken, the hind foot touching first, thus avoiding the rolling motion of the true pace. The slow pace is a comfortable and attractive gait. It is little used outside of the show ring. Many trainers do not favor it, for the horse easily falls into the habit of taking the true pace which is not a desirable saddle gait because it is rough and uncomfortable. The true pace is the worst gait a saddle horse can possess; the rider cannot rise to it and save himself as in a trot.

Fox trot. — The fox trot is a slow trot or jog trot. It is not so popular as the running walk. It is a broken-time gait and difficult to describe. Some riders, when asked to exhibit the fox trot, simply restrain their horses to as slow a trot as possible, seeking to pass that off as a fox trot. However, the true fox trot is not accompanied by restraint.

Running walk. — This is a slow gait, as are also the slow pace and fox trot. The running walk is faster than a flat-foot walk and is taught by gently urging the horse out of the ordinary walk, but restraining him from a trot. The movement of the limbs is more rapid than in a walk, but in about the same rhythm. Each foot strikes the ground independently, and there are three feet on the ground all the time. The true running walk is usually characterized by a bobbing or nodding of the head, and, in some instances, by a flopping of the ears, in unison with the foot-falls. It is an all-day gait, easy and comfortable to both horse and rider, and equal to about five miles an hour. It is, however, not as showy or attractive as the other gaits.

Many saddle horses are educated to all seven of the gaits, and some have a knowledge of special movements known as the high-school gaits.

Walk, Trot, Canter Horse.

This type is also styled the "three-gaited horse" and the "park hack." This is the horse which conforms to English fashions, whereas the five-gaited saddler is exclusively an American type. The three-gaited horse is ridden in true English fashion; this means the use of the English pad saddle, the curb bit and snaffle, and the crop in place of the riding

whip. At the trot, the rider does not sit close to the saddle but performs what is called "posting."

General appearance. — The walk, trot, canter horse has his mane pulled and his tail docked and set, in accordance with English fashion, whereas the gaited horse wears a natural mane and tail. Otherwise, the two types have practically the

Fig. 103. The Three-Gaited Saddle Type.

Connoisseur, an excellent type of walk, trot, canter horse. Owned by Mr. Wm. Ritter of Columbus, Ohio.

same general appearance. Most three-gaited saddlers are American Saddle Horses which, for one reason or another, are marketed as three-gaited horses. There are also quite a number of walk, trot horses which are of Thoroughbred breeding, and some have a strong infusion of the blood of the American

Trotter. In such cases. the head and tail are not carried so high, and there is not the evidence of style in form and action which characterizes the horse that is of American Saddle Horse breeding.

Gaits. — This horse must show three gaits, and three only; these are the walk, trot, and canter. It is as objectionable for a three-gaited horse to show more than the gaits mentioned as for the five-gaited horse to know less than the five gaits.

While many people have adopted the walk, trot, canter horse in preference to the five-gaited type because they accept English horse fashions as law, there is still another reason why the American type with its five or more gaits is not favored by all riders. The reason is that there is no advantage in having a horse with all the gaits unless the rider is skillful enough to keep them distinct. If the man is less instructed than the horse, a sad confusion of paces is apt to result. A well-mouthed, well-suppled horse, with a good trot and a good canter is more useful to the ordinary rider than is one of the highly accomplished gaited saddlers; hence the popularity of the three-gaited horse, especially in the larger cities. Saddle horse breeders recognize this state of affairs and annually send to market a large number of three-gaited animals with short manes and tails, as well as large numbers of five-gaited horses.

Outside of the matter of gaits, the requirements for the five-gaited and three-gaited types are so nearly identical that one discussion will suffice for both.

REQUIREMENTS OF THE SADDLE HORSE.

The essential points to be looked for in a saddle horse are (1) beauty of conformation, (2) sure-footedness, (3) comfortable seat, (4) best of manners, (5) knowledge of the gaits, (6) durability, and (7) dark solid color.

1. Beauty of conformation. — Attractiveness of form and action is almost, if not quite, as valuable in the saddle horse as in the carriage horse. People who ride for pleasure take as much pride in the ownership of an attractive animal as do the owners of carriage horses.

2. **Sure-footedness.** — Saddle action must, first of all, be safe and sure. A horse inclined to stumble is dangerous, and cannot be highly valued for saddle purposes.

3. **Comfortable seat.** — Though a horse be sure-footed, he will not be of much use or value for saddle work unless he gives his rider a pleasant ride. Rough-gaited horses are not useful saddle horses.

4. **Manners.** — The intimate relation between horse and rider calls for the very best of manners. Conduct that would be tolerated from a horse in harness may be very disagreeable if the horse is under saddle. The very nature of the use to which the saddler is put makes manners one of the prime essentials.

5. **Knowledge of gaits.** — To a considerable extent the value of the saddle animal is measured by his knowledge of the gaits. As this is largely a matter of training, it is placed fifth in the list of requirements. There must be no mixing of gaits; each gait must be pure, and the horse should change gaits promptly and easily at the signal from the rider.

6. **Durability.**—This implies enough substance combined with quality of bone and joints to insure good wearing qualities. Although a pleasure horse and hence not asked to do extreme labor, nevertheless real pleasure does not come to the rider who knows his horse to be delicate in bone, or otherwise liable to injury, if called upon to do hard work.

7. **Color.** — Dark colors are much preferred, including bay, brown, chestnut, and black. Flashy colors such as dapple gray, roan, dun, cream, white, and parti-color are too conspicuous for ordinary saddle use, but may find a demand from circuses

DETAILED DESCRIPTION OF SADDLE TYPE.

Size and weight. — These are quite variable depending on the character of the work and the weight of the rider. The height is usually from 15.1 to 15.3 hands, and the weight from 1,000 to 1,150 pounds. A gaited horse of 15.1 hands and 1,000 pounds is termed a "lady's saddler," or if a walk, trot, canter horse, a "lady's hack;" but for heavier riders larger animals are required, some men needing a horse standing over 16

hands and weighing 1,200 pounds or even more. For the sake of comparison the heights and weights of the various subtypes of saddle horses are here given:

Type	*Height*	*Weight*
Five gaited	15 —16	900—1200
Three gaited	14.3—16	900—1200
Hunter	15.2—16.1	1000—1250
Cavalry	15 —15.3	950—1100
Polo pony	14 —14.2	850—1000

Conformation.—The saddle horse is considered by many people to be the most stylish, beautiful, and finished of all horses. The principal requirements in conformation are (1) a long, refined neck, (2) nicely sloping pasterns and shoulders, and (3) moderately high and refined withers. The lines of the head should be cameo-like in sharpness and clean-cutness. An ideal saddler will naturally have a head showing an unusually kind disposition and high intelligence, for the intimate relation between horse and rider demands the best of manners in the horse and thinking ability on both sides. The head should be set at the right angle on a very long, refined, nicely arched neck. Unless there is lots of horse in front of the saddle, the appearance is spoiled, and a horse with a short, straight, heavy neck is not easily controlled. There should be easy flexion of jaw and neck, and this is possible only with a long, refined neck, properly arched. However, a "weedy" neck, that is, one lacking in muscular development, is not wanted. Much attention must be given to the slope of pastern and shoulder, for straight pasterns and shoulders are more objectionable in the saddle horse than in any other type because they are almost certain to make the horse a hard rider. Height and refinement of withers are necessary for a similar reason. Horses that are low in the forehand are not comfortable to ride. Furthermore, the saddle cannot be made secure on round, flat withers, this being particularly true of the side saddle. The extension of the shoulder into the back and shortness and strength of coupling are very important. A straight or roached back does not afford an easy ride; there should be a certain degree of springiness, without any weakness or sway-backed conformation. The saddle horse is somewhat upstanding, and the head and tail should be smartly carried.

Refinement and finish. — The saddle horse should possess a high degree of quality, and lots of smoothness from end to end. There should be greater refinement of head, ear, and bone than in the heavy-harness type of horse. The shoulders should be well laid in, and the hindquarters smoothly turned. The smoothness of the typical saddler is in marked contrast to the angular appearance of the roadster. Rotundity of body is a highly desirable feature. Evenness of croup is more important in the saddle horse than in any other type; if a horse has a steep croup, the defect is magnified a great deal when the saddle is placed upon his back, and he presents a plain appearance.

Action. — The action should be energetic, elastic, of moderate height, and especially there should be trueness of motion in all gaits. Gracefulness and ease of action are very desirable. A springy step resulting from sloping pasterns and shoulders is more essential in the saddle horse than in any other type. A straight-shouldered and -pasterned horse gives one a ride like a carriage without springs. Collected action, by which is meant harmony or unison of movement between fore and hind legs is necessary for gracefulness and comfort. It also means that the legs will be kept at all times under the weight, thus permitting of quick turns or any other evolutions desired. Collected action is largely a result of properly training the horse, and skill on the part of the rider. By pressure of the leg, or use of the whip or spur, the horse is kept alert, with the hind legs well under the body, while the hands bring sufficient pressure on the mouth to restrain the movement slightly, arch the neck, and secure a small degree of yielding of the jaw. If the action is not collected, the horse moves awkwardly and executes sudden commands in a clumsy fashion.

Temperament and disposition. — The temperament should be sanguine, as in all other light horses. The disposition should be kind, willing, honest, and courageous. There should be docility with high spirit and animation.

CHAPTER XXXII

THE HUNTER AND POLO PONY

The hunter and polo pony differ rather markedly from the two types of saddle horses just described, largely because they are required to do work of a highly specialized nature in which performance is of greater importance and beauty less valued than with the gaited horse and park hack. Hence, the hunter and polo pony are given separate consideration in order that their peculiarities of type and requirements may be better emphasized.

The Hunter

The hunter is the type used in following the hounds in fox hunting. He must be up to carrying his rider at good speed over long distances across country, jumping fences and ditches when called upon to do so. Like the park hack, this is an English type. His mane and tail are worn short, and he is ridden in much the same fashion as the three-gaited saddler.

Although the American demand for this horse is somewhat limited, the supply is still more so, resulting in high prices being paid for green horses of the hunter stamp. In England the demand is great, and American horses of hunter type have been much sought after by exporters. The English people have invested many millions of dollars in the sport of fox hunting. There is an increasing demand for hunters in this country, and the demand will continue to grow because fox hunting, besides being a most healthful and invigorating amusement, is a fashionable and popular sport among those who are able to take part in its pleasures. It is estimated that within twenty-five miles of New York there are six hundred to eight hundred hunters in daily use, and that the suburbs of New York and Philadelphia total nearly fifteen hundred such animals. Many are well worth over $1,000, and the great majority are worth $400 to $500 each. It is probable that this census represents from $750,000 to $1,000,000 worth of

horses for hunting. In Canada there are hundreds of excellent hunters, and the sport is on the increase. The Central West of the United States is beginning to take up fox hunting, several hunt clubs having been organized in that section during the last few years.

From the nature of the work, the hunter must be a horse of more size, ruggedness, and constitution than the other types of saddle horses. He must be a stayer at hard work, a jumper, and a horse of courage and decent manners. His bone must be of good size and of the right quality, and there must be an evidence of strength throughout his conformation. Otherwise he cannot long withstand the hardships of the hunting field.

Height and weight. — With reference to height, much will depend upon circumstances. Weight-carrying hunters are always more difficult to procure and command higher prices. Short, light-weight men prefer 15.2 hands to 15.3, but height is quite subsidiary to conformation. Where fences are high, tall horses are necessary, but conformation must not be sacrified to this. Some hunters are nearly 17 hands. Hunters are classed as light, middle, and heavy weight according to their size and weight. Most of the hunting horses in use range in height from 15.2 to 16.1 hands, and in weight from 1,000 to 1,250 pounds.

General appearance. — The general appearance of the hunter should be that of a thin-skinned, big-boned, small-headed, fine-shouldered, deep-chested, clean-limbed animal, with a neatly turned, compact body, and having a facial expression of great keenness, docility, and quick perception. In selecting or judging hunters, particular attention is given to conformation, and action comes in for much attention also.

Head. — The head should be light, a heavy head in a hunter being very objectionable; the forehead straight; the eyes large and prominent; the ears erect, thin, and covered with fine hair; and the skin covering the head and face should also be thin, rendering the various prominences upon the skull easily apparent. The high-class hunter should have a mild, keen, and extremely intelligent facial expression, expressive of alertness to a degree.

Neck. — The neck must be long, narrow towards the poll, and the head should be carried obliquely, a lofty carriage being undesirable in the hunter. As the shoulders are approached, the neck should increase in width, be of moderate thickness, and clean along its upper border, with a closely-cropped mane. Many hunters are very weedy in the neck, and if this is the case, the horse is unable to recover himself in the event of a fall, as the muscles of the neck materially assist in raising the forepart of the body in its attempt to regain balance.

Fig. 104. The Hunter.

Withers. — The upper border of the neck should pass into high withers, and most of the best hunters are high in this region.

Shoulders. — When judging hunters, attention must be fixed upon the shoulders, not only while the horse is at rest, but also when jumping, as good shoulder action is one of the most important points in a hunter. In action it must be free and full, yet fine, because if the shoulders are logged up

with muscles (heavy shoulders), the free action is interfered with when jumping.

Chest. — The chest must be deep; in fact, it is self evident that a hunter should be "well-hearted" in order to provide plenty of space for the free play of heart and lungs under extreme exertion. Width of chest is not required and often means bulky shoulders.

Fig. 105. The Hunter in Action.

Mr. Edward B. McLean's Alarms jumping at the National Capitol Horse Show at Washington, D. C., in 1914, ridden by Mr. Louis Leith.

Ribs. — A slightly flat side is desirable, though the ribs must not be short, otherwise the horse becomes "tucked up" or "washy" in appearance.

