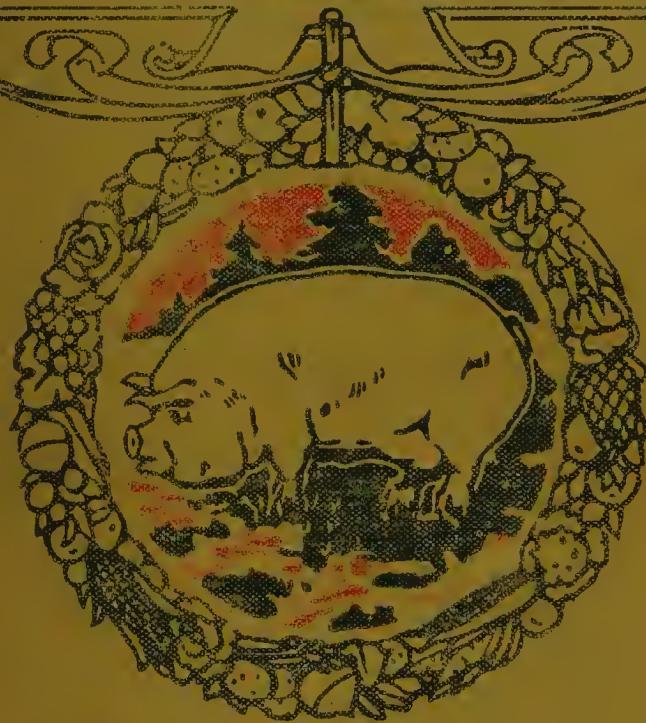


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PRODUCTIVE SWINE HUSBANDRY

BY G. E. DAY B.S.A.

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—EMBRSON.

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We ought to blame the culture, not the soil."
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PREFACE TO SECOND EDITION

IN presenting this revised edition of Productive Swine Husbandry to the public, the author wishes to express his appreciation of the reception accorded the first edition, for which the demand has exceeded expectations.

In the revision, new material has been added for the purpose of widening the scope of the book and making the text more generally applicable to all latitudes. Certain faults of the original book have been corrected, and important additions have been made to the illustrations. In short, an effort has been made to bring the book up to date, and to make it a suitable textbook for agricultural students as well as a convenient and valuable reference book for the busy farmer.

The author wishes to gratefully acknowledge the assistance rendered him by Professor K. C. Davis, the editor of the book, and also by Professor C. L. Willoughby of the University of Florida, who has furnished many pertinent suggestions in connection with the revision.

GEORGE E. DAY.

ONTARIO AGRICULTURAL COLLEGE,
Guelph, Ontario, Canada.

PREFACE

IN the preparation of material for this book, the author has worked with a twofold purpose,—namely, to prepare a book which will serve as a text-book for agricultural students, and to place at the disposal of the busy farmer a reference book which will give him, in concise form, the findings of the best experiment stations in regard to the problems involved in the successful handling of swine. As to whether these objects have been attained, the public must be the judge.

In the treatment of the different breeds of swine, and other topics where favoritism or partiality is possible, it has been the purpose of the writer to state the exact truth and give "both sides of the case." Where direct comparisons are advantageous, they have been made without fear of criticism.

Although the treatment of each topic is concise, it has been the desire to make the survey of the field as cosmopolitan as possible,—no single section of the country has been in the writer's mind.

No effort has been made to avoid the practical sides of the subject in order that a certain type of schools might prefer the book. On the other hand, the practical sides have been placed foremost, with the belief that all students as well as breeders should prefer to think of the subject in a practical way. An effort has been made, however, to treat the matter concisely and logically, and arrange the topics in order. The chapters have been grouped into seven parts to make them more easily referred to by both students and breeders.

The review questions at the end of each chapter are given for the use of students who may not be thinking of the sub-

ject from the practical side. They may also be used by the beginner as a "check list" of the problems he is to encounter from time to time in his new undertaking.

The chapter on "Suggestions to Beginners" is written with the special desire to give the right words of counsel to those who for the first time are taking up annual breeding of swine.

The beginner, the professional swine-breeder, the general farmer with a small herd, and the student have all been kept in mind while preparing this work.

The author will be glad to receive criticisms of any parts of the book.

GEORGE E. DAY.

ONTARIO AGRICULTURAL COLLEGE,
Guelph, Ontario, Canada.

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PART I
INTRODUCTORY

CHAPTER I.

THE PLACE OF THE HOG UPON THE FARM.

THE swine industry occupies a rather peculiar position in many localities. Swine multiply rapidly and come into use for breeding at an earlier age than other farm animals; consequently, it takes only a short time for farmers to increase or decrease their stock, as the case may be.

The Hog Supply.—When, owing to scarcity in the supply of hogs, the price for hogs goes up, we find farmers increasing the number of breeding sows, and in a very short time the supply of hogs coming to market increases to such an extent that the price is likely to break. If the decrease in price is very severe, the farmer becomes disgusted, and the chances are that many farmers will sell their breeding sows and practically go out of the business. This unloading process adds to the burden of the market, and general demoralization is apt to follow. By and by, after the market has absorbed the excessive supplies thrown upon it, a scarcity occurs again, owing to so many having gone out of the business of hog raising, and prices once more reach a high level. This is a signal for farmers to rush again into hog raising, and overstock their farms in many cases, so that once more the market becomes top-heavy, and the history of the hog market repeats itself.

Now, it is altogether probable that very few of those who were tempted to rush into the business on account of high prices obtained any profit from the venture. They paid high prices for breeding stock, but by the time they had hogs ready for the market, the decline in prices began, and before they were through they were selling their hogs at a loss.

Profit from Hogs.—The man who makes money out of hogs is the man who has hogs to sell when prices are high, whose farm is never over-stocked, nor yet entirely depleted of its supply. He knows how many hogs his farm will carry to advantage under average circumstances, and he practises a wise conservatism. When prices are high, he has a good profit, when they are low, his profit is small, but the average is fairly satisfactory. He may slightly expand or contract his operations at various times, but he never “plunges.”

The “plunger” is apt to find himself “in” the hog business when he ought to be “out,” and “out” when he ought to be “in.” The other man is “in” at all times, but never to such an extent as to be seriously damaged when the market goes wrong.

Judgment Required.—It is not the object of the writer to urge farmers to feed more hogs—far from it. Every farmer must be his own judge in this matter, and many farmers should never attempt to raise hogs, owing to the fact that either the man himself is not adapted to the business or his conditions are unsuitable. Nevertheless, it is true that a few hogs might be kept profitably upon many farms where they do not find a place to-day.

Hogs use By-products.—Generally speaking, the hog may be regarded as a by-product of the farm, or, in other words, he is a means of marketing the by-products of the farm. In the cattle feed lots, we find him utilizing the corn which the cattle have failed to digest and which otherwise would be wasted. In the dairy district, he is the means of obtaining good value for skim milk, buttermilk, and whey. Where mixed farming is practised, he consumes any dairy by-products, small potatoes, and various other unmarketable substances, and gleans the stubble fields, returning to his owner cash value

for substances that are completely neglected on many farms. Even the cottager frequently utilizes him to obtain a cash return from kitchen refuse and table scraps. It is as a consumer of by-products and so-called worthless materials that the hog shows to the best advantage from the stand-point of profit.

Marketing Home-grown Feeds.—The farmer who raises most of his own feed is in a much better position to feed hogs, or any other class of stock, than the man who has to purchase all his feed. The farmer who grows his own feed may not get any more than market prices for the grain or other produce consumed by the hogs, and may still have a fair profit through selling his produce at market prices in the form of pork; but the man who buys his feed can have for profit only what he obtains in excess of the market value of the feeds consumed by the hogs. Thus the farmer who grows his feed has two sources of profit, namely, the grower's profit, or the profit obtained by selling his produce at market price; together with the feeder's profit, or what he obtains for his produce in excess of market price by selling it in the form of pork. The man who has to buy all the produce which he feeds his hogs can have only the feeder's profit, and under unfavorable conditions this profit may be so small that it will scarcely pay for the labor involved.