Back, loin, and croup.—The back and loin should be of medium length, and the latter must be broad and clothed with

powerful muscles, passing into neatly turned quarters—the so-called "goose rump" being of objectionable conformation.

Arms and knees.—The arms should be strong and powerful; the forearms of good breadth above and ending below in broad-jointed, clean-cut knees. A stiff knee is certainly detrimental, as is also low daisy-cutting action, as such horses cannot freely flex and extend their joints during the leap.

Thighs and hocks.—The first and second thighs must be neatly turned, and clothed with powerful muscles. Particular attention must be paid to the hocks and to hock action; the hock joints must be broad, deep from front to back, clean in outline, and covered with thin skin.

Cannons, fetlocks, and pasterns.—The cannons, fetlocks, pasterns, and feet demand special examination. The so-called "clean" legs are indispensable, and every horseman knows the meaning of this term. If a hunter's legs are of this description, there is little fear that they will fill up after a heavy day's work. Associated with cleanness must be considerable substance; hence, they have but very little value for breeding ideal pastern is one with a moderate degree of slope, broad in front, deep from front to back, and well rounded at the sides. It should be covered with thin skin. Pasterns that are too long, too oblique, or light in the bone, are of bad conformation; and short, upright pasterns are extremely objectionable for very evident reasons.

Feet.—The feet must be concave on their lower surface, proportionate in size, of good shape, well open at the heels, neither contracted nor cracked.

Color.—In selecting a hunter, color seldom plays any part, and in the hunting field are horses of almost every color. Bay, brown, light or dark chestnut, and gray are the principal colors, more especially bay and brown, with either white or black points.

Disposition.—This is of great importance in order to insure the safety of other horses, the hounds, and the rider. Some hunters are tremendous pullers, in fact, defy all attempts to hold them. There is great difference in temperament and disposition—one hunter will rush at his fences in a reckless and headstrong way, and another will even walk to his jump

and clear it in a businesslike manner. It is because so many Thoroughbreds have bad dispositions, that horses having a small amount of draft blood are often more desirable as hunters than are those of straight Thoroughbred breeding.

Production of hunters.—There is no breed of hunters. They are largely of Thoroughbred breeding, about seven parts Thoroughbred and one part cold (draft) blood being a generally accepted formula in breeding hunters. This proportion is secured by mating a three-quarter-blood mare with a Thoroughbred stallion of correct type to get hunters. The infusion

Fig. 106. A Hunt Team and Pack of Fox Hounds.

of cold blood gives greater size and ruggedness and a better disposition, but is said to lessen to some extent the staying qualities and gameness of the animal. Some most excellent hunters have come of straight Thoroughbred breeding. Ireland has long enjoyed a wide reputation for the rearing and sale of the best hunting horses—the name "Irish hunter" carrying the idea of super-excellence in this type of horse, even if some so named were in reality bred in places far removed from the Emerald Isle.

The Polo Pony.

Modern polo is largely a rich man's game. It is played with four mounted men on a side, the object being to drive a wooden ball between goal posts at the ends of a field 300 yards long and 120 to 150 yards wide. Each player carries a long-handled mallet of regulation design. It is a very fast game for both ponies and men, requiring quickness and precision.

History of polo.—Polo existed in Persia and Turkey before the tenth century. Thence it spread to Central Asia, Thibet, and Central India, being found at Calcutta in the fifteenth and sixteenth centuries. It is said to have also existed in Japan a thousand years ago. English officers returning from India, in 1874, started polo at the Hurlingham Club, Fulham, England. Hurlingham has since been recognized as the great center of the sport, and the rules it has laid down have been accepted as authority in every country except America, where a few changes in these rules have been made.

The game was introduced into this country in 1876, and from a small start made in that year it has steadily grown in favor. In 1911 there were 42 civilian clubs and 38 military posts in this country where polo was played. The game is now played the world over. When first introduced into this country, the ponies used were 13.2 hands high; from these, very tall men almost touched the ground with their feet. Larger and faster ponies were found more advantageous, and the standard was fixed at 14 hands. It has since been raised to 14.1, and again to 14.2, the present standard. The rules limit the height of ponies to 14.2 hands or under, but this rule is not strictly enforced; the modern game is played at such high speed that only big 14.3- to 15-hand Thoroughbred or three-quarter-blood ponies are considered good enough for important matches. The range in weight is from 850 to 1,000 pounds.

Demand for good ponies.—It is a thoroughly established fact that a player is no more proficient than his pony. The question of suitable mounts has been troublesome to American players from the very first. There was a time when western cow ponies made acceptable mounts for the game. They were brought to the East by the carload and sold at very moderate

prices. A small percentage of these developed into really good polo ponies. As competition became keener, the demand for better and better ponies became more imperative, and today the cow pony has been replaced by what is virtually a Thoroughbred horse of small size. In almost every case, the best modern ponies were sired by a Thoroughbred stallion. English ponies used for polo have always carried more or less Thoroughbred inheritance; they are bred in the purple, trained two years, and carefully housed and fed. There has been formed in England a Polo and Riding Pony Society for the purpose of establishing and improving a breed of ponies for polo.

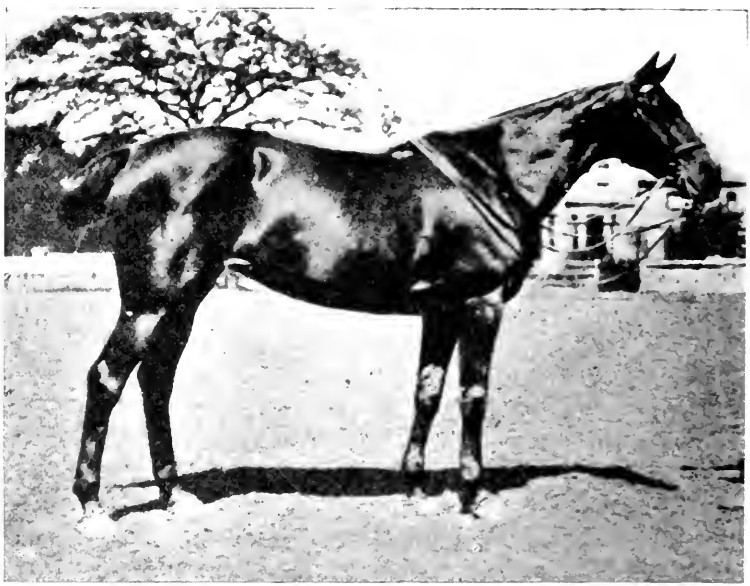


Fig. 107. Polo Pony of Excellent Type.

Owned by Mr. L. Waterbury and ridden by him when a member of the American team which won the International Cup from England.

Five years ago a number of American ponies were valued at $1,000, and for some imported English ponies up to $2,000 had been paid. At a sale in England, in 1898, a pony named Sailor, brought $3,750. In 1909 the American team which went to Hurlingham to compete for the world's championship was enabled to win largely because of the excellence of their ponies. These ponies were English-bred, and were reported

to have cost high prices ranging up to $5,000. The American victory brought as much credit to English pony breeders as it did to the playing ability of the American team. In championship contests, four to six ponies are used by each player and some players maintain a big string of ponies from which to make selections for games.

What constitutes a good polo pony?—The polo pony must combine speed with weight-carrying ability. He must be wiry, agile, and under proper training must acquire ability to

Fig. 108. A Good Type of Polo Pony

quickly start, stop, and wheel. He must have a light mouth. He must be intelligent and learn to like the game and follow the ball. The disposition must be such as insures a level head, doggedness, docility, courage, and quickness. Much depends on the rider; there is danger of the pony becoming a puller if the rider is deficient, and some ponies become ball-

and-mallet shy by being struck accidentally on the head and legs. A pony that pulls hard or becomes wild in a fast scrimmage, or swerves off the ball, is useless in first-class polo.

The game calls for lots of endurance and wearing quality, hence the conformation of middle, hindquarters, feet, and legs largely determines a pony's adaptability for the game. The object of breeders is to produce a pony 14.2 hands high, able to carry from 168 to 200 pounds for ten minutes in a fast game.

The polo pony should be built like a weight-carrying hunter. His head should be well set on, wide between the jaws, with plenty of room at the throttle. He should have a big, clear, sound, prominent eye; small, pricked ears, indicative of alertness; a well-formed, well-arched, and muscular neck; a fine, sloping shoulder; not too fine at the withers, and his breast should be ample and in proportion to the remainder of the forequarters. His forearms should be big and powerful, the knees wide, particularly good under the knee, with a short cannon. The fetlocks should be large and clean-cut, the pasterns well supplied with bone, and of proper slope and strength. The foot should be of good size, smooth, nicely shaped, the heels open, and the frog well developed and elastic.

He should be deep from withers to sternum, and fairly wide through the chest; he should be short in the back, well coupled, ribbed close up to the hip, with plenty of muscle behind the saddle. His thighs and quarters should be big and powerful, carrying down into the gaskin in well-defined masses of muscle, and the gaskin should bulge with muscle also. The hock should be broad and flat, with the natural prominences clean-cut and well developed. The tendon of Achilles should be well defined and powerful. There should be great bone below the hock, and in other respects the hind limb should be similar to the fore one.

Production of polo ponies.—At present the only method of producing ponies such as the modern game demands is the mating of polo pony mares with a Thoroughbred stallion of approved type. However, a very large percentage of get is over height, and only a small percentage of foals that are of proper size have the conformation and disposition to become

polo ponies. Evidently the breeding of this pony is not a proposition for the general farmer, but only for the specialist who makes a special study of the requirements of players and of methods of production. In Texas and other western states are a few ranches which make a business of breeding these ponies and training them, being equipped with polo fields for this purpose. Beginning with western cow ponies, they have graded up their pony stock by the use of dwarf Thoroughbred sires until the present stocks are practically of straight Thoroughbred breeding. England has taken up the production of

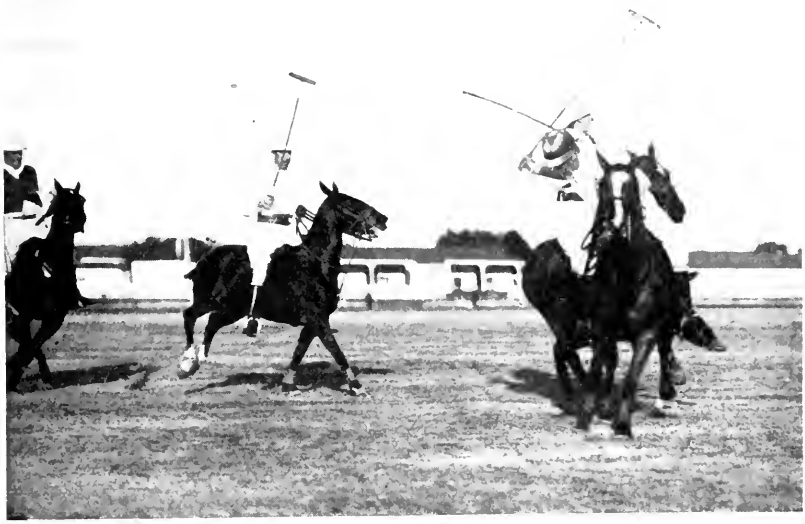


Fig. 109. The Polo Pony in Action.

polo ponies in a more systematic manner than have we in this country. In 1893 they formed the Polo Pony Stud Book Society, thus laying the foundation for pedigrees and for the establishment of a breed. The name of the society was later changed to the Polo and Riding Pony Society. Beginning in 1895, annual shows have been held by this organization, and enough progress has been made in breeding to indicate that in time a true breed of ponies for polo will be established. When this is accomplished, the production of polo ponies will not be so difficult or uncertain as it is today.

CHAPTER XXXIII.

MARKET CLASSES OF HORSES.

The present rank and importance of the various horse markets is shown by the following figures giving the receipts for 1914.

1.	St. Louis	148,128	8.	St. Joseph	26,073
2.	Chicago	106,282	9.	Denver	16,957
3.	Kansas City	87,155	10.	Oklahoma City	14,412
4.	Pittsburg	49,258	11.	Sioux City	9,673
5.	Fort Worth	47,712	12.	Wichita	7,017
6.	Omaha	30,688	13.	St. Paul	5,683
7.	Indianapolis	26,856			
				Total	575,894

Auction rules.—At the large horse markets, horses are sold at auction under certain rules which are well known and understood by all horsemen who buy or sell at these markets. As the horse comes into the auction ring, a clerk on the auctioneer's stand displays a placard on which appears in large letters the rule under which the animal will be sold, such as "Sound," "Serviceably sound," "At the halter," etc. The rule under which the horse is sold is a guarantee made by the seller to the buyer. The buyer has until noon of the following day to refuse the horse, if upon examination and trial he finds that the animal is not as represented.

The definitions of the principal rules which govern the sale of horses are given below. Exceptions to these rules may be announced from the auction stand, pointing out the defects, in which case they are recorded and go with the horse.

1. *Sound.*—Perfectly sound in every way.

2. *Serviceably sound.*—Virtually a sound animal, barring slight blemishes which do not interfere with his usefulness in any way. His wind and eyes must be good, but a spot or

The Illinois Experiment Station has made an extensive study of the market classes of live stock and meats, and has published five very valuable bulletins setting forth the information thus obtained. The bulletin on horses, Bulletin No. 122, "Market Classes and Grades of Horses and Mules," written by Prof. R. C. Obrecht, has been used as the basis for this and the next chapters. The student will find it well worth while to refer to this bulletin, especially for the excellent illustrations which it contains.

streak in the eye which does not affect the sight will be considered serviceably sound as long as the pupil of the eye is good. He must not be lame or sore in any way.

3. *Wind and work*—The only guarantee this carries with it is that the animal has good wind and is a good worker.

4. *Work only.*—He must be a good worker, but everything else goes with him. No other guarantee than to work.