Raising Pigs.—Another point worthy of consideration is the fact that under favorable conditions and skilful management young pigs can be raised for feeding at a lower cost than that for which they can be bought. This point will be dealt with more fully in Chapter XXVII, but is mentioned here as one of the factors which help to explain why some people can make hog feeding profitable, while others cannot.

One of the great difficulties in connection with the swine industry is the fact that so many people are not content to

engage in the undertaking except on a large scale, and the people who can handle hogs in large numbers and make the business a financial success are comparatively few. The average farmer is safer to handle hogs in rather small numbers, and use them as an adjunct to his other farm operations. Used in this way, and handled with a reasonable degree of judgment,

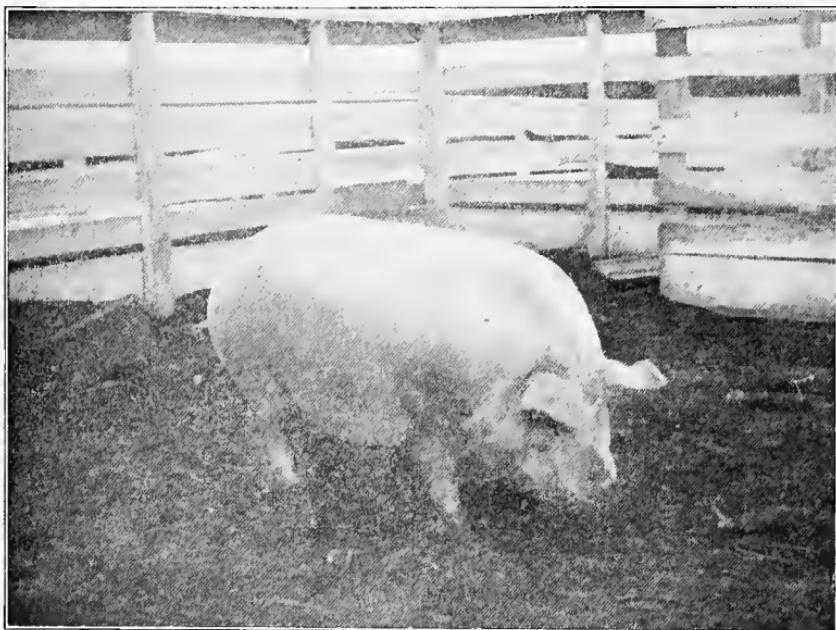


FIG. 1.—Champion Chester White barrow at Chicago, exhibited by the Iowa Agricultural College. This hog is almost the extreme fat type.

the hog will give a good account of himself in adding to the revenue and the profits from the farm. A very few years' experience should enable a farmer to determine just about how many hogs he can raise to advantage. Some farms will carry very large numbers owing to the system of farming which is carried on, but for many of the smaller farms one breeding sow is plenty.

On Dairy Farms.—The hog fits in especially well upon dairy farms where skim milk, buttermilk, or whey has to be fed upon the farm. Perhaps no animal will give as high returns for dairy by-products consumed, as the hog, and no feed gives a finer quality of bacon than dairy by-products. It is also worthy of note that the man who has skim milk is in a

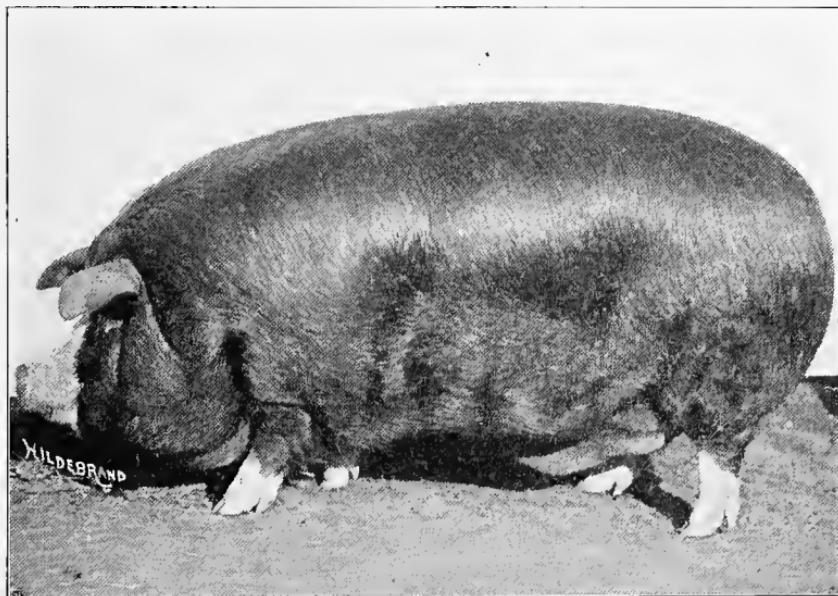


FIG. 2.—Poland-China barrow, champion at the International Exposition. This hog represents practically perfection of form from a lard hog standpoint.

better position to raise pigs than the man who has none, for the reason that it is difficult to find a satisfactory substitute for skim milk for young pigs just after weaning.

Pure-bred Hogs.—What has been said in the preceding paragraphs has no reference to the raising of pure-bred hogs for breeding purposes, but applies simply to the production of market hogs. The breeders of pure-bred hogs understand

their business, and know about how far their conditions warrant the extension of their operations, so that it is not so necessary to offer suggestions to them along this line. It is true that the breeder of market hogs always has a use for pure blood, but it is not every person who can make a success of breeding pure-breds to supply the demand for breeding stock, and the average farmer is safer to adhere to producing market hogs.

To sum up, it may be said that the hog is especially valuable for consuming the by-products of the farm, and the number of hogs carried to advantage upon a farm is governed very largely by the quantity and character of the by-products to be consumed. When carried in appropriate numbers, the hog is an exceptionally economical producer of meat, preventing waste, and giving cash returns for substances that are frequently wasted, or which have little market value. Trying to take advantage of fluctuating market prices by alternately over-stocking and under-stocking with hogs is seldom a financial success. The man who consistently follows up the business upon conservative lines is the man who is well satisfied with the hog as a source of profit.

REVIEW.

1. Tell of the effect of the supply of hogs on the usual tendency of farmers to vary the size of their herds.
2. Give a better plan of getting profit from swine.
3. In what way must each farmer be his own judge regarding the raising of more hogs?
4. Tell of the use of hogs as users of by-products.
5. Which is better, to raise or to purchase hog feed?
6. Which is usually better for the feeder, to raise young pigs or to buy them?
7. Tell of the fitness of swine upon dairy farms.
8. Under what circumstances should pure-bred hogs be kept?

CHAPTER II.

TYPES OF SWINE.

THERE are two well-defined types of hogs, which are the outcome of local conditions and market requirements,—namely, the fat or lard type and the bacon type.

Reasons for Two Types.—The fat or lard type of hog is the product of the “corn belt.” Corn feeding has a tendency to produce fat at the expense of the muscle or lean meat, and corn is the principal hog feed of the United States. Most of the hogs of the United States are grown in the great corn-producing States, and it is here we find the lard type in its highest degree of perfection. This type plays an important part in the exports of the country.

But, in addition to the demand for the products of the lard hog, there is an important demand, both at home and abroad, for a leaner class of meat. In some of the large cities of England this demand has taken a definite form, and what is known as the “Wiltshire side” is especially designed to meet this demand. A hog suitable for manufacturing into “Wiltshire sides” is known as a “bacon hog,” and breeding stock of a type suitable for producing bacon hogs is said to possess bacon type. Bacon hogs cannot be produced successfully under a system of corn feeding, and hence we find the bacon hog produced in greater numbers in countries where the feed for the hog is more varied in character, and where the conditions are less favorable for producing the lard hog than they are in the United States. The countries sending the greatest number of Wiltshire sides to Great Britain are Denmark, Canada, and Ireland. Generally speaking, hogs cannot

be grown so cheaply in Canada and Denmark as they can in the United States, particularly in the corn belt; but, on the other hand, Wiltshire sides usually command a higher price per pound in England than the meat of the lard hog. This higher price for finished product affords some protection to the swine industry in Canada and Denmark, and it was to escape direct competition with the American product in Great Britain that Canada and Denmark engaged in the production of bacon hogs and the manufacture of Wiltshire sides. Such an arrangement seems to be the part of wisdom, each country devoting its attention to the type of hog which it can produce to best advantage.

The fat or lard type of hog is characterized by a compact, thick, deep, smooth body, remarkable for its depth and thickness rather than its length. There should be a proportionate development of the different parts, and all parts should blend smoothly together, giving what is called compactness of form. The hams, back, and shoulders are the most valuable parts from a market stand-point, and should be largely developed. The market hog should be fattened to a high degree, because lard is an important consideration with the packer, and a well-fattened hog will dress a larger percentage of its live weight than one which is not well finished, which is another important point with the packer. (See Figs. 1 and 2.)

Quality is denoted by fine hair, smooth, clean skin, rather fine, clean bone, and even distribution of flesh. There should be no wrinkles in the skin, the jowl should be broad, plump, and full, but not flabby, and the belly should be reasonably trim, that is, not sagging or baggy in appearance. In breeding animals, some allowance would have to be made for sows which had produced several litters of pigs.

The animal should be able to walk freely, without apparent effort, and the *pasterns* should be short and upright.

The *snout* should be moderately fine, the face wide between the eyes, and the poll wide and full. Width between the eyes and fulness of poll denote a good feeder. The *eye*

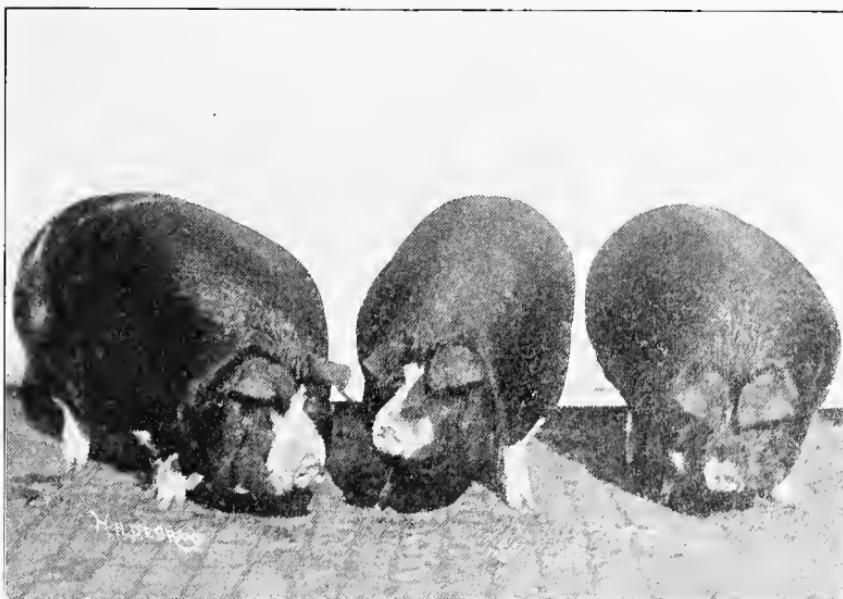


FIG. 3.—Grand champion pen of barrows at the International Exposition.

should be full, bright, and of good size, and there should be an absence of creases and folds of fat about the eyes. The size and shape of the *ear* varies in different breeds, but it should be fine, soft, and generally somewhat small.

The *jowl* should be full, broad, deep, smooth, and firm, carrying its fulness well back toward the point of the shoulder.

The *neck* should be short and deep, and should blend smoothly into the shoulder at all parts.

The *shoulder* of the fat hog has considerable market value, and hence should be largely developed. It should be broad, deep, and smooth; compact on top, blending smoothly into the body, and being well covered with flesh over all its parts. The



FIG. 4.—Pen of Chester White barrows at the International Exposition.

breast should be wide, deep, and full, denoting constitution; and the *fore-legs* should be set well apart, short, tapering, and straight. The *pasterns* should be upright, the bone rather fine, and clean cut in appearance, and the feet strongly formed.

Along the region of the back and loin lie some of the most valuable cuts, and, therefore, large development is asked for in this region. The *back* should be broad, straight, or very

slightly arched, medium length, uniform width from shoulder to ham, thickly fleshed, even, and smooth, without creases or lumps. The *loin* should be broad, strong, full, and thickly and smoothly fleshed. The *ribs* should be well sprung, and the side deep, smooth, and even between shoulder and ham.

The *heart-girth* should be large, the animal being full back of the shoulder, and deep and full at the fore flanks. The hind flank should also be deep and full.

The *ham* is another important consideration from a packer's stand-point. It should be broad, deep, plump, smoothly and heavily fleshed, with the flesh carried well down towards the hock on the inside as well as at the rear. The *rump* should be the same width as the back, long, smooth, and slightly rounded from the loin to the base of the tail. The *hind legs* should be short, straight, set well apart and squarely under the body, with bone, pasterns, and feet as already described.

The above description gives a fairly clear impression of the general type of the fat hog, and shows how well the type meets the requirements of feeders in the corn belt. (See Figs. 1, 2, 3, and 4.)

Breeds of the Fat Type.—Poland China, Berkshire, Chester White, and Duroc-Jersey are the most popular breeds of the fat type. Others of less importance in America are Cheshire, Victoria, small Yorkshire, Essex, and Suffolk. For consideration of these breeds see other chapters.

The Bacon Type.—To produce a good Wiltshire side of bacon requires a hog of certain definite peculiarities as to weight, condition, and conformation. The customers for this class of bacon are extremely fastidious, and, if the bacon does not come up to the standard in every particular, it is very heavily discounted in price. As a rule, the weight limits are usually fixed at 160 pounds to 200 pounds live weight. It