5. *Legs go*—Everything that is on the animal's legs go with him; nothing is guaranteed except that he must not be

Fig. 110. Horse Market at Union Stock Yards, Chicago.

Winding and trying-out horses immediately after purchase. If the horse is found to be not as represented when sold, the buyer has the privilege of returning him to the seller.

lame or crampy. He must, however, be serviceably sound in every other respect.

6. *At the halter.*—Sold just as he stands without any recommendations. He may be lame, vicious, balky, a kicker, or anything else. The purchaser takes all the risk. The title only is guaranteed.

Market requirements.—The factors that determine how well horses sell upon the market are soundness, conformation, quality, condition, action, age, color, training, and style. These, together with some minor considerations, are discussed below.

Soundness.—The market demands that a horse be serviceably sound, by which is meant one that is as good as a sound

horse so far as service is concerned. He may have slight blemishes, but nothing that is likely to cause lameness or soreness in any way. He must be good in wind and eyes, but may have small splints and puffs, and a little rounding on the curb joint. Broken wind, thick wind, sidebones, unsound hocks such as curbs, spavins, and thoroughpins, large splints, and buck knees are discriminated against.

Conformation.—If a horse is to do hard work, with a minimum of wear, and give the longest possible period of service, he must possess a conformation indicative of strength, endurance, and longevity, the indications of which are good feet, a good constitution, good feeding qualities, good bone, and symmetry of conformation. Conformation has been discussed fully in connection with the various types described in preceding chapters, and no further discussion is necessary here.

Quality.—Quality in a horse is of great importance, as has already been emphasized. A horse lacking in quality is a comparatively cheap animal.

Condition.—To be appreciated on the market, a horse must be fat and possess a good coat of hair, which gives him a sleek appearance. Condition is most important in draft, chunk, and wagon horses. Some men, notably in some parts of Northern Ohio, are making good profits by buying young drafters and stall-feeding them until they are fat. When a green horse goes to the city, he loses weight during the first few weeks until he becomes used to the new conditions, and it is a decided advantage if he enters city work carrying a high finish. When a horse is fed to a high state of fatness, it invariably improves his spirit and style, as well as his form and weight. The following specifications, prepared under the di- who sends his horse to market in finished form is offering the animal in most attractive condition. Thus will the horse catch the eye of buyers and realize extra dollars. Fat is not muscle and should not be mistaken for it; at the same time, fat is rightfully a very important item of value on the horse market.

Action.—Action has been fully discussed in preceding chapters. We have seen that the requirements vary according to the type of horse, and that action is always a very impor-

tant item of value, in some instances being most important of all factors determining the value of the horse.

Age.—Horses sell best from five to eight years old. Heavy horses, such as drafters and chunks, sell best from five to seven years old, but a well-matured four-year-old in good condition will find ready sale. Carriage, saddle, and road horses sell better with a little more age, because they do not mature so early and their education is not completed as soon as that of heavy horses. They are most desired from five to eight years old.

Color —As a rule, the color of horses is of secondary importance, provided they possess individual excellence. As has been seen, more discrimination is made against color in pleasure horses than in those used for business and utility purposes.

Training and disposition.—Every class calls for a horse of good disposition and well educated for his work. Mere "greenness" in a drafter, however, does not affect the price much if he is free from vice and bad habits, but carriage and saddle horses must be thoroughly schooled in order to realize good values.

Sex.—Sex is not of great importance in the market. However, geldings sell better than mares for city use, as there is some liability of mares being in foal, and if not, the recurrence of heat is objectionable. For farm use and southern trade, mares are preferred, because farmers buy horses with the expectation of breeding them.

Breed.—The breed to which a horse belongs has but little or no influence upon his market value as long as he has individual excellence.

Style and freshness.—If able to shape themselves well in harness, very plain horses often make a stylish showing, and this increases their value materially. They should be spirited and energetic, which generally comes from being well fed. They should be well groomed, the hair being short and sleek, lying close to the body, and possessing a luster which indicates health. Clipping of the foretop and limbs should not be practiced in the case of heavy horses, as it is an indication of staleness or second-hand horses. The presence of the foretop

and feather leaves no doubt as to freshness from the country. For the export trade, removal of the foretop is said to depreciate a horse $25.00 or more. The feet should be in good condition and of a good length hoof, which is necessary to hold a shoe.

Breeders make no real effort to supply some of the market classes of horses, either because the demand is very limited or the price too small. Such classes are supplied by careless breeding, by the mixing of types, and by the misfits which result even when the breeding of horses is conducted as wisely as possible.

The classification outlined below includes not only those classes of horses which may be said to be regular commodities on the large horse markets, but also other more rare and valuable classes which are only to be had from certain dealers and breeders who cater to an exclusive trade not represented at the large markets.

PAGE 398

Classes	*Sub-Classes*	Height Hands	Weight Pounds
DRAFT HORSES	Heavy Draft	16 to 17.2	1750 to 2200
	Light Draft	15.3 to 16.2	1600 to 1750
	Loggers	16.1 to 17.2	1700 to 2200
CHUNKS	Eastern Chunks	15 to 16	1300 to 1550
	Farm Chunks	15 to 15.3	1200 to 1400
	Southern Chunks	15 to 15.3	800 to 1250
WAGON HORSES	Expressers	15.3 to 16.2	1350 to 1500
	Delivery Wagon	15 to 16	1100 to 1400
	Artillery Horses	15.1 to 16	1050 to 1200
	Fire Horses	15 to 17.2	1200 to 1700
CARRIAGE HORSES	Coach	15.1 to 16.1	1100 to 1250
	Cobs	14.1 to 15.1	900 to 1150
	Park Horses	15 to 15.3	1000 to 1150
	Cab	15.2 to 16.1	1050 to 1200
ROAD HORSES	Runabout	143. to 15.2	900 to 1050
	Roadster	15 to 16	900 to 1150
SADDLE HORSES	Five-Gaited Saddle	15 to 16	900 to 1200
	Thrre-Gaited Saddler—Light, Heavy	14.3 to 16	900 to 1200
	Hunters—Light, Middle, Heavy	15.2 to 16.1	1000 to 1250
	Cavalry Horses	15 to 15.3	950 to 1100
	Polo Ponies	14 to 14.2	850 to 1000

Draft Horses.

A full description of draft type has already been presented, so that it is only necessary to mention the chief distinctions between the three sub-classes, Heavy Draft, Light Draft, and Loggers.

Heavy draft.—These are the heavier weights of the draft class; they stand from 16 to 17.2 hands high, and weigh from 1750 to 2200 pounds.

Light draft.—The light drafter is similar in type to the heavy drafter, but is smaller; they stand from 15.3 to 16.2 hands, and weigh from 1600 to 1750 pounds. While 15.3 hands is accepted as the minimum height for light drafters, it should be understood that a 15.3-hand horse is less desirable than one taller and he borders closely on the class known as eastern chunks.

Loggers.—These are horses of draft type that are bought for use in the lumbering woods. This trade demands comparatively cheap horses, yet wants them large and strong. Because of the prices paid, the trade is usually compelled to take the plainer, rougher horses of the heavy draft class, and some are slightly blemished or unsound, such as "off in the wind," small sidebones, curbs, wire marks, etc. Loggers should stand from 16.1 to 17.2 hands, and weigh from 1700 to 2200 pounds.

Chunks.

Usage has fixed the name of this class, which is significant of the conformation of the horse, rather than the use to which he is put. However, the prefixes given in the sub-classes are rather indicative of his use. Chunks are divided into three sub-classes, Eastern, Farm, and Southern.

Eastern chunks.—At one time, this class was known as Boston chunks, but as the trade has widened to other cities they are known by the general name of eastern chunks. They are most generally used in pairs or three abreast to do the same work as draft horses; but may be used in pairs, in a four-in-hand, or in a six-in-hand team. The eastern chunk may be briefly and accurately described as a horse of draft horse type in all respects except size and weight. He is, then,

a little drafter. He is usually a little more blocky and compact than the true drafter. He stands from 15 to 16 hands high, usually not over 15.3, and weighs from 1300 to 1550 pounds, depending upon size and condition. Being required to do his work mostly at the walk, his action should be similar to that of the draft horse. The walk should be elastic, quick, balanced, straight, step long, trot regular and high, without winging, rolling, interfering, or forging.

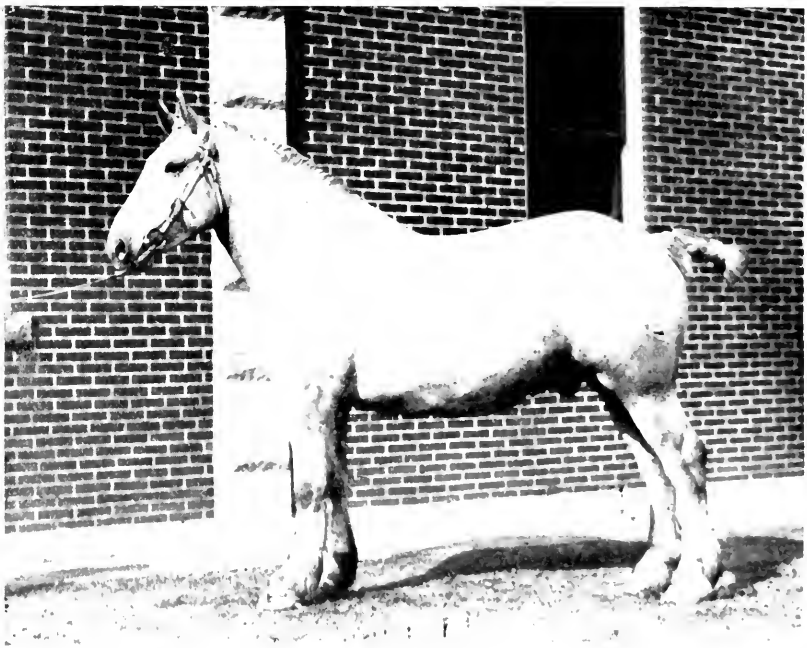


Fig. 111. Eastern Chunk.

Farm chunks.—Horses of this class may be found on the market at all seasons of the year, but during the spring months they form an important feature of the trade. They are bought to be used on the farm, and are in most urgent need during the season when crops are being planted. They are usually of mixed breeding, draft blood predominating, and are commonly known among farmers as "general-purpose" animals. Mares are more generally taken than geldings. For this class, low-set, blocky horses are wanted, not so heavy as

the eastern chunks. Farm chunks are usually lighter in bone, and often slightly blemished or unsound. In general, the typical farm chunk should be a moderate-sized, all-round good individual, standing from 15 to 15.3 hands high, and weighing from 1200 to 1400 pounds. Being lighter horses than the eastern chunks. they should be a little quicker and more active on foot. The varied use to which horses are put on farms requires ability to trot readily if necessary. However, since the walk is their most important gait, they should be good walkers and do it with ease and rapidity.

Southern chunks.—In some markets these are termed "southern horses," or "southerns." They are small horses that are taken by dealers to large southern cities and sold to southern planters for tilling their lands and for driving and riding. The southern farmer does not cultivate deeply, and the soils are light, consequently he does not require very large horses. However, each year the trend of the market is for larger horses for this trade. Southern chunks are small horses standing from 15 to 15.3 hands high, and weighing from 800 to 1250 pounds. They are rather fine of bone, possessing an abundance of quality, and are more rangy in conformation than any of the other chunks, having more of the light horse blood. Many of them are similar to the cheaper horses used on the light delivery wagons of cities. They should have good all-round action. The southern chunk is comparatively a cheap horse.

Wagon Horses.

This class includes horses useful for quick delivery. The demand is from cities and towns. These horses must be closely coupled, compactly built, with plenty of constitution and stamina. They must be good actors, have a good, clean set of limbs, with plenty of bone and quality, and a good foot that will stand the wear of paved streets. The sub-classes are Express Horses, Delivery Wagon Horses, Artillery Horses, and Fire Horses. Their breeding is a mixture of draft and light bloods. They are neither light nor heavy horses, but may be said to be middle-weights.

Express horses.—Express horses are used by express companies to collect and deliver goods to and from railroad

stations. Different companies use horses of slightly different size and weight. For instance, if the business of a company is centrally located in a city, and depots are not far apart, they use larger horses and load heavier; if the business is done in the outlying parts of a city, and the depots a considerable distance apart, lighter horses with more action are wanted. They are used singly or in pairs, and the size of the horse will depend on the weight of the wagon. The lightest ones are called "money horses," as they are hitched to the lightest wagons to deliver valuables, this kind of work demanding quick service.

The typical expresser is rather upstanding, deep bodied, and closely coupled, with good bone and an abundance of quality, energy, and spirit. He should stand from 15.3 to 16.2 hands high, and weigh from 1350 to 1500 pounds in good flesh; the average express horse is 16 to 16.1 hands high, and weighs around 1400 pounds in working condition. His head should be neat, his neck of good length, and his crest well developed. His shoulder should be obliquely set, coupled with a short, well-muscled back and strong loin. His croup should be broad, rounding, and well muscled, his quarters deep, and thighs broad. He should not be goose rumped, nor cut up in the flank. His underpinning should be of the very best, his cannons broad and clean, and his hoofs of a dense, tough horn.

The express horse is required to do his work both at the walk and trot, the latter being the principal gait. He should be quick and active, and should keep his feet well under him and throw enough weight into the collar to move a heavy load at the walk, or a lighter load at the trot. As in the previous classes, he should be a straight-line mover, with possibly a little more knee and hock action.