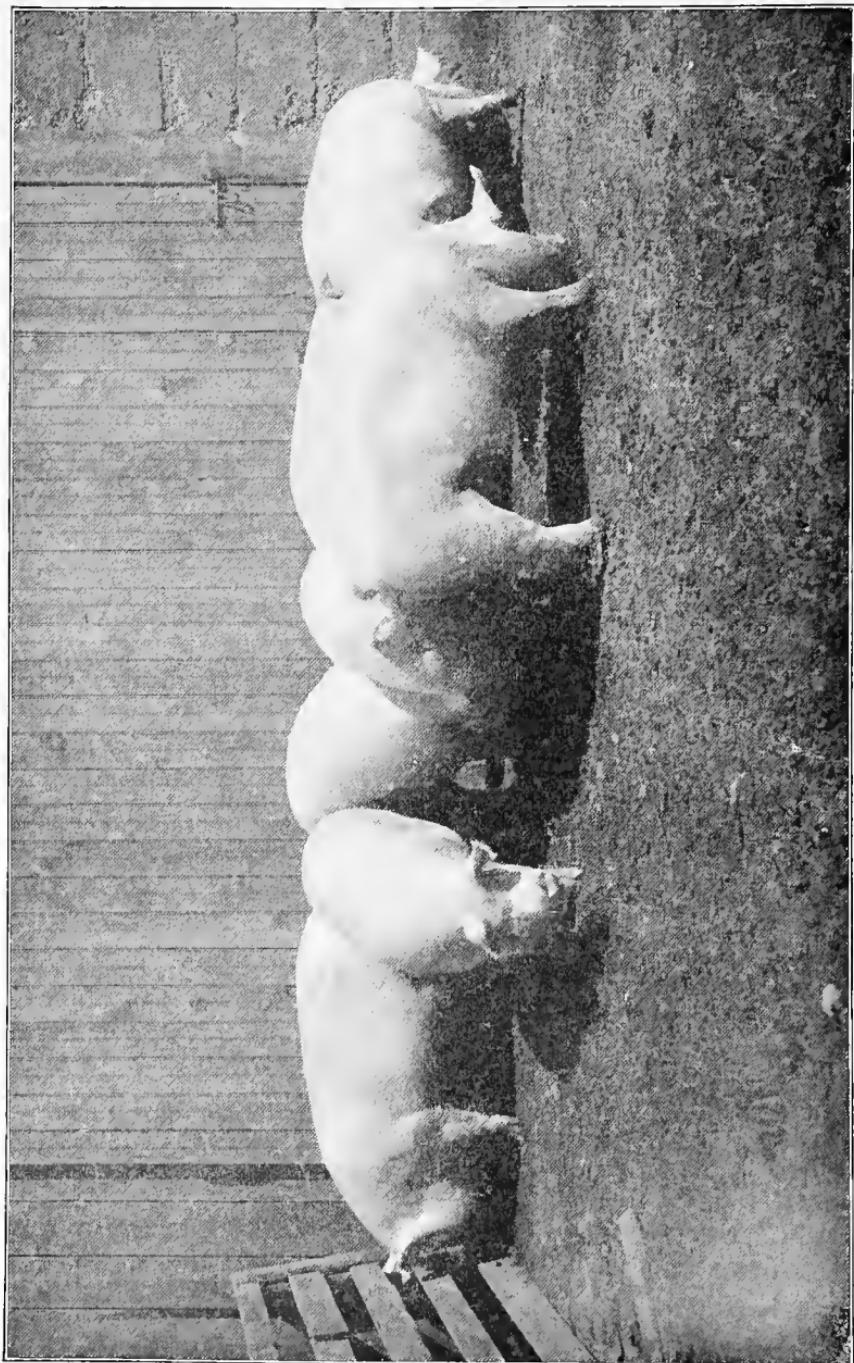


FIG. 5.—Group of young large Yorkshire sows. This group shows uniformity, bacon type, quality, and constitution in a marked degree. (Photo from the breeder, J. E. Brethour, Burford, Ontario.)

is true that a hog may weigh slightly more than 200 pounds and still make a very good Wiltshire side, but most hogs are inclined to be too fat after they pass the 200-pound mark, and consequently this is fixed as the limit, though it is not strictly adhered to. As to condition, it is possible to have the hog too thin or too fat. When the carcass is split down the back, the layer of fat along the back should run from an inch to an inch and a half in thickness, and should be as uniform in thickness as possible from the loin to the neck. The most valuable meat in a Wiltshire side is the upper part of the side from the ham to the back of the shoulder, including the upper corner of the gammon or ham, the loin, and the upper half of the ribs. The lower part of ham and the flank and belly meat are not worth as much per pound as the upper portions, and the shoulder and neck are comparatively cheap parts.

Conformation.—In form, the bacon type of hog (Fig. 5) is very different from the lard type. It is longer in the leg and body, has less thickness and depth of body, and is lighter in the shoulder, neck, and jowl. The hog should be long from the back of the shoulder to the ham, but comparatively short from the back of the shoulder to the snout. Along with length, however, the hog must have sufficient depth and thickness to denote constitution. No matter how long in body it may be, if it has long, coarse legs, and a narrow, cramped chest, it is an undesirable type to breed from. A trim belly is desirable, because the belly meat is cheaper than the upper part of the side. In judging sows that have produced several litters of pigs, some allowance must be made in this connection.

A fine, smooth *coat of hair* denotes thriftiness and good quality of flesh. Wrinkles on the *skin*, if at all marked, indicate coarse-grained flesh. Softness or flabbiness of flesh

denotes too much fat in proportion to lean. There is a marked difference between the handling qualities of a finished bacon hog and a finished lard hog, the former being much firmer to the touch. The bacon type of hog has heavier bone than the fat or lard type, but very coarse, puffy looking bone denotes poor quality of flesh and is often associated with poor feeding qualities. Though the bone is fairly heavy, the legs should present a clean-cut appearance.

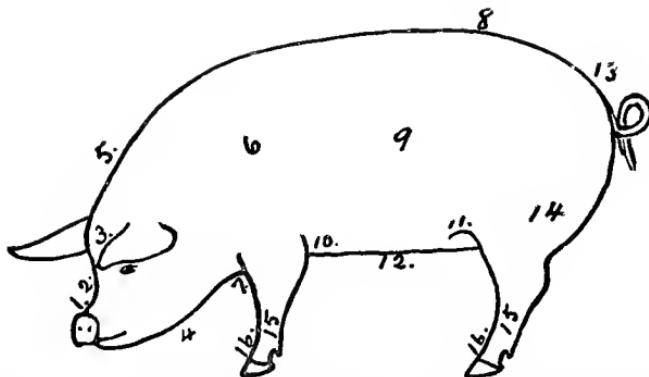


FIG. 6.—Diagram showing location of points of the hog. 1, snout; 2, face; 3, poll; 4, jowl; 5, neck; 6, shoulder; 7, breast; 8, loin; 9, ribs; 10, fore flank; 11, hind flank; 12, belly; 13, rump; 14, ham; 15, shank; 16, pastern.

The *jowl* has very little market value. A heavy jowl denotes a tendency to put on too much fat. Good width of jowl is desirable from a feeder's stand-point, but it should be very trim and neat.

A long, serawny *neck* indicates weak constitution and slow feeding qualities. On the other hand, a short, thick neck with an arch, or crest of fat on top, such as is commended in the fat hog, will cause the side of bacon to be heavy at the shoulder and neek end, and this is the cheap end of a side of bacon. The neck should be of only medium length, and should possess no tendency to arch on top.

The *shoulder* of the bacon hog is somewhat upright, making the animal comparatively short from the back of the shoulder to the snout, but long from the back of the shoulder to the rump. The shoulder is a cheap part, and, therefore, should be rather light. It should be very compact over the top, should be no



FIG. 7.—Rear view of pig of bacon type, showing the neat, smooth, tapering ham desired in the bacon hog.

wider than the back, and should blend smoothly into the body at all points.

The *back* carries the most valuable meat, but it should not be wide, because a wide back invariably carries too much fat for a Wiltshire side. It should possess medium width, and should carry its width evenly throughout. The top line should be slightly arched, the highest point being over the loin.

The *loin* is the most valuable cut in a Wiltshire side, and

should be as wide as the rest of the back, full, strong, and well packed with flesh.

The *spring of rib* of a bacon hog is very characteristic. It should spring out boldly from the backbone, then turn sharply and drop in an almost vertical direction, giving a flat, straight side.

From a packer's stand-point, a bacon hog cannot have too

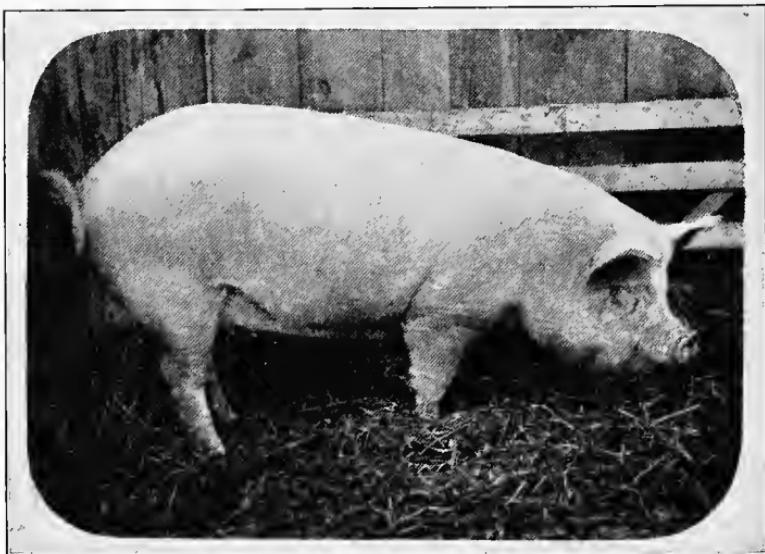


FIG. 8.—This young sow furnishes a good example of bacon type.

long a *side*, but the breeder must exercise care that he does not secure this extreme length at the expense of constitution. It is well to avoid extremes of all kinds. It is absolutely necessary, however, that the hog should have good length of side, much more than is found in the fat type.

The *rump* affords a valuable cut, but a flat, broad rump indicates the presence of too much fat. The rump should be the same width as the back, should be very smooth, and slightly rounded from side to side over the top.

Great, broad, bulging *hams* are not wanted on the bacon hog. Such hams carry too much fat, and require severe trimming in preparing the side of bacon for market. The ham of the bacon hog is smooth and firm, and tapers toward the hock. (Figs. 7 and 8.) The flesh should be carried well around the bone, leaving no barenness of bone on the inside of the thigh.

Bacon Breeds.—The leading breeds of the bacon type of swine are the Tamworth, and Large Yorkshire; sometimes the Hampshire is so classified. These are discussed in other chapters.

SWINE OF FAT, OR LARD, TYPE.

DESCRIPTION AND SCALE OF POINTS.

A. GENERAL APPEARANCE:

	Counts.
<i>Size</i> —Well developed for age.....	5
<i>Form</i> —Deep, thick, smooth, low set, good length, but compactly built, standing on well-placed legs. Top line straight, or slightly arching; under line, straight; belly, trim and neat..	10
<i>Quality</i> —Hair, fine; skin, smooth, showing no tendency to wrinkle; bone, clean and fine; flesh, smooth and mellow, but showing no flabbiness	10
<i>Condition</i> —Deeply and evenly covered with flesh, but not overdone for the purpose for which the animal is intended.....	6
<i>Style</i> —Active and sprightly, walking without a swaying movement, and standing well up on toes. Breeding animals should show strong character	4

B. HEAD AND NECK:

<i>Snout</i> —Moderately fine	1
<i>Face</i> —Broad between eyes; poll, broad and full.....	1
<i>Eyes</i> —Good size, full, and bright.....	1
<i>Jowl</i> —Full, broad, deep, smooth, and firm, carrying fulness back near to point of shoulder	2
<i>Ears</i> —Medium size, fine, and soft	1
<i>Neck</i> —Short, thick, and deep. Rounding and full from poll to shoulder top	2

C. FORE QUARTERS:

<i>Shoulders</i> —Broad and compact on top, deep, well fleshed, blending smoothly with neck and body	6
<i>Breast</i> —Wide, deep, and full	3
<i>Fore Legs</i> —Set well apart, short, tapering, and straight; pasterns, upright; bone, clean and fine; feet, medium size and strongly formed	3

D. BODY:

<i>Back</i> —Broad, straight or very slightly arched, medium length, uniform width from shoulder to ham, thickly fleshed, even, and smooth, without creases or projections.....	8
<i>Loin</i> —Broad, strong, full, and thickly and smoothly fleshed.....	5
<i>Ribs</i> —Long and well sprung.....	4
<i>Side</i> —Medium length, deep, smooth, even between shoulder and ham	6
<i>Heart Girth</i> —Large, full back of shoulder, and deep and full at fore flanks	5
<i>Flank</i> —Deep and full	2

E. HIND QUARTERS:

<i>Rump</i> —Same width as back, long, smooth, slightly rounded from loin to base of tail	4
<i>Ham</i> —Broad, deep, heavily fleshed, plump, and reasonably smooth; flesh carried well down to hock on inside as well as at rear..	8
<i>Hind Legs</i> —Short, straight, set well apart and squarely under body; bone, fine and clean; pasterns, strong; feet, medium size and strongly formed	3
 Total	<hr/> 100

SWINE OF BACON TYPE.

DESCRIPTION AND SCALE OF POINTS.

A. GENERAL APPEARANCE:

	Counts.
<i>Size</i> —Well developed for age.....	5
<i>Form</i> —Long; smooth, all parts proportionately developed so as to give the impression of a well-balanced, strongly-built animal.	
Top line, strong; under line, straight; belly, trim and neat..	10

<i>Quality</i> —Hair, fine; skin, smooth, showing no tendency to wrinkle; bone, clean and strong but not coarse; flesh, firm and smooth, with no flabbiness at jowl, fore-flank, belly, or ham	10
<i>Condition</i> —Well covered with firm flesh, especially along back and loin, but not heavily loaded with fat.....	6
<i>Style</i> —Active and sprightly, walking without a swaying movement, and standing well up on toes. Breeding animals should show strong character.....	4
 B. HEAD AND NECK:	
<i>Snout</i> —Medium length and moderately fine.....	1
<i>Face</i> —Broad between eyes; poll, broad and full.....	1
<i>Eyes</i> —Good size, full, and bright.....	1
<i>Jowl</i> —Fair width and muscular, but very neat, showing no flabbiness	2
<i>Ears</i> —Moderately thin, and fringed with fine hair.....	1
<i>Neck</i> —Medium length and muscular, but possessing no tendency to arch on top	2
 C. FORE QUARTERS:	
<i>Shoulders</i> —Smooth, somewhat rounded from side to side over top, and very compact; no wider than back, and not running back on side so as to shorten distance between shoulders and ham	6
<i>Breast</i> —Good width and full.....	3
<i>Fore Legs</i> —Set well apart, medium length and straight; pasterns, upright; bone, clean and strong; feet, medium size and strongly formed	4
 D. BODY:	
<i>Back</i> —Medium width, rising slightly above the straight line, and forming a very slight arch from neck to root of tail.....	6
<i>Loin</i> —Wide as rest of back, strong and full, but not unduly arched	5
<i>Ribs</i> —Good length and moderately arched.....	4
<i>Side</i> —Fairly deep; long, smooth, and straight between shoulder and ham; a straight-edge laid over shoulder point and ham should touch the side throughout.....	8
<i>Heart Girth</i> —Full, but not flabby at fore flanks, filled out even with side of shoulder; there should be no tucked-up appearance back of fore legs nor droop back of shoulder top.....	5
<i>Flank</i> —Full and low	2

E. HIND QUARTERS:

<i>Rump</i> —Same width as back; long and slightly rounded from a point above hips to tail, and somewhat rounded from side to side over top	4
<i>Ham</i> —Full without flabbiness; thigh, tapering towards hock without wrinkles or folds, and carrying flesh well down towards hock	6
<i>Hind Legs</i> —Medium length; hocks, set well apart, but not bowed outward; bone, clean and strong; pasterns, upright; feet, medium size and strongly formed.....	4
Total	100

REVIEW.