Delivery wagon horses. — Generally speaking, delivery wagon horses are not as large as expressers, and not as high-grade animals; most mercantile firms are not such liberal buyers as the express companies, and consequently they get a cheaper grade of horses. However, this is not always true, as some of the large department stores, whose deliveries serve as an advertisement, will pay more for the very best than express companies, thus getting very choice animals. The

conformation requirements are practically the same as for express horses, except they are not quite so large, standing from 15 to 16 hands, and weighing from 1100 to 1400 pounds. The action requirements are the same as for express horses, though some are not as good actors. The demand for delivery wagon horses comes from all kinds of retail and wholesale mercantile houses, such as meat shops, milk houses, grocery houses, dry goods firms, and hardware merchants, for use on light wagons for parcel delivery. Some of the coarser, rougher

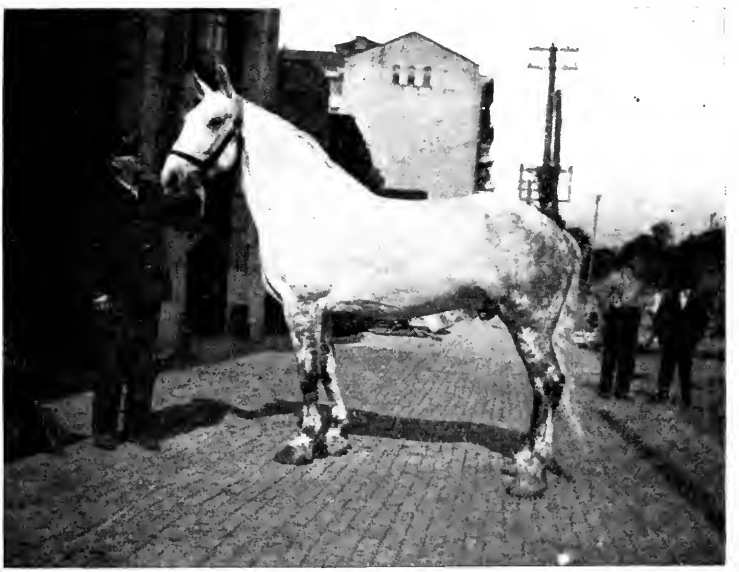


Fig. 112. The Fire Horse.

ones are used on the huckster wagons, junk wagons, sand wagons, and by contractors for cellar excavating, street cleaning, railroad grading, or almost any kind of rough, heavy work.

Artillery horses.—Artillery horses conform very closely to the better grades of delivery wagon horses of the same weight. The following specifications, prepared uuder the direction of the Quartermaster General of the United States War Department, clearly set forth the requirements.

"The artillery horse must be sound, well bred, of a superior class, and have quality; of a kind disposition, well broken

to harness, and gentle under the saddle, with easy mouth and gaits, and free and prompt action in the walk, trot, and gallop; free from vicious habits; without material blemish or defect, and otherwise conform to the following descriptions: A gelding of uniform and hardy color, in good condition; from 5 to 8 years old; weighing from 1050 pounds, minimum weight for leaders, to 1200, maximum weight for wheelers, depending on height, which should be from 15.1 to 16 hands."

The demand for artillery horses is rather spasmodic, at some times being much greater than at others. Contracts are given to the lowest responsible bidder to supply them in large numbers at a specified time. Because of the rigid examination

Fig. 113. The Fire Horse in Action

and requirements of official inspectors, many men have lost money in filling contracts.

Fire horses.—The fire horse is more rangy in conformation than the expresser, he being required to throw weight into the collar and often to take long runs. The requirements are very rigid, as will be seen by the specifications set forth by Mr. Peter F. Quinn, former Superintendent of Horses of the Chicago Fire Department:

"The work required of a horse best suited to fire department services necessitates almost human intelligence. Such a horse must not only be well bred, sound in every particular, quick to observe, prompt and willing to respond to every call, but as well, ambitious to discharge his numerous and unusual

duties under constantly differing surroundings. In selecting, the first requisites are tractability, good feet and legs, with bone and hoof of the best texture, a short, strong back, and well-proportioned fore- and hindquarters, well covered with firm, elastic muscles. For heavy engine companies and heavy hook-and-ladder trucks, a gelding of uniform and hardy color, in good condition, from five to seven years old, standing 16 to 17.2 hands, and weighing from 1500 to 1700 pounds should be selected. Hose-carriage horses, same age; weight from 1200 to 1400 pounds; height, 15 to 16.2 hands."

The demand for fire horses is very limited, coming from fire companies of cities. There are usually enough horses in the general supply to meet the demand.

Carriage Horses.

The chapter dealing with carriage horse type presents a detailed description of the general class known as carriage horses, and while this general class is subdivided into at least four smaller groups, known as Coach, Cob, Park, and Cab Horses, nevertheless the differences between them relate mostly to size and weight, and practically the same conformation, style, and action is desired in all four sub-classes. Keeping carriage horse type in mind as applying to all four groups, only a few remarks are necessary in order to give the reader a correct idea of each sub-class.

Coach horses.—Coach horses may be described as carriage horses of large size. They should stand from 15.1 to 16.1 hands high, and weigh from 1100 to 1250 pounds. The weight is not of such great importance with coach horses as with draft and wagon horses. The essential thing is to get a horse that looks right and proper before the large, heavy vehicle to which he is hitched. For instance, the most desirable height in horses for a park drag, body break, or heavy coach is 15.3 to 16 hands, and they should weigh around 1150 to 1200 pounds. For a light brougham, a pair of 15.2 hand horses, weighing 1100 pounds is more appropriate. A hearse requires black horses from 15.3 to 16.1 hands high, weighing 1200 to 1250, and without white markings. White horses are also used to some extent by undertakers.

The demand for coach horses comes from wealthy men who maintain stables of fine horses and equipages for pleasure driving, and at times there is also quite an active demand from exporters, who ship to Mexico and European markets. They are hitched singly, in pairs, unicorn (sometimes called a spike, as one horse is hitched to the end of the pole, ahead of a pair), four-in-hand, and six-in-hand, to coaches, breaks, park drags, etc. A large percentage of coach horses have a predominance of American Trotting Horse blood, while a few are produced from the imported coach breeds; but since many of the imported so-called coach horses possess the common fault of grossness and coarseness, as a class they do not possess the requirements demanded by the American markets.

Cobs.—Cobs differ from coach horses in size and in the use to which they are put. They are driven singly, in pairs, or tandem, usually by ladies, though they may be used by gentlemen as well. Cobs stand from 14.1 to 15.1 hands high, and weigh from 900 to 1150 pounds. Strictly speaking, this is an English horse, and in England they never consider a horse a cob that stands over 15 hands, but the American markets accept them 15.1 hands high. A 15-hand cob should not weigh over 1100 pounds, but his condition will have much to do with his weight. The strongest demand comes for horses 14.3 to 15 hands high, and weighing from 1000 to 1100 pounds. Being essentially a lady's horse, solid colors are wanted, without flash markings. The demand for cobs comes from much the same source as for coach horses. Since they are a little more proper for ladies' driving than a full-sized coacher, they are often spoken of as ladies' cobs. They are usually hitched to a light brougham, phaeton, or some carriage that is not intended for carrying more than four. While the demand is strong, it is more limited than for coach horses.

Park horses.—The park horse, sometimes called the gig horse, is neither a large nor a small carriage horse, but is a carriage horse of medium size. Many coach and cob horses meet the requirements for park horses so far as size and weight are concerned, yet cannot correctly be classed as park horses. This is because the park horse represents the cream of the carriage horse class. He is a higher-priced horse than

either the coach or cob horse. He has the same conformation and action as they, but his conformation is more perfect, his action higher and more sensational, and his style and elegance more outstanding. This does not mean that coach and means that the park horse is the fanciest of a strictly high-class group, to which all three belong. Park horses are strictly cob horses are in any wise cheap horses, for they are not. It dress horses, and, as their name implies, one that a lady or gentleman would want to drive in a park. They are hitched to a cart or gig, or may be driven tandem to the latter vehicle. They are also driven in pairs before mail phaetons and victorias. The limits for height and weight are 15 to 15.3 hands and from 1000 to 1150 pounds, the most desirable height being 15.1 to 15.2 hands, and the weight from 1000 to 1100 pounds. The demand for park horses greatly exceeds the supply, and such will doubtless continue to be the case. It is readily apparent that the park horse is difficult to produce. Some are of Trotting Horse breeding, a few have been produced by crossing Hackney stallions on Trotting or Thoroughbred mares, but the best are of pure Hackney breeding; the latter method is attended by greater certainty of good results than any other method of production.

Cab horses.—The cab horse is a comparatively cheap horse, and the requirements are not so rigid as for coach, cob, or park horses. They are used on cabs, coupes, hansoms, and other vehicles for public service in cities. They are much the same type as the coach horse, in fact many of them are the discarded and lower grades of the coach sub-class. Cab horses stand from 15.2 to 16.1 hands high, and weigh from 1050 to 1200 pounds. The principal qualities sought are symmetry of form and endurance. They should possess good feet and bone, strong constitution, a deep barrel with good spring of rib, and should be closely coupled. Not as much flesh is demanded in cab horses as in coach horses, for they supply a cheaper trade, but they should be in good condition. Their action should be straight, but need not be excessively high. In fact, moderate action is all that is desired, since moderate action means greater endurance. The demand comes from livery and transfer companies, and at times from export buy-

ers. Horses of this class are generally of nondescript breeding, excepting the discarded coachers, and the supply is greater than the demand, making them cheap horses.

Road Horses.

This class includes Runabout Horses and Roadsters. Runabout horses occupy an intermediate place between typical roadsters and carriage horses, but on account of their action, conformation, and the use to which they are put, may be more properly classed as road horses.

Runabout horses.—A runabout horse is a rather short-legged horse, standing from 14.3 to 15.2 hands high, and weighing from 900 to 1050 pounds. His head should be neat, ear fine, eye large and mild, neck of good length and trim at the throttle. The neck should be of medium weight, not quite so heavy as that of the coach horse, and not so light and thin as that of the roadster. The shoulder should be obliquely set, the withers high and thin, the back short, well muscled, and closely coupled to the hips by a short, broad loin. The barrel should be deep and round, the ribs well sprung, and the chest deep; the croup should be long and the hips nicely rounded. The limbs should be well placed and heavily muscled, the bone broad and clean, and the pasterns of good length and obliquely set, joined to well-shaped feet. The runabout horse is not quite so stockily built as the cob, being not so heavy in neck and crest, not so full made and rotund in body, and not so heavy in quarters. The action is more moderate than that of a cob; he does not need to be as high an actor, but should have more speed. The action should be bold, frictionless, and straight, such as is conducive to speed and beauty of form.

The demand for runabout horses is for single drivers. They are used largely by business men of cities on runabouts and driving wagons. The demand is active at remunerative prices. They are of more or less mixed breeding, the predominating blood being either of the American Trotting Horse, American Saddle Horse, or Hackney breeds.

Roadsters.—The chapter dealing with light-harness or roadster type sets forth the requirements for roadsters in form, action, and speed, and discusses the uses to which they are put. No further discussion is needed here.

Saddle Horses.

The saddle horse class includes the five sub-classes known as Five-Gaited Saddlers, Three-Gaited Saddlers, Hunters, Cavalry Horses, and Polo Ponies. All of these, with the exception of the cavalry horse, have received full consideration under the subject of types of horses in preceding chapters. Space need be given here only to a description of the cavalry horse.

Cavalry horses.—The Quartermaster General of the War Department has sent out the following specifications as the requirements for an American cavalry horse:

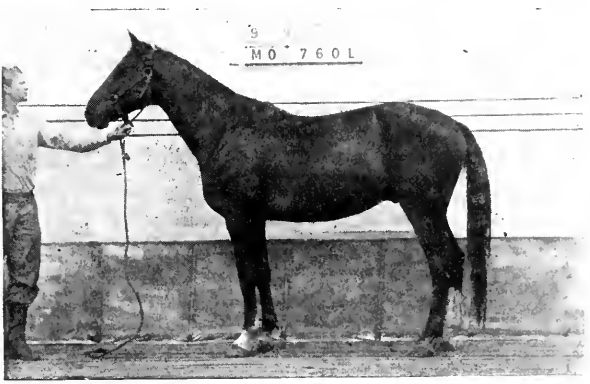


Fig. 114. Cavalry Horse.

"The cavalry horse must be sound, well bred, of a superior class, and have quality; gentle and of a kind disposition; thoroughly broken to the saddle, with light and elastic mouth, easy gaits, and free and prompt action at the walk, trot, and gallop; free from vicious habits, without material blemish or defect; and otherwise to conform to the following description: A gelding of uniform and hardy color. in good condition; from four to eight years old; weighing from 950 to 1100 pounds, depending on height, which should be from 15 to 15.3 hands."

Cavalry remounts for the United States War Department are purchased as needed through contract orders, the contract being let to the lowest responsible bidder. In filling orders,

dealers are often obliged to educate many of the recruits to the saddle, in order to meet the specific requirements.

Miscellaneous Horses.

Feeders.—Feeders are horses thin in flesh which are purchased to be put in condition and resold. They may belong to any of the above classes, but the practice is more generally applied to draft horses, chunks, and wagon horses. The old adage, "a little fat covers a multitude of defects," is still true: the value of flesh when put on thin horses can hardly be appreciated, unless one has seen them fleshed and placed again on the market.

Range horses.—During certain seasons of the year, there may be found on the market horses bred and reared on the range, commonly known as "range horses." They are divided into two general classes, light and heavy, according to the predominance of light or draft horse blood. For the sale ring, each of these classes is divided into carlots as follows: "colts," meaning weanlings; "ones," the yearlings; "twos," the two-year-olds; "dry stuff," the three-year-olds and over, those not suckling colts; and "mares and colts," the brood mares with colts at foot. In the auction ring, the price is stated per head and the buyer takes the entire lot. Most of the range horses find their way to the country, where they are usually broken; when educated, they may be returned to the market and may fill the demand for some of the commercial classes.