1. Give reasons for the two types of hogs.
2. Tell where each is most commonly found.
3. Describe five or more characteristics of the fat or lard type.
4. Give five or more characteristics of the bacon type of swine.
5. Give examples of breeds of the fat type.
6. Give examples of breeds of the bacon type.

PART II

PRINCIPLES OF SWINE BREEDING

CHAPTER III.

BREEDING AND SELECTION.

The Breeder.—The business of the stock-breeder is a peculiar one. He has to deal with life, and all those mysterious possibilities that exist in the living creature have to be reckoned with in his operations. It is not a matter of fixed rules. No man can map out a system which will apply to all cases and give a definite result with absolute certainty. The successful breeder requires a thorough knowledge of his business and the ability to reason accurately, so that he may modify his methods and adapt them to the requirements of each individual problem which comes before him. Knowledge of general principles can be acquired from books, but the successful application of those principles must be learned, very largely, in the school of experience.

Theory and practice must go hand in hand, and knowledge must be combined with reason; but the really great breeder seems to possess a sort of intuitive genius given to the very few, and hence great breeders are not common.

Another thing necessary to success is a love for animals. If a man dislikes hogs, he had better not attempt to breed them, because failure is sure to follow. It is the enthusiastic lover of a breed of animals who will make the greatest success of breeding them.

Finally, there can be no progress unless the breeder has a very clear ideal before him towards which he is working, which implies, of course, that he must be a thorough judge of the breed he handles. He may never reach his ideal, but he must never lose sight of it. No matter how much money may

be invested in the enterprise, it will amount to nothing unless the breeder has a clearly defined object in view.

He will meet with many things to try his faith, but he must not waver; he will be frequently cast down, but he must not despair. Difficulties, disappointments, and hope deferred are part of the heritage of the breeder, and he requires the highest class of courage to be able to "stick to his guns" and eventually bring victory out of what appeared to be certain defeat.

There is no royal road to success as a breeder, and, while there may be few who attain to greatness, there is no reason why any man should not attain a reasonable degree of success in breeding swine, providing he possesses a liking for these animals and a determination to conquer the difficulties incident to the undertaking.

Utility.—Every breeder should ask himself why he is breeding the animals of his choice. Is it to humor the whims of the few or to meet the demands of the many? If his work as a breeder is to be a success, he must never lose sight of the requirements of the man who produces the market hog for the money that is in it. No matter how pure the blood or how perfect the type from the breeder's stand-point, if the hog does not meet the requirements of the packer, if it is not suited to paying the rent and lifting the mortgage when placed in the hands of the average farmer, then all the effort employed in its production has been wasted. The watchword of the truly successful breeder must be *utility*. Utility is the touchstone upon which each breeder's work will be tested. If his work stands the test it will surely meet with recognition, but if it fails in the test it will ultimately disappear and be forgotten. Every step in the breeder's operations must be dominated by this one great consideration, and if he ever loses

sight of the importance of utility, he need never hope to achieve lasting distinction as a breeder.

Utility must be viewed from two stand-points: (1) The butcher requires an animal that will give him the largest proportion of valuable meat, and (2) the farmer requires an animal that will reproduce its kind in profitable numbers and make rapid and economical gains. There would be little use in aiming to please the butcher if the animal did not meet the requirements of the farmer, but the butcher must not be left out of consideration if a really useful animal is to be produced. In breeding operations, therefore, both these men must be kept in view, and the *breeding, feeding, and killing* qualities must each receive a due share of attention.

In-breeding.—It is not intended to attempt a general discussion of the principles of breeding; but the question of in-breeding—that is, the *mating of animals that are closely related*—is of such importance that it is deserving of some notice in a publication dealing with swine husbandry.

Advice of a Breeder.—That very successful Berkshire breeder, N. H. Gentry, read a paper before the American Swine Breeders' Association, in which he gave his experience with in-breeding of Berkshires. His experience extends over a considerable number of years, and the following statement is taken from his paper:

“ Neither in-breeding nor the reverse will be a success unless matings are made with animals suited to each other,—that is, having no weakness in common if possible, and as much good in common as possible. This, in my opinion, is the key to success in all breeding operations, and success will come in no other way. In my opinion, in-breeding, as a rule, is very good or very bad. If you intensify the blood of animals that are good, you do good, but if they are bad, you go wrong

as fast or faster than you go right in the other case. If it is true that in-breeding intensifies weakness of constitution, lack of vigor, or too great fineness of bone, as we all believe, is it not as reasonable and as certain that you can intensify strength of constitution, heavy bone, or vigor, if you have those traits well developed in the blood of the animals you are in-breeding with? The latter is certainly my belief and experience. . . . I believe there is little or nothing to fear from kinship of animals mated if they are suited to be mated together."

Mr. Gentry states that he has not used a boar other than his own breeding for twenty years, and describes the good results from using the great boar Longfellow 16,835, and Longfellow's sons and grandsons in his herd. One instance is a boar he showed at the World's Fair in Chicago in 1893. This boar weighed 660 pounds at 13 months and 6 days of age, and possessed as much action, strength, vigor, and masculine development as any boar he ever saw. The sire of this boar was a son of Longfellow, the dam was a daughter of Longfellow, and the sire of the dam was by the sire of Longfellow. This is an example of very close in-breeding producing remarkably good results.

Prominent swine breeders resort to in-breeding at times. A very successful breeder told the writer that he did not care to practise very close breeding as a rule, but he would not hesitate to mate animals as closely related as cousins. Mr. Gentry states that at first he practised in-breeding through necessity, not being able to find boars outside his own herd which he thought suitable for his use. No doubt many a breeder has found himself in a similar position at times, and there is no doubt that a certain amount of in-breeding would be preferable to using unrelated males which were of inferior quality.

The history of animal breeding shows that in-breeding has

played an important part in the improvement of practically all breeds of live stock. It concentrates the blood and makes animals more prepotent,—that is to say, causes them to transmit their own qualities to their progeny with great certainty. In this respect, therefore, in-breeding is beneficial; but it must not be forgotten that it will fix bad qualities as well as good ones. Mr. Gentry strikes the keynote when he says: “I believe there is little or nothing to fear from kinship of animals mated if they are suited to be mated together.” But how many men are capable of discerning whether the animals are suited to one another or not? Mr. Gentry states that if the animals are bad, a person will go wrong very fast by practising in-breeding. The chances are that more than ninety-nine per cent of the men breeding swine to-day could not say with any degree of certainty whether a given pair of animals were suited to be mated together, and since bad results are likely to follow an error in judgment, it seems safe to assume that in-breeding is something *to be practised by the few only.*

It requires a master of the art of breeding to practise in-breeding with success, and in the history of stock breeding we read of some of the greatest breeders the world has known who were compelled to resort to the introduction of fresh blood after persistently following in-breeding for a considerable time.

Avoid In-breeding.—It will be safer, therefore, for the average breeder to avoid in-breeding, and to leave the practice in the hands of those who are exceptionally skilful in the art of breeding. If a breeder happened to secure a boar of exceptional excellence as a stock getter, he might find it to his advantage to do a certain amount of close breeding, but boars of this description are not numerous, and it is seldom that we are fortunate enough to secure one. Mr. Gentry secured such a boar in Longfellow, and recognized the boar's merit, but

Longfellows are scarce. We might think we had a second Longfellow, but an attempt to concentrate his blood by in-breeding might prove the utter ruin of the herd, because the boar might possess weaknesses which did not become apparent until his progeny were inbred.

Cross-breeding means the mating of animals belonging to different breeds, and implies that both male and female are pure-bred. Though a good deal of cross-breeding is practised, very little systematic work has been done in the way of studying the relative merits of pure-bred and cross-bred hogs, and little in the best way of crossing to obtain a given result.

Some work in cross-breeding at the Ontario Agricultural College gave indefinite results, so far as cheapness or rapidity of gain was concerned. There was nothing to indicate that one method of crossing necessarily gave better results than another, or that cross-bred pigs were necessarily better than pure-breds.

J. H. Grisdale, Central Experimental Farm, Canada, reports cheaper gains from cross-breds than from pure-breds, but he failed to find that any one method of crossing was superior to another, so far as his work went.

The writer's experience leads him to believe that the progeny of animals which have become too fine and lack growth and thrift can be much improved as profitable feeders by the introduction of the blood of a more growthy and heavier-boned type; or that animals that are coarse-boned, or slow feeders, can be improved by using the blood of a finer type. Frequently, however, this result can be attained without resorting to cross-breeding, by selecting types within the same breed. In the case of thrifty, rugged pure-breds, which are of a type which meets the requirements of the feeder, it is difficult to see how any advantage is to be derived from cross-breeding.

In mating extreme types, it is probably safer to use a roomy, growthy type of female, because such sows are generally more prolific and better mothers than a very fine, compact type of sow. The roomy sow, mated with a compact type of boar, will generally prove more profitable than a fine sow mated with a coarse boar. The progeny will be similar in both cases, but are likely to be more numerous and better nourished from the roomy type of sow. In these matters, however, a man must work according to the material he has at hand, and he may find it necessary to cross in the opposite way from that recommended here. (See Fig. 9.)

Grade Breeding.—A grade animal may be defined as one whose parents are not both pure-bred. One parent may be a pure-bred and the other not, or neither parent may be a pure-bred. Generally speaking, the more "crosses" of pure blood an animal possesses, the better animal it is. There are grades which carry so many "crosses" of pure blood that they are essentially pure-breds in everything but name. For producing market hogs—that is, hogs for fattening purposes—a good grade sow may answer just as well as a pure-bred, provided she is mated with a good boar. A large proportion of market hogs are produced in this way.

Pedigree and Heredity.—A good many people are inclined to look upon pedigree as something distinct from utility. Nothing could be further from the truth. The question is frequently asked, "Which is of greater importance, individuality or pedigree?" The question does not admit of a definite answer, for neither is complete without the other; that is to say, the desirable breeding animal should possess individual merit as well as a good pedigree.

The reason we value pedigree is because we believe in heredity. The pedigree tells us the names of the ancestors



FIG. 9.—Land-race sow, a type of sow common in Denmark. These sows are commonly crossed with Large Yorkshire boars to produce the famous Danish bacon.

of the animal in question, and we believe that the ancestors of an individual have an influence in determining the character of the progeny of the individual. Therefore, if we find in the pedigree of a certain animal the names of a considerable number of animals known to possess a high degree of merit, and if the animal under consideration is a reasonably good representative of the breed, we would feel fairly safe in breeding from such an individual. We would say that such an animal had a good pedigree, because it comes of a good line of ancestors. If, however, we found an animal that was quite satisfactory as an individual, but the pedigree showed us names of ancestors which we knew possessed very undesirable qualities, we would hesitate to select such an animal to put into our herd, especially if it were a boar, because we would be afraid that some of those undesirable qualities might crop out in the progeny and be spread throughout the whole herd. We might even go so far as to select a boar not quite equal as an individual to the one just described, but possessing a good pedigree.

It would not be advisable, however, to breed from a really bad individual merely because he had a good pedigree, because there are many animals with good pedigrees which should never be used for breeding. It is just here that experience is necessary to enable a breeder to hold the balance properly between individuality and pedigree.

It may be added that a tabulated pedigree means nothing to the man who does not know anything about the animals whose names appear therein, and the man who would become a breeder must make it his business to familiarize himself with the great sires and families which have attained to eminence in the breed he is handling. It must be remembered, also, that the immediate ancestors, such as the sire, dam, grand-

sire, and granddam, are likely to have a greater influence for good or evil than more remote ancestors, and, therefore, the first two or three generations—or, in other words, the *top crosses*—should receive special attention in studying a pedigree. The more remote the ancestor, the less important is its influence likely to be.

Selection of the Boar.—In these days, when pure-bred males are plentiful and reasonable in price, there is practically no excuse for using anything but a pure-bred boar, even though the sows may be merely grades. The pure-bred male will transmit his own qualities to his progeny with greater certainty than a grade or cross-bred, and will get pigs of more uniform quality and excellence, so that it pays to use a purebred boar even for producing market hogs. It is true that many pure-bred boars should not be used for breeding, but this affords no reason for using a grade boar. The “scrub” pure-bred should be rejected along with the grade and the cross-bred, and there are reasonably good pure-bred boars always available to the man who will make an effort to get one.

Price and Merit.—When selecting a boar to head a pure-bred herd, it will not do to be too economical regarding price. This does not mean that we are to pay fancy prices, running into the thousands, such as we sometimes read about; but it is well to bear in mind that a boar which is not good enough to command a fair price is seldom good enough to put at the head of a pure-bred herd. The importance of the herd will determine the price which the owner can afford to pay for a boar, but a few extra dollars on the price of a boar is a small matter when it is the means of securing something that the breeder really needs. The mere size of the price, however, is not a safe criterion of the merit of the boar, but it rests with the man who makes the selection to see that he gets value

for his money. It is right here that a wide experience and a seasoned judgment count for so much in stock breeding. Sometimes aged boars, which have proved their excellence as stock getters, are to be had at a very reasonable price, and if they are still active, they are much safer to buy than young, untried boars. There is much unreasonable prejudice against

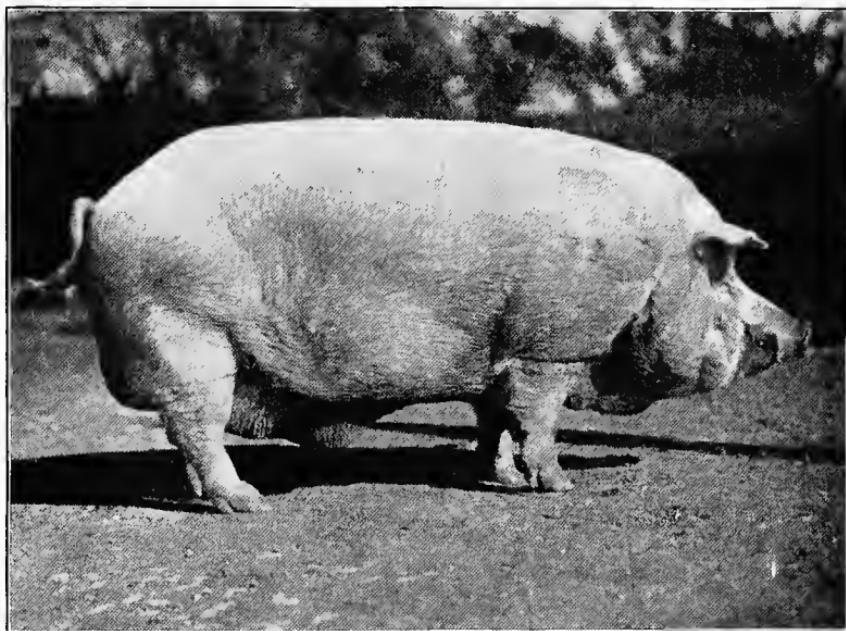


FIG. 10.—Chester White boar, winner of sweepstakes at the Louisiana Purchase Exposition.

aged boars, and many an excellent aged boar is sent to the butcher long before his usefulness is past, merely because no person would buy him for breeding purposes; and young boars, many of which should have gone to the butcher before being used at all, are taken in preference. These things are matters of judgment, and to select wisely the breeder must *know* what he requires.