Ponies. — Ponies of various grades and breeding are frequently found on the market, and are usually bought for the use of children and ladies. The characteristics distinguishing ponies from horses are not easily described. The principal distinguishing feature is that of height, a pony being 14 hands or under. But there are dwarf horses that do not have pony blood or characteristics that come within these limits. Other pony characteristics are a deep body with rounding barrel, heavily muscled thighs and quarters, croup not drooping, and width well carried out, all of which the small horse does not usually possess. The neck is usually short and heavy, though this is not a desirable quality. Ponies are essentially chil-

dren's horses, and they must be kind and gentle in disposition, with as much spirit as is compatible for their use. There are no special requirements for weight, the limits being quite wide. They should be straight-line movers, and the more knee and hock action they possess, the higher prices they will bring, other things being equal. The Indian pony, or "cayuse" as he is sometimes called, is larger; he is a descendant from the native range stock, and is classed on the market as a range pony.

Plugs. — Plugs are worn-out, decrepit horses with but little value. This class is too well known to need description.

Weeds. — Weeds are leggy and ill-proportioned horses lacking in the essential qualities, such as constitution and substance. The fetlocks must be capable of full flexion. The or for service of any kind.

Prices for Horses at Chicago.

Prices during 1914.—The writer has taken the liberty of condensing as follows the *Chicago Live Stock World's* review of the Chicago horse market during 1914:

"During the first six months of the year, prices on all sorts of horses, with one or two exceptions, remained as high as they had ever been, and business was better than during the corresponding period of any of the five preceding seasons. Two notable exceptions to this rule of price maintenance were big, rugged team horses weighing 1500 to 1600 pounds, and neat little farm geldings weighing around 1200 pounds. In July, business began to drop off, and a period of stagnation followed, for which the reason became apparent when war was declared. Thereafter during August and September, until the foreign inspections were organized, the trade was demoralized. There has been nothing doing in commercial classes ever since. The entire stage was monopolized by the rider and gunner.

"Throughout the year, there have been signs of changes taking place in the horse trade. Some eastern dealers have gone out into the country, bought their own horses, and, after having them fitted at their own expense, have shipped direct to the East. Then sundry country buyers have got into the

habit of going on east with their horses. The absence of these good loads from the market centers lowers the average character of supplies, and lessens price averages."

Prices of the various classes compared.—Prices during 1914 averaged as follows upon the Chicago market, figures for preceding years being given for comparison:

Class	*1914*	*1913*	*1912*	*1911*	*1910*	*1902*
Draft horses	$208	$213	$210	$205	$200	$166
Carriage horses (pairs)	483	493	473	483	473	450
Drivers	169	174	177	182	172	145
General use	160	165	160	155	144	117
Saddle horses	184	189	195	190	177	151
Southern chunks	93	98	97	92	87	57

The above is a rather incomplete and indefinite report, but it is all that is available. Taking all Chicago receipts of horses during 1914, their total value was $19,662,170, and their average value only $183, as compared with an average of $188 in 1913, and $179 in 1912.

CHAPTER XXXIV.

MARKET CLASSES OF MULES.

The mule market is of more recent origin than the horse market, but has developed into a large business. Whereas horses are usually sold at public auction, mules are usually sold at private sale, being sold singly, in pairs, or in any number to suit the needs of the buyer. When large numbers are wanted of a uniform height and weight, they are most often sold as a fixed price per head and the salesman gives a guarantee as to age, soundness, and other requirements. When an order is placed for mules of different sizes or for different market classes, they will ordinarily be figured individually, or in pairs.

Market requirements.—The market requirements for mules are similar to those for horses. They should be sound, of a desirable age and color, well fleshed, and sleek in coat; and should possess abundant quality and a strong conformation. They should also have good action. These requirements are discussed in detail below.

Soundness.—Mules should be serviceably sound. Blemishes are objectionable, though not in the same degree as with horses. They should be sound in eyes and wind, and should be good workers. The most common and serious unsoundnesses are large spavins, puffs, sidebones, defective eyes, and unsound wind.

Age.—The most desired age is from four to eight years; however, there are exceptions in some classes, as noted below.

Condition.—The appearance is greatly improved if mules are marketed carrying flesh enough to round out their middles. Sleek, glossy coats of hair are often estimated to be worth ten dollars. The flesh should be smooth, not lumpy or rolly. The value of flesh on mules is about equal to that on draft horses—which is twenty-five cents per pound with a good grade of horses.

Quality.—Refinement of head, hair, bone, joints, and hoofs is an evidence of good bone and wearing qualities.

Conformation.—All mules should have a large chest, long shoulder, deep barrel, straight short back with as much spring of rib as possible, a broad loin, and a long level croup. The underline should be comparatively straight, the rear flank well let down, and the thighs and quarters heavily muscled. The legs

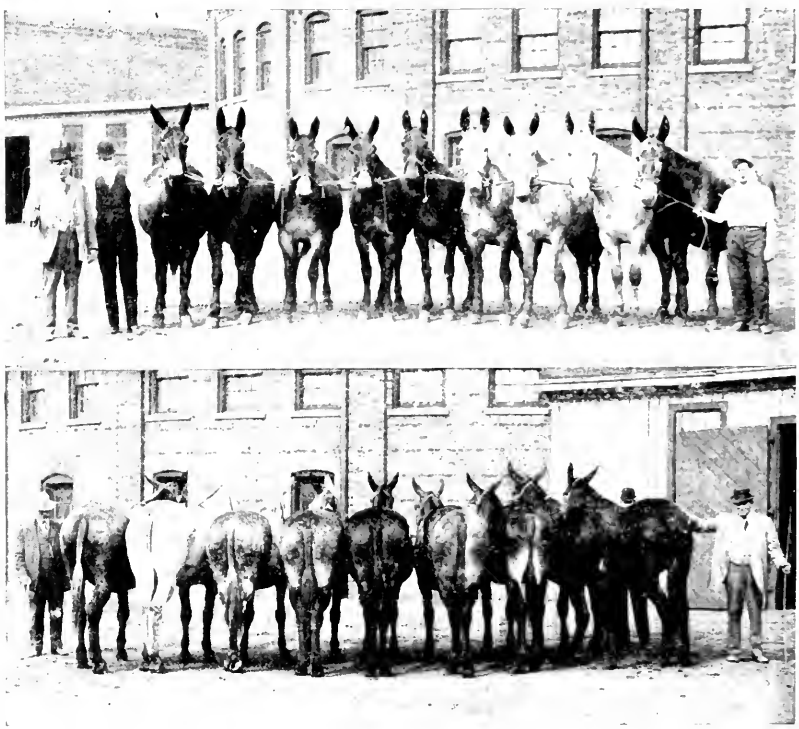


Fig. 115. High-Class Draft Mules.

should evidence both substance and quality, the feet should be large, wide at the heel, and sound, and the hoofs should be smooth. The form, muscling, and set of legs should be approximately the same as in horses. The head of the mule is a good index of his disposition and temperament; it should be of good size, yet clean-cut as an evidence of quality. The forehead should be broad and flat, and the nose slightly

Roman, which indicates stamina and strength. If the head is as described, with light coloring running well up toward the bridge of the nose, the animal is usually considered to be a more reliable and agreeable worker than one not possessing these characteristics. The ears should be long, thin, tapering, and carried erect; the neck should be long, with moderate crest, and should join the shoulder smoothly. The mane should be roached, and the tail clipped in the regular manner with not too short a bush.

Color.—All mules of solid color, except white, are in good demand, though color is not an important factor. Dapple grays are popular in the draft class, but as a general rule, bays, browns, and chestnuts are most desirable, while flea-bitten grays are discriminated against.

Action.—Action counts for very little in market mules. They should show vigor and energy in their movements and be straight-line movers. They should not be sore in legs or feet, nor defective in action because of badly set legs.

The market classes of mules are determined by the use to which they are put, but in order for a class to exist there must be a demand for considerable numbers of a definite type. In the St. Louis market, which is the largest mule market in the world, there are five market classes which are as follows:

Classes	*Height Hands*	*Weight Pounds*
MINING MULES	12 to 16	600 to 1350
COTTON MULES	13.2 to 15.2	750 to 1100
SUGAR MULES	16 to 17	1150 to 1300
FARM MULES	15.2 to 16	900 to 1250
DRAFT MULES	16 to 17.2	1200 to 1600

Mining mules.—These are purchased for use in mines, principally to haul cars of ore or coal to the hoisting shafts. They are rugged, deep bodied, short legged, compactly built, and have heavy bone and large feet. They stand from 12 to 16 hands high, and weigh from 600 to 1350 pounds. Those used down in mines are termed "pit mules," and the height of these is limited by the depth of the vein worked. Ages from 5 to 8 years are most preferred, but a well-developed four-year-old, or a well-preserved ten-year-old, is often accepted. Geldings are much preferred to mare mules for this

trade. Bad wire marks on the feet are severely discriminated against, as they are likely to become sore from contact with sulphur and other chemicals in the mine. The demand for miners is strong and constant throughout the year, and comes from all sections where mines are operated.

Cotton mules.—Cotton mules are very similar to mining mules in size, but are lighter boned and not so compactly built. They should have small, neat heads, and possess much quality and finish. Their feet are smaller and bodies proportionately lighter. Cotton mules stand from 13.2 to 15.2 hands high, and weigh from 750 to 1100 pounds. They are most desired from 3 to 7 years old, but may find ready sale up to 12 years of age. Mare mules sell better than geldings in this class. The trade begins about the first of September and continues good throughout the fall and winter months, then gradually decreases until after the cotton crop is planted, or about April. From this time until the following fall, the demand is light. Cotton mules are used by cotton growers to plant, cultivate, and harvest the cotton crop, but a great many such mules are also taken to cities for use on delivery wagons and other purposes.

Sugar mules.—These are mules especially adapted for use on the sugar farms of Georgia, Louisiana, and other southern states. Sugar mules are taller, larger, more breedy looking, better finished, and have heavier bone than cotton mules. The feet should be large in proportion to the bone. They stand from 16 to 17 hands high, and weigh from 1150 to 1300 pounds. Mare mules from 3 to 6 years old are most desired for this trade. As sugar mules are larger and possess more quality and finish than cotton mules, they sell for a little more money. The trade begins in August, and usually ends in February. They are in greatest demand in September, October, and November.

Farm mules.—Mules purchased for use on farms in the central states are known on the market as farm mules. They are less uniform in type than the other classes, as farmers like to buy animals that show promise of further development. Farm mules are usually from 15.2 to 16 hands high, and from 3 to 6 years old, four-year-olds being preferred.

They are often plain looking and thin in flesh, though possessing good constitution, bone and feet, and showing indications of a good outcome when well fed and cared for. Many of them are worked for a time, then fattened and returned to the market. When resold, they may be taken as miners, sugar mules, or cotton mules. The strongest demand for farm mules occurs during the late winter and spring months.

Draft Mules.—Draft mules are large, heavy-boned, heavy-set mules, with plenty of quality. They are purchased to do heavy teaming work. Many are used by contractors doing railroad grading, and consequently they are often spoken of as railroad mules. They are especially demanded for heavy teaming work in cities in warm climates, where they are preferred to horses because they are said to be hardier, able to stand the hot sun better, and not subject to as many ills. Draft mules stand from 16 to 17.2 hands high, and weigh from 1200 to 1600 pounds and upwards. They should combine weight and strength. They should be large, rugged, heavily boned, and strongly muscled. The feet should be large, the back short and strong, the middle deep and closely coupled, the croup fairly level, and the thighs and quarters massive. They are most desired from 5 to 8 years old, and little preference is shown regarding sex. The demand is strong and quite constant the year round.

Plugs.—These are worn out, cheap mules that have but little value. They are usually unsound in one or more respects, very plain and rough in form, and many are of advanced age.

Export mules.—The export trade in mules has increased during recent years. Large shipments have been made to South Africa, Philippine Islands, and Cuba. The size and type of these mules varies, depending on the use to which they are put and the country to which they are sent. Some are used for army service, some for agricultural purposes, some for heavy teaming, and some in mines. Hence the term "export mule" is a trade name which is not restricted to any particular kind of mules.

CHAPTER XXXV.

HORSE BREEDING.

This is a broad subject which may be considered and discussed at length from many points of view. Only very brief treatment is possible here, however, in which the most common mistakes in horse breeding are pointed out and their remedies briefly discussed. The subject will not be considered from the viewpoint of the wealthy man with whom horse breeding is mainly a hobby, nor from the standpoint of government work in establishing or perpetuating certain breeds and classes of horses. This is written from the standpoint of the farmer who desires to breed horses in a moderate or small way for the profit there is in it.

Horse production on the small farm.—The advantages of intensive farming have been widely discussed for a number of years. Intensive farming is farming on a small scale, but doing it perfectly, hence realizing the largest possible return on a moderate investment. Horse production on a small scale, as discussed here, is similar to intensive farming. It means the ownership of one or two pairs of high-class brood mares, preferably purebreds, which are used to do part or all of the farm work, and which are given the very best care and attention. They are bred only to high-class stallions of the same breed as themselves, and during pregnancy they are well cared for, well fed, and not overworked. As foaling time draws near, they are watched carefully and assistance is given if necessary. They foal on clean bedding in a clean stall, or, better still, at pasture, and the foals are immediately treated to prevent navel ill. The foals are given the best of care and are carefully trained, being halter broken as early as possible and made gentle by proper handling. They are kept growing after they are weaned, and in due time their education in harness or under saddle is accomplished in a careful and complete manner. This is intensive horse production.

Intensive horse raising therefore means keeping a few extra-good brood mares, and each year producing a few extra-good foals which may be grown out by the breeder or sold as weanlings or yearlings to be developed by someone else. The first costs under this plan are not necessarily less expensive than where a large number of the average kind of brood mares are kept. Good brood mares cost considerable, but they are the only kind on which large profits may be made. If this plan seems impracticable because purebred mares are expensive, why not reach the same end by buying a weanling or yearling filly of the desired breed, growing out this filly to breeding age, and retaining her best filly foals for breeding purposes? In this way, given a few years' time, it is easily possible to get on an intensive footing with as many mares as are desired.

We have had enough of the average kind of horse production in this country; in fact, far too much of it. Until late years, purebred draft mares were so scarce that they were almost regarded as curiosities. Enough time has elapsed, however, to demonstrate beyond all doubt that it pays much better to keep a few extra-good brood mares and raise carefully a few good foals, than it does to keep a lot of cheap mares and produce a lot of cheap horses, without feed enough to give any of them a fair chance. Put your money in fewer mares, give the foals the best of feed and care, and you will make more money than you will by raising ten or a dozen average foals in the average way. Today the tendency is for the cheap horse to bring less, and for the good horse to bring more than ever before. The automobile has helped to bring about this condition, and the writing on the wall should be heeded.

Only recently, the writer visited a farm where he was shown a sixteen-year-old grade draft mare of good type and individuality. On the same farm were five good mares, all out of the aged mare mentioned. Other of her numerous offspring had been sold at good prices. The mare had made the farmer money and is still making it, for at the time of this visit she had a fine filly foal by her side. But the owner was not satisfied. "Think how much more money I would have made," said he, "if I had begun with a purebred registered mare. If the

old mare had been purebred and registered, the value of every one of her foals would have been easily doubled, and it wouldn't have cost a cent more to raise them." The lesson to the young breeder is clear,—start right, even if it means starting slowly by buying one young registered filly, and from her building up a breeding stud of fine mares.

The farms of the Middle West and East are well adapted to the intensive plan of horse production, because most of the farms are not large, and usually the teaming is done by the owner himself, or by one or two hands who are always under close observation. On big farms, with incompetent and ever-changing help, if valuable brood mares are kept, they are liable to be injured if used to do the farm work. The writer is not one of those who advocate keeping brood mares in idleness. They will be healthier and will produce stronger foals if worked in moderation. The plan should call for working the brood mares, but not working them as hard as we work geldings or mules. Let them earn their board, and board them well. They may be worked well up to foaling time if care is taken not to back them to a heavy load, or put them to a hard strain, or turn them quickly. Mares have been hurriedly unhitched and unharnessed while cultivating corn or doing some other moderate work, and have foaled thrifty, well-developed foals, the equal of any. But such mares have been well fed and cared for during pregnancy, and they should be given as long a vacation on pasture after foaling as the farm work will permit.

The most profitable horse breeding in France, Belgium, England, Scotland, and America is done on the intensive plan, on farms of moderate or small size, by farmers who are good practical horsemen with a taste for doing things well. There is ample room in the United States for much more horse raising on this plan, and we have always had too many inferior mares, too many cheap stallions, and too many cheap horses hunting buyers.

Choosing a type to breed.—What type of horse shall the farmer breed? The answer depends upon how much capital is available to put into the business, upon the personal qualifications of the breeder, and also upon his personal preference

as to type. To some extent, the choice will depend upon the location of the farm, and upon the crops that can be grown. It will ordinarily require more capital to engage in the breeding of light horses than in the breeding of draft horses. Light horses especially require more expensive equipment to accomplish the training and finishing without which they sell at comparatively moderate prices. Because of temperament and disposition, some men are more successful with one type of horse than another. The man who intends to engage in the breeding of horses should ask himself the following questions regarding any or all types he may have under consideration. 1. Am I familiar enough with the type and the methods of its production to know what I am striving to produce and how to produce it? 2. Provided I can produce the type successfully, how can I dispose of my animals, and what are the chances of realizing full value for my stock? 3. Are my buildings, fences, land, and crops adapted to handling the type I have in mind, and if not, can I remedy the shortcomings?

Advantages of draft type.—In the majority of cases, the best type for the farmer to produce is the draft horse. It has many advantages. The brood mares are much better suited to do the work of the farm than are any of the light horse types. Practically no special training is needed to make the drafter ready for market, and he is marketable at a younger age than is ordinarily true of the types of light horses. If he is kept free from wire cuts and other blemishes, and is fat and well groomed when offered for sale, he should realize full value. The carriage horse or saddler, on the other hand, requires months of handling in order to give him a good mouth and develop his action or gaits, as the case may be. Furthermore, a wire cut or other blemish is much more serious with these types than with the drafter. They require more care and attention from birth to selling time, and require a greater age to finish them for market. It is also true that there are fewer misfits in breeding draft horses than with any other type of horse, in other words, results are more certain and sure. The production of draft horses fits into general farming better than the production of any of the light horse types. For these various reasons, the draft horse is of greatest interest to

most farmers, and is most frequently selected by farmers who take up horse breeding.

Light types require greater skill.—Let it be understood, however, that the foregoing arguments are not intended to discourage the breeding of types other than the drafter. The point is that carriage, saddle, and roadster horses are more difficult to produce than drafters, and but few persons, com-

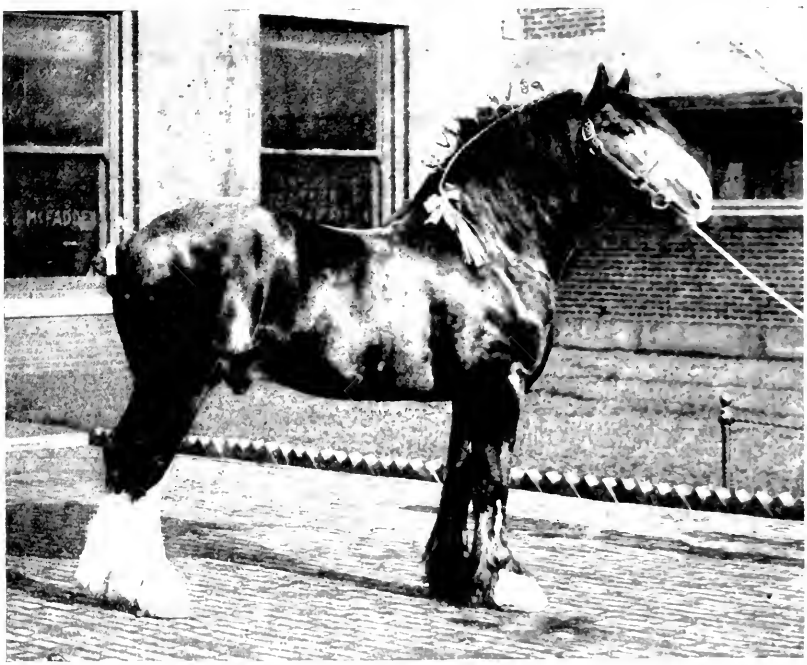


Fig. 116. Correct Type in the Draft Stallion.

Fyvie Baron, Grand Champion Clydesdale stallion at the 1913 International. Owned by Conyngham Bros. of Wilkesbarre, Pa. Note his masculinity, quality, style, symmetry, correct position of legs, nice pasterns, and good feet.

paratively, are qualified to breed them successfully. The production of light horses requires a higher order of skill both in breeding and salesmanship than does the production of the draft horse, and when this is supplied, light horse breeding is a profitable enterprise. Hence the selection of the type to breed should be governed largely by the ability of the man

who is to supervise the breeding, provided, of course, he is to work under conditions not unfavorable to the type he is best qualified to produce. Failures in horse breeding, as in most other things, usually have been due to the man believing himself capable of doing things for which he was not qualified.

Perhaps in no other field have so many breeders found themselves mistaken regarding their abilities as in the breeding of the trotting horse. This type appeals strongly to the majority of Americans, and many farmers and others have believed that they knew a safe and sure system of breeding for speed that could not but make every animal produced a good one. Even in the best of hands, the breeding of trotters is very doubtful as to results, and only a small percentage of the foals ever attains anything noteworthy on the turf. Speed is an elusive quality dependent on such a rare combination of good qualities in the animal as to make results in breeding very uncertain, and it should be understood that only a few men possess the special qualifications necessary to success in breeding this type of horse, and that only the wealthy, who are willing to accept the pleasure and fascination of the undertaking as partial remuneration for the capital invested, can ordinarily afford to take up this difficult art. A few men of moderate means have made a success with trotters by selling yearlings as "prospects" to be developed in the hands of some one else, but even this method is uncertain as to results financially.

Pony breeding offers a good field for profit to those who are in position to reach the trade for Shetland, Welsh, or Hackney ponies. The breeding of polo ponies, however, is as yet a very uncertain undertaking comparable to breeding trotters.

Selecting a breed.—After the type of horse has been chosen, it is next in order to decide what breed of that type shall be selected. The choice of a breed is not so serious or important a matter as the selection of a type or the selection of the individuals which are to compose the stud. It will depend largely upon the personal fancy of the breeder, although in some types of horses in certain localities, one breed may be so much liked or another breed so much disliked as to make

it advisable for the new breeder to conform to the choice of the community, if it is possible to do so. He can then profit from the experience and advice of his neighbors, he will benefit from a greater number of local sales of his stock, and there will be more stallions to select among when mating his mares. After deciding what type shall be produced, the mistake is sometimes made of selecting a breed to work with which does not rightly belong to that type. For example, efforts are sometimes made to produce the carriage type from trotting-bred stock, or from a saddle breed, and while many excellent heavy-harness horses have sprung from these breeds, they have been largely in the nature of accidents in breeding, and ordinarily they cannot be produced in this way with enough regularity to make such a plan of breeding advisable.

Selecting the individuals.—We now come to the matter of selecting the individuals which are to compose the stud. First of all, they must be sound; and this is a matter to which many farmers pay too little attention. Buyers offer the best prices for sound stock, and the farmer has too frequently sold his young mares that were sound, and has retained those with sidebones, ringbones, spavins, curbs, etc., for breeding purposes. This is radically wrong and a very short-sighted practice. Soundness is of very vital importance in every type of horse, and especially in animals used for breeding purposes. The individuals should also be true representatives of the type to which they belong. Whether or not the brood mares should be purebred depends on the amount of capital available and on the type of horse selected. If possible, it is preferable that they be purebred, registered mares. In breeding drafters for the market, some very profitable work has been done with good grade draft mares. In such cases, however, these mares have shown excellent draft type, even though they were not eligible to registry. Purebred draft mares cost considerably more to buy, but have the very great advantage of having their foals eligible to registry, and hence of greater market value. In breeding carriage, saddle, and roadster horses, it is essential in most cases that purebred mares be used. Well-developed feminine character and good disposition are fundamental qualities in a brood mare, as such mares are usually

more regular breeders, better mothers, and more easily handled and worked than are mares of masculine appearance or mean, vicious, or highly nervous disposition.

A sound, purebred stallion that is true to type and a good individual in every way is the only kind worthy of patronage. If there is no such horse in the community, it will pay to ship the mares a long distance to reach such a one. If possible,

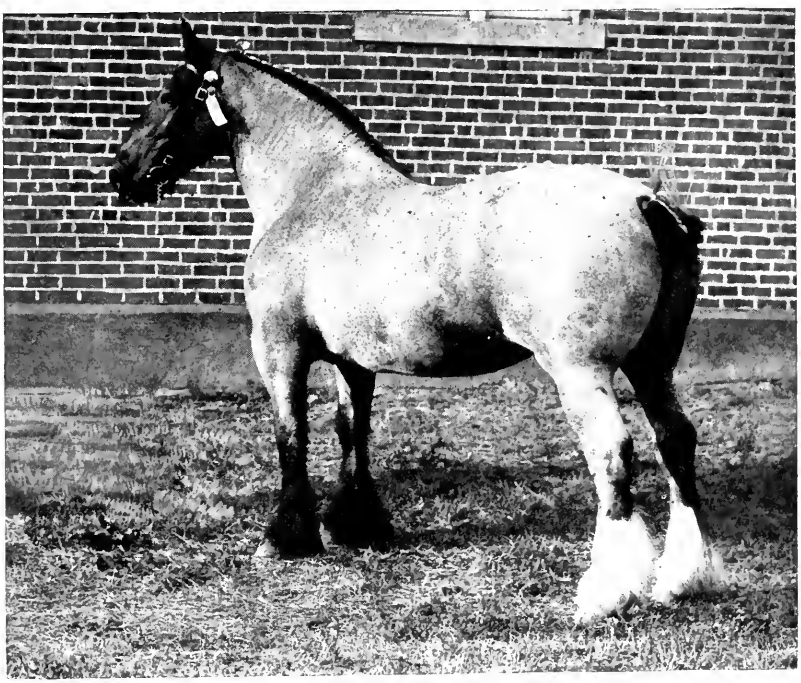


Fig. 117. Correct Type in the Draft Mare.

Coldham Surprise, Grand Champion Shire mare at the 1913 International. Owned by Mr. Geo. M. McCray of Fithian, Ill. Note her roomy middle, faultless top line, symmetrical form, abundant muscling, and large bone. She has ruggedness and strength combined with quality and femininity.

it is always best to patronize a stallion that has proved himself a sure breeder and a getter of good foals. There is no greater folly than breeding to a horse simply because he stands at a low service fee, yet this is done in a vast number of instances every season. There would not be the great num-

ber of unsound, mongrel, and inferior stallions standing for public service if there did not exist a demand for them on the part of mare owners. There can be only one explanation so far as the owner of the mare is concerned, and that is the saving in the amount of the service fee; but no more short-sighted practice can be followed, it having been demonstrated in almost every community that the added value of the foal from a high-class stallion, as compared with the foal by a cheap horse, repays the extra service fee many times over. It costs little more to raise a good foal than an inferior one, and the foal by the cheap stallion is not ordinarily a profit maker. So many breeders have shown a lack of judgment in this matter, and horse stocks have deteriorated to such an extent in some states on account of the large number of mares bred to cheap horses, that stallion laws have been enacted which debar unsound stallions from public service, and require that placards be posted on the stable door telling whether the stallion is a purebred, cross-bred, grade, or mongrel. Every state needs a law of this kind, modified to suit its needs.

Results of careless breeding.—Another evil in need of remedy is the too common practice of mixing the types of horses. Heavy mares are mated with trotting stallions in order to produce an animal for road use, or with no particular idea in the mind of the mare owner except to "get a colt." Light-weight, light-boned mares, without any semblance of draft qualities, are mated with draft stallions in the hope of getting a draft foal, or again simply to "get a colt." The results of such breeding are to be seen on every hand in the country, and a visit to any large horse market reveals the fact that a large percentage of the animals offered for sale are of no particular type or market class, because they have a variegated ancestry, the result of indiscriminate crossing of heavy and light horses. One is at a loss sometimes to know by what method some market offerings were produced. The result is a lot of cheap horses adapted to no particular work, which net the producer a loss in most cases and seldom yield a profit. Breeders must learn to stick to type. The experience of all

successful horse breeders teaches no other lesson more forcibly than this.

Pedigree not always an indication of merit.—In the minds of many people, the words "purebred," "registered," and "imported" have a charm much greater than they deserve. Far too often, glaring faults of individuality or even serious unsoundness are passed with light criticism because the animal in question is eligible to one or more of these fascinating names. After all, one must conclude that there is something in a name. It is a fact that many purebred horses are practically worthless for breeding purposes. If an animal is purebred and registered, its value is very greatly increased, provided it is a good individual of useful type; but if the animal is decidedly faulty in conformation, or has serious unsoundness, its pedigree and registration number are of small account, and the animal is of little or no value for breeding purposes.

Feed and care.—Every successful breeder is a good feeder and caretaker, for no matter how excellent the ancestry of a foal may be, its inherited good qualities cannot reveal themselves unless the foal is provided with good quarters and plenty of the right feed with which to build up and grow. Feed and care are fully as important as parentage in producing good horses.

Summary.—In conclusion, therefore, follow the intensive rather than the extensive plan of horse production; select the type to breed after careful study of the situation; select a breed which truly belongs to that type; select sound individuals possessing a high degree of individual excellence; breed to a strictly high-class, purebred stallion, regardless of the amount of his service fee; if there is no such stallion in the immediate neighborhood, ship the mares whatever distance is necessary to reach a high-class horse; patronize a tried and proven sire if possible; stick to a definite line of breeding—do not mix the types indiscriminately; raise a class of foals that merit plenty of good feed and care, and supply the same; be conservative in your judgment and appreciative of the fact that the breeding of horses is an enterprise which repays careful study of all departments of the business.

A Few Statistics.

The leading countries in point of numbers of horses and mules in 1914 were as follows:

	Horses	*Mules*
United States	24,145,000	4,719,000
Canada	2,948,000	———
Argentina	8,894,000	535,000
Austria-Hungary	4,374,000	43,000
France	3,231,000	193,000
Germany	4,523,000	2,000
Italy	956,000	388,000
European Russia	24,639,000	———
United Kingdom	2,233,000	31,000
India	1,699,000	277,000
Japan	1,582,000	———
Asiatic Russia	10,330,000	———
Australia	2,509,000	———
World	95,698,000	8,642,000

The United States has 25.2 per cent. of the world's horses and 54.6 per cent. of the world's mules. Spain is the only country which has more mules than horses.

The average value of horses in the United States in 1915 was $103.33, while the average value of mules was $112.36. Ohio, Michigan, Wisconsin, Utah, and Idaho were the only states which reported a higher average valuation for horses than for mules in 1915.

Iowa, with 1,600,000 head, had more horses in 1915 than any other state. The other leading states in the order of importance were Illinois, Texas, Kansas, Missouri, Nebraska, Ohio, Minnesota, Indiana, and North Dakota. The horses of Ohio were valued higher per head than those of the other nine states mentioned, so that in total valuation of horses Ohio ranks third, Iowa and Illinois being first and second.

The leading mule-owning states are Texas, Missouri Georgia, Mississippi, and Alabama, in the order given, while no mules were reported in 1915 from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Five states own more mules than horses, these being North Carolina, South Carolina, Georgia, Alabama, and Mississippi.

CHAPTER XXXVI.

UNSOUNDNESS IN THE HORSE.

Soundness is a very vital factor in determining the value of a horse, and a knowledge of unsoundness is very essential to success in breeding. Brief description of the most common unsoundnesses has been deferred until the close of the discussion of horses in order that the student may learn to fix his attention, first of all, on type. The matter of soundness, while important, is often overemphasized. Presented here at the close, such information should supplement, but not displace, knowledge previously acquired.

If a horse is unsound, his unsoundness may be accounted for in one or more ways: (1) he may have had a natural weakness in conformation or structure which predisposed him to the unsoundness; (2) he may have been strong in conformation, but forced to do extreme labor which was beyond the power of the animal machine to endure; (3) the unsoundness may be the result of a bruise, blow, cut, or other injury; (4) unsoundness may result following a diseased condition of some part of the body, and (5) lack of proper care, as, for example. failure to keep the feet in proper balance so as to distribute the weight and wear equally over the various parts of the foot and leg, may bring on unsoundness. In the horse for work, it matters little which of the above explanations applies; he is unsound, and the horse market fixes his value according to the nature of the unsoundness, without regard to the reason why the horse has it. In the horse intended for breeding purposes only, unsoundness should not be considered a serious detriment unless it is explained by the first of the possibilities listed above. For example, it is wiser to breed to a horse having a naturally strong hock which, because of accident or extreme work, has developed a bone spavin, than it is to breed to a sound horse having a weakly formed hock which is free from bone spavin only because it has never been put to the test of even moderate work. It is often difficult, however, to

determine with accuracy the reason for an unsoundness, and in all such doubtful cases the unsoundness should be looked upon with suspicion and the horse rejected for breeding purposes.

Certain unsoundnesses are ordinarily referred to as "hereditary," on account of their marked tendency to reappear in succeeding generations. More correctly, however, it is some weakness of conformation that is transmitted which predisposes the members of the family to one or more unsoundnesses. Considerable difference of opinion exists among well-informed persons as to the hereditary transmission of many diseases.

A number of minor troubles which are not unsoundnesses are here given brief mention, because of the frequency with which they are met and to satisfy curiosity regarding them. Treatment is briefly mentioned in some cases for a similar reason. Many minor troubles are important because they blemish a horse. A blemish merely detracts from the appearance of an animal, whereas an unsoundness interferes with his working capacity. Many unsoundnesses are blemishes as well. The list here presented is not by any means a complete list of the diseases of the horse, and it is not necessary that it should be complete. A study of the ills to which the horse is heir shows that his eyes, legs, and wind are the seats of unsoundness.

Blindness.—Any defect of sight is a serious defect in a horse, and eye trouble always furnishes grounds for rejecting horses for unsoundness. Inspecting a horse for blindness requires expert knowledge of the diseases of the eye, and, although the average horseman can in many cases discover defective eyes, no horse is safely passed as sound in eyes except by a well-qualified veterinarian. Severe weeping, partially closed eyelids, sunken eyes, inability to bear strong light, a cloudy appearance of the cornea, unnatural or dull color, failure of the iris to contract to a considerable degree when brought from darkness to light, too active play of the ears, failure to blink when an object is passed close to the eye — these and many other conditions give evidence of defective vision. (See also **cataract** and **periodic ophthalmia.**)

Blood spavin.—Blood spavin is situated in front and to the inside of the hock, and is merely a varicose or dilated condition of the vein passing over that region. It occurs directly over the point where the bog spavin is found, and is frequently confused with the latter. It constitutes a blemish rather than an unsoundness.

Bog spavin.—This is a round, smooth, well-defined swelling in front and a little inward of the hock. On pressure it disappears to reappear on the outside and just behind the hock. It is caused by a weakness in the synovial sacs of the joint, accompanied by a hyper-secretion of synovial fluid or joint oil. Bog spavins are more often blemishes, rather than unsoundnesses. They are classed as the latter only when they are well developed or cause lameness. Slight cases are described as merely "a little full in the hocks." Treatment consists of rest, blistering, cauterization, and the use of pressure pads and peculiar bandages.

Bone spavin.—This is a bony growth of variable size in the hock, which may or may not make itself visible on the exterior. It most often occurs at the inner and lower border of the hock, but may arise on the upper part, or on the outside of the hock. In some cases, no outward signs of spavin are perceptible; these are called "occult" spavins. Care should be taken not to mistake a prominent development of the inner and lower border of the hock, natural in some animals, for a spavin. Hocks that are narrow or tied in below are subject to bone spavin, as are also those of coarse structure.

Bone spavins affect one or more of the six bones of the hock. The spavin usually represents an effort on the part of nature to repair the joint. Spavins are caused by sprains, by violent efforts in jumping, galloping, trotting, or pulling, by slipping or sliding, and other similar causes. This is classed as an hereditary unsoundness. It is one of the most serious unsoundnesses of horses; it causes lameness and stiffens the joint. As with sidebones and ringbones, the size of the spavin is not a safe index of its seriousness. An excellent test for spavin lameness consists in lifting the affected leg off the ground for one or two minutes, holding the foot high so as to flex all the joints. Then start the animal off in a trot,

when the lameness will be greatly intensified if it is caused by spavin. Treatment consists of complete rest for a month or more, blistering, the use of proper medicaments, firing, and special operations on the joint. Firing produces a small scar, and when this is present the spavin is called a "jack."

Broken wind or heaves.—This condition is denoted by a characteristic hollow cough, short, and something like a grunt, which once heard is easily recognized a second time. Inspiration is performed normally, but expiration is abnormal, being double, or what is commonly called the "double lift." The first portion of the expiration expels the air as normally, and the second apparently squeezes the remainder of the air from the lungs in a gradual manner, seemingly with more or less voluntary exertion. When such an animal is put to work, there is also a wheezing noise with the breathing. From a commercial standpoint, a broken-winded horse has practically no value, yet he may continue to work fairly well. The cough is sometimes disguised by unprincipled persons through the administration of such substances as shot and grease; but this is only temporary. The abnormal breathing cannot be concealed. In some cases of broken wind, the air vesicles of the lungs have been found, after death, ruptured; the right side of the heart enlarged, and the walls of the stomach dilated, though this is not always true. A predisposition to this disease may be inherited. In doubtful cases of broken wind, give the animal all the water he will drink and then ride or drive him uphill. This will bring out the symptoms if the disease is present.

There is a great diversity of opinion as regards the exact cause of heaves. It is usually associated with disorder of digestion, or to an error in choice of food. Feeding on clover hay or damaged hay or straw, too bulky food, and keeping the horse in a dusty atmosphere or a badly ventilated stable produce or predispose to heaves. Horses brought from a high to a low level are predisposed.

Capped elbow.—This malady is commonly termed "shoe boil," and consists of a bruise at the point of the elbow, generally caused by the heel of the shoe when the horse is lying down, and sometimes from other causes. The continued irri-

tation leads to the production of a tumor at the point of the elbow. The skin may be broken, and slight suppuration very often occurs. The cause must be removed, and the animal provided with a leather or rubber ring around the fetlock while in the stall. The remainder of the treatment is surgical. Capped elbow may cause severe lameness, but it is usually a blemish only.

Capped hock.—This is quite common and may or may not constitute unsoundness. It is the result of a bruise, either continuous or intermittent, and may appear suddenly or gradually. Such bruises may be received in shipping by train or boat, or by the habit some animals have of kicking against the sides of the stall, or at fences, or even in harness. The skin, bursa, or the bone may be involved in capped hock. Usually it is the skin, which becomes very much thickened over the point of the hock. It is in every case a blemish. Treatment consists of hot and cold applications and blistering.

Cataract.—When the lens of the eye becomes so cloudy or opaque as to present a white or grayish color, the eye is said to be affected with cataract, which is a practically incurable form of blindness. A blow over the eye and other causes bring it on. It is rather common, particularly in aged horses.

Chronic cough.—A permanent cough accompanying broken wind, glanders, and other diseases constitutes an unsoundness.

Cocked ankles or knuckling.—This is a partial dislocation of the fetlock joint, in which the position of the bones is changed, the pastern becoming more nearly perpendicular. While it is not always an unsoundness, it nevertheless predisposes to stumbling and to fracture of the pastern. Young foals are frequently subject to this condition, and in the great majority of such cases the trouble disappears in a few weeks without treatment. Horses with erect pasterns often knuckle as they grow old, especially in the hind legs. All kinds of hard work, particularly in hilly districts, are exciting causes of this trouble. It is also caused by improper shoeing, in which the toe is made too long and the heel too low, thus producing inflammation and retraction of the tendons. Last-

ly, it is caused by disease of the suspensory ligament or of the flexor tendons, whereby they are shortened, and by disease of the fetlock joint. It is one of the worst faults a horse can possess, and it greatly affects the value and the price. Treatment varies depending on the cause of the trouble. Relief may be secured by so shoeing as to shorten the toe and elevate the heels, thus relieving the tendons. In extreme cases, the tendons may be operated on to secure relief. Firing and blistering effect a cure in some instances.

Contracted feet.—Contraction of the feet is not a diseased condition in itself, but is a symptom of such and leads to trouble. Contraction is due to a removal of the full functions of the foot, such as is the case in lameness, removal of frog pressure, defective shoeing, etc. Contraction occurs more especially at the heels, and more frequently in the fore feet than the hind ones. Veterinarians look upon this condition as constituting unsoundness. Treatment is not of much avail, but going barefoot or wearing a special shoe to spread the heels will help to alleviate the condition.

Corns.—A corn is a bruise to the fleshy sole, and is manifested by a reddish discoloration of the horny sole beneath the bruise. It usually occurs upon the inner quarter of the fore foot. A corn very often causes severe lameness, and is a cause of unsoundness. The treatment consists in paring, special shoeing, poulticing, keeping the part thoroughly clean, and a few weeks' rest.

Cracked heels.—This condition is denoted by an inflamed state of the skin, which becomes broken, and, if severe, may cause lameness. They are frequent in the horse, especially following a frost, the moisture from the thaw favoring this. It is similar to chapped hands, and fissuring is favored by the movements in the hollow of the heels. Treatment consists of the application of a soothing liniment applied daily with tow and bandage.

Curb.—This is an unnatural prominence of variable size, located on the posterior border of the hock, four or five inches below the point of the hock. It is easily detected by viewing the joint in profile. It is caused by a sprain of the tendon which passes over that part, or of the strong ligament located

there. Hocks that are sickled, coarse, and thick in appearance, or that are too narrow from front to back at their base, most often develop curbs. Violent efforts in heavy pulling, high jumping, or slipping are often the direct cause of curb. Curbs do not often cause lameness, or, if they do, it is usually during the formative stage. Legally it is an unsoundness, although it is not much of a detriment, especially in horses for slow work. Curbs are much less serious than bone spavins, ringbones, sidebones, cocked ankles, and stringhalt. Treatment in the early stages consists of cold applications to relieve the acute inflammation. When the first stage has passed, blistering, frictions with ointments, and firing are often used with good success.

Fistula.—This is an ulcerous lesion found at the withers. Fistulas follow as a result of abscesses, bruises, wounds, or long-continued irritation by the harness or saddle. The pus burrows and finds lodgment deep down between the muscles. The horse becomes incapacitated for work for a considerable period. Most cases are curable. The treatment is largely surgical; the animal should be placed in the care of a competent veterinarian as soon as the condition is discovered. After the fistula is healed, a scar usually remains in the region of the withers. A horse that has had fistula is liable to subsequent attacks of the same trouble.

Founder or laminitis.—This is a simple inflammation of the fleshy laminae within the hoof. Being exceedingly vascular, the laminae are subject to congestion, and, being enclosed within the hoof, there is very little room for the relief of the congestion. The animal suffers most agonizing pain. Concussion is one of the most common causes. Another is overfeeding, especially on barley, wheat, or corn, causing indigestion, irritation of the alimentary tract, and inflammation of the fleshy laminae through sympathy. Other causes are unusual excitement, bad shoeing, over-exertion, exhaustion, rapid changes of temperature, or any other agencies of an oversupply of blood to the fleshy laminae, resulting in congestion and inflammation. But it is the after-effects which are of most interest to us here. The disease sometimes becomes chronic, and this seriously affects the secretion of horn. The

toe of the hoof turns up, the heels become longer than natural, while the hoof near the coronet is circled with ridges like those of a ram's horn. These ridges are wide apart at the heel, and close together in front, and are due to periods of interference with the growth of horn simultaneous with the inflammation of the fleshy laminae. Because of the high heel and turned-up toe, the leg knuckles at the fetlock joint. Usually, accompanying these defects, the sole is found to be thin, convex, and weak, and will stand but little wear. Because of the convexity, the diseased tissues bear unusual weight, and such animals are generally incurable cripples.

Grease.—This is not an unsoundness, but is such a troublesome and common complaint that brief mention is here given. It is a skin disease appearing nearly always in the hind cannons. Draft horses are more subject to it than light horses. Some individuals are predisposed to it — those with coarse skin and coarse feather. Other horses have it as a form of parasitic mange, denoted by a greasy condition of the skin, congestion of the skin, erect hair, and offensive odor due to discharge from the sores. There is a constant itching and the horse rubs the part, producing thickening and wrinkling of the skin. Treatment varies. Half an ounce of Fowler's solution of arsenic night and morning in the feed, burning with hot iron, applying hot linseed poultices, dressing with lead lotion, giving a mild physic, decreasing amount of feed allowance — all these furnish good methods of treatment.

Hip down.—This is a fracture of the point of the hip, often caused by the animal striking the part against the door post of the stable. It causes a flatness and sometimes the broken piece of bone may be felt. It is best detected by standing squarely behind the animal and viewing it across the hips. It constitutes a blemish.

Navicular disease.—Navicular disease is a chronic inflammation involving the navicular bone, the navicular bursa, and the flexor tendon of the foot. It is brought on by repeated bruising. Light horses are affected much oftener than heavy horses. The hind feet are seldom affected. It is practically never found in mules. One-third of the weight falling on the leg is sustained by the little bow-shaped navicular bone, and

the bone in turn is supported by the flexor tendon of the foot. (See Fig. 84.) Such defects as an insufficient plantar cushion, a small frog, and contracted feet predispose the horse to navicular disease. In this way the disease may be hereditary, as these predisposing causes may be transmitted to offspring. High knee action, fast work, and hard pavements also endanger a horse from this disease. Dry stables, heavy pulling, and bad shoeing also tend toward the development of this trouble. In the early stages of navicular disease, the animal at rest points the affected foot forward and rests it on the toe, with the fetlock and knee flexed. In the lameness which develops, the affected leg takes a short stride, and the toe strikes the ground first. The disease is progressive and incurable, rendering the animal practically valueless, but not entirely useless on soft ground. To relieve the pain, neurotomy may be performed, an operation in which the sense of feeling is destroyed in the foot by cutting out pieces of the nerve at the fetlock. Navicular disease is one of the most serious unsoundnesses.

Periodic ophthalmia or moonblindness.—This is a disease affecting the eyes of horses, probably caused by a germ. It is quite commonly called moonblindness, because it was thought at one time that the moon had some influence on the cause of the disease. There is undoubtedly a hereditary predisposition to the disease, but there are few cases to indicate that the disease itself is transmitted from parent to offspring, but rather the colt is born with a weakness of the eyes, transmitted by the stallion or dam. Other predisposing factors are low, swampy pastures, poorly ventilated or insufficiently lighted stables, over-feeding, etc.

The disease comes on with an inflammation usually of one eye. The transparent portion of the eyeball becomes bluish or white in color, most noticeable in the lower part. The eye is kept half closed on account of pain produced by light. Often this is associated by a swelling of the eyelids and reddening of the membrane lining them, with a discharge of tears over the face. There is no indication of an injury or more severe inflammation at one point than at another. In one to two weeks these symptoms disappear and the eye may be

practically normal to all general appearances for a period of usually one to three months, when another attack occurs more severe than the first. After a few attacks have come and gone, the eye has a bluish appearance, looks cloudy instead of clear, the eyeball is shrunken, retracted in the orbit, and the lens develops a cataract. Not being satisfied with having destroyed one eye, the disease frequently affects the other, and the history of the first is repeated.

Poll evil.—Poll evil is a fistula upon the poll of the head, and in no sense differs from fistulous withers except in location. It is caused by blows, bruises, and chafing by the halter or bridle.

Ringbone.—This is a bony growth at the coronet or on the pastern, in either the front or hind legs. It is called "ringbone" because it often grows around the coronet so as to form a ring, although in a large number of cases the growth takes the form of a lump on the pastern, rather than that of a ring at the hoof-head. This disease may result from severe work in early life, from bruises, blows, or sprains, or from improper shoeing. Ringbone often follows an abscess of the coronet, or a deep-punctured wound. It is also classed as an hereditary unsoundness, horses with short, upright pasterns being predisposed. Ringbones often cause lameness which may disappear with exercise, returning again when the animal is cooled. They may or may not stiffen the joint. The size of the ringbone is not so important as its position. If it is located so as to interfere with the movement of the tendons behind or in front of the foot, it is a very serious trouble. Prevention of ringbones consists in keeping foals well nourished, and keeping the hoofs in balance. Curative measures consist of so shoeing as to straighten the axis of the foot and pastern as viewed from the side; blistering, followed by a few weeks of rest; and point firing in two or three lines over the ringbone. When these measures do not relieve lameness, the only recourse is nerving.

Roaring or thick wind.—Horses that make a loud, unnatural noise in breathing are said to have thick wind, or to be roarers, excepting those which manifest this trouble because of a severe sore throat. Any obstruction of the free passage

of air in some part of the respiratory tract may cause roaring; occasional causes are nasal polypi, thickening of the membrane, pharyngeal polypi, deformed bones, paralysis of the wing of the nostril, etc. However, chronic roaring is caused by paralysis of the muscles of the larynx, thus permitting the cartilage and vocal cord to lean into the tube of the larynx. The noise is made during inspiration, and in far-advanced cases may be produced also during expiration. A horse is tested for roaring by putting him to severe exertion, as the sound is usually made only when at work. Roaring is a serious unsoundness because it incapacitates an animal for severe work, and it is a serious blemish because the noise is unpleasant. It is classed as an hereditary disease. Treatment varies depending on the exact cause, and includes a course of iodide of potassium in the early stages of the disease, or, in advanced cases, operating on the larynx.

Grunting.—When a pass is made at a horse with a stick, or he is otherwise startled, and he grunts, he should be further tested for roaring. It is a common thing for a roarer to grunt, although grunters are not always roarers. Such animals should be given a severe test of wind. Pleurisy and rheumatism will cause grunting, which ceases when the animal recovers from the disease.

Whistling.—This is only a variation of the sound emitted by a roarer. It may be temporary, due to a severe sore throat.

Sand crack.—Sand crack is a splitting of the wall of the hoof, beginning at the coronet, and commonly at the inner quarter in the fore feet or at the toe in hind ones. It is due to imperfection in the growth of horn. It may cause lameness through sensitive parts being nipped by the crack. It constitutes unsoundness. The treatment is rest and cutting a notch transversely below the crack. If there is lameness the crack may be clasped. The shoe may be seated out below the crack, relieving pressure.

Sidebones.—Sidebones are formed by the ossification of the lateral cartilages of the foot, so that they become hard and unyielding, instead of soft and elastic. (See Fig. 84.)

This disease is most common in heavy horses. They are found more often in the front feet than in the hind ones, and the outer cartilage is more often affected than the inner one. In the hind feet they are of little importance, since they cause no lameness. In the front feet they may or may not cause lameness, usually the latter; however, they always lessen the natural expansion of the heels and often result in shortening of the stride. When lameness is present, the horse comes out of the stable stiff and sore, but with exercise the gait shows improvement. Sidebones are caused by sprains, bruises, blows, and other injuries; and by high-heeled shoes, high calks, and short, upright pasterns. The size and prominence of a sidebone is not an index to the damage it may produce. Treatment is not of much account. It consists in using cold-water bandages, then blistering or firing. Neurotomy (nerving) is often practiced to relieve lameness. This is classed as an hereditary unsoundness. It is a serious form of unsoundness, but is not so serious as bone spavin, ringbone, roaring, or blindness.

Splint.—A splint is a variable-sized bony enlargement on the cannon bone, usually on the inside of the upper two-thirds of the front cannons. The button-like enlargements at the lower end of the splint bones should not be mistaken for splints. Splints occasionally cause lameness; if so, they constitute an unsoundness. They are more detrimental in horses used for fast work than in heavy horses used for slow work. In the great majority of cases, splints are only minor blemishes. Many horses have them. Splints often appear in young horses and may be absorbed shortly afterwards without treatment. The chief cause of splint is concussion. Other causes are sprains and injuries or blows on the cannon bone. No treatment should be given, as they but rarely cause trouble. Blistering and firing are sometimes practiced.

Sprung knees or buck knees.—This defective conformation may be congenital or the result of heavy labor at too early an age, there being retraction of two of the principal flexor tendons of the parts below the knee. While not an unsoundness, it detracts from the usefulness and value, especially in saddle

horses. Horses with badly sprung knees may fall even when standing at rest and unmolested.

Stringhalt.—This disease comes under the general heading, chorea. It is manifested by a sudden, involuntary jerking up of one or both hind legs when the animal is walking or trotting. It may be very slight in some horses, but increases with age. In some the affected leg is caught up very violently and high, and then lowered equally sudden and forcible. It is more often associated with a nervous disposition than with a sluggish one. It is an incurable disease and very considerably lessens the price. It is best detected by causing the animal to back, or turning him around in his tracks first one way and then the other.

Swollen legs.—A swollen leg usually indicates disease, the causes being many. It is also not uncommon in old horses, or those having a sluggish circulation. It is not an unsoundness, but detracts from the appearance and is highly undesirable. Treatment consists in giving laxatives, saltpeter, and moderate exercise.

Thoroughpin.—This is similar to bog spavin; it is a swelling occurring at the back and on top of the hock in that part known as the "hollows." It is due to weakness of the capsular ligament and to hyper-secretion of synovial fluid. It is round and smooth, and most apparent when viewed from behind. The swelling is usually on both sides and a little in front of the hamstring. When pressed on one side, further distention occurs on the opposite side. It seldom causes lameness. Treatment is the same as for bog spavin. Thoroughpin is not a serious ailment, being usually only an eyesore, although many horsemen consider it an unsoundness.

Thrush.—This is a disease of the cleft of the frog which may cause lameness. It is usually the result of negligence, the result of uncleanliness. The cleft of the frog becomes suppurating and moist, and there is a very rank odor. Treatment consists in washing, disinfecting, drying, dusting with a little calomel, and packing. This must be repeated daily until the part becomes normal.

Windgall or road puff.—Joints and tendons are furnished with sacs containing a lubricating fluid called synovia. When

these sacs at the fetlocks become distended by reason of an excessive secretion of synovia, they are called windgalls. They form a soft, puffy tumor about the size of a hickory nut or walnut. They are sometimes found in young horses, but are most common in horses used for hard labor, especially on pavements. They may be accompanied by lameness, but if not, they are classed merely as blemishes. As a rule, no treatment is necessary in young horses. Older animals may be treated by resting, cold-water douches and bandages, and blistering.

INDEX.