The desirable conformation of the boar will depend upon whether he belongs to the fat type (Fig. 10), or the bacon type (Fig. 11), and will also be influenced, more or less, by the breed to which he belongs. The general type of the fat hog and the bacon hog is discussed in another place, but it may be said that we expect a boar to be stronger in the head

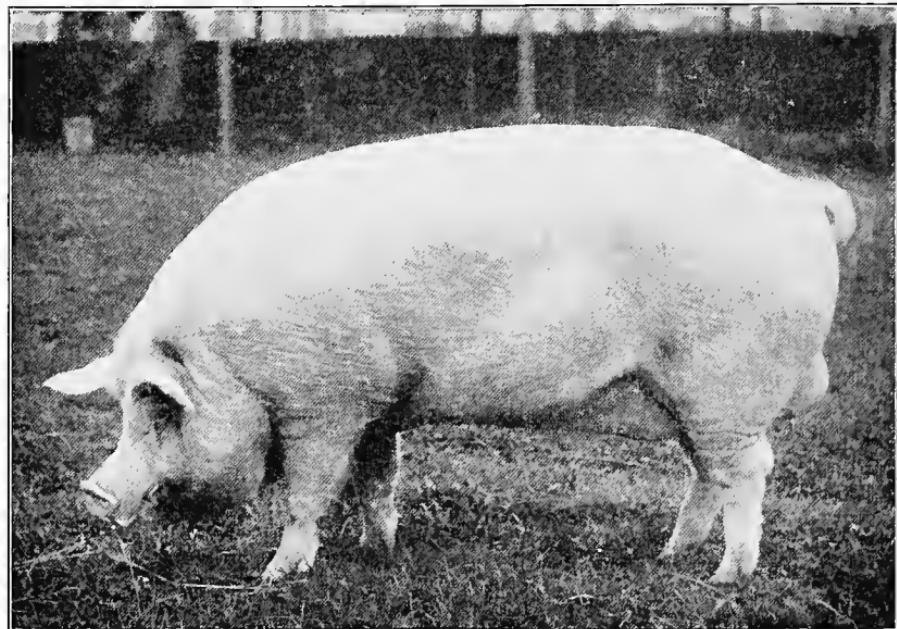


FIG. 11.—Large Yorkshire boar, a winner at the English Royal show. Note the length, the smoothness, the strong top-line, and the trim belly. Also note the strong, clean-cut bone.

and to possess a more muscular neck, more massive shoulders, and heavier bone, than a sow or barrow. He should conform to the best type of the breed to which he belongs, and should have a bold, impressive carriage and general appearance. There should be nothing effeminate about his appearance and general make-up. Coarseness and roughness are not desirable, but if

it came to a choice between two boars, one of which was fine and effeminate, and the other inclining to coarseness but strongly masculine, the writer's experience would lead him to choose the latter, other things being equal.

Selection of the Sow.—For the production of market hogs it is not essential that a sow should be pure-bred. A grade

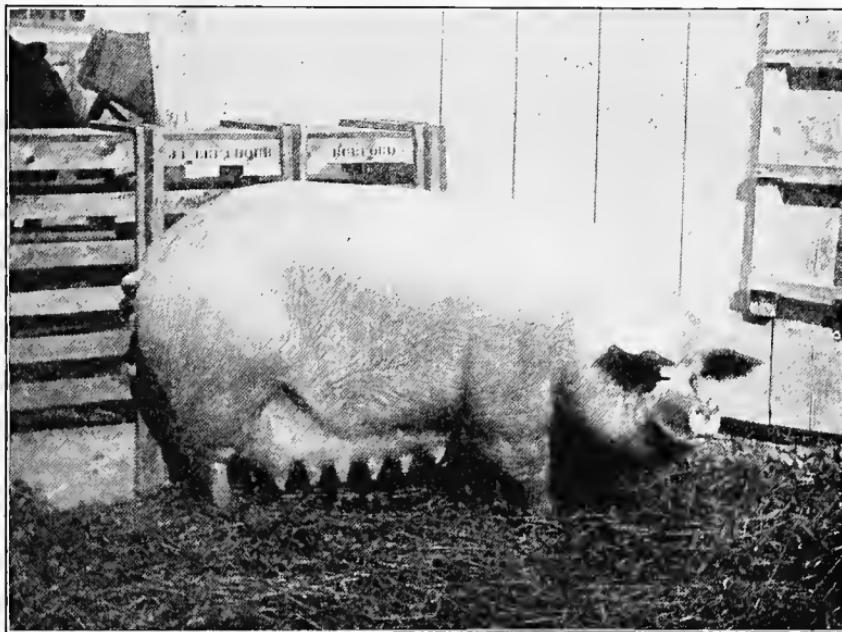


FIG. 12.—An excellent type of breeding sow. She possesses length, depth, smoothness, and quality. The head shows strength and docility, and is truly feminine. The well-developed and well placed teats denote prolificacy and good milking qualities.

sow of good type and parentage will usually produce very satisfactory pigs for market purposes, if mated with a boar of good breeding and quality, but, of course, none of her boar pigs should be kept for breeding purposes.

Whether pure-bred or grade, a sow selected for breeding should be from a prolific mother, and by a boar that comes

of a prolific family, because fecundity is hereditary to a very high degree. It is safest to select a sow from a matured mother who has had a chance to demonstrate her usefulness. In making a selection, the number and character of the teats should be noted. A sow is more likely to make a good mother if she has at least twelve well-developed teats, set well apart, and the front ones well forward on the body. (Figs. 9 and 12.)

In character, the sow is directly the opposite of the boar, and there is a femininity about her general appearance and bearing which indicates the prolific and indulgent mother.

When a really good sow is once obtained, she should be kept in the herd as long as she retains her usefulness. A really first-class sow is not too easily obtained, and when once acquired it will be found the part of wisdom to keep her as long as she continues to produce satisfactory litters.

REVIEW.

1. Tell of the complexities of the breeder's business.
2. Tell of the requirements for a farmer to be a good swine breeder.
3. Tell of the need of his keeping the element of utility in his mind.
4. Give two view-points for considering utility.
5. What is meant by "in-breeding"?
6. Give Mr. Gentry's advice regarding it.
7. What is the practice of prominent swine breeders regarding it?
8. What is the safe rule for the farmer to follow regarding in-breeding?
9. What is cross-breeding? Give some of its uses.
10. Gives suggestions to follow in mating extreme types.
11. Define "grades," "high-grades." To what extent are they used?
12. Tell of the importance of pedigree and heredity in swine breeding.
13. Why select a pure-bred boar? Why do it well?
14. Tell of the desirable conformation of the boar.
15. Tell of the desirable conformation of brood sows.

PART III
BREEDS OF SWINE

CHAPTER IV.

RELATION OF BREED TO ECONOMY OF PRODUCTION.

PROBABLY the most extensive tests with breeds of swine have been conducted by the Ontario Agricultural College and the Iowa State Experiment Station. At the Ontario Agricultural College five tests were conducted in which six breeds of swine were compared as to the amount of feed required for 100 pounds gain live weight. At the Iowa Experiment Station three tests were made in which the same six breeds were compared as to the amount of feed required for 100 pounds gain live weight. The results of these two series of tests are, therefore, of considerable importance. In the Ontario tests, only the meal is considered in four of the tests, such feeds as dairy by-products and green feed, which were the same for all breeds, being omitted. In one test the results are given in terms of dry matter.

Ontario Feeding Trials.—Following are the results of the Ontario tests:

MEAL CONSUMED PER 100 POUNDS GAIN IN WEIGHT.

1st Test.

	Pounds.		Pounds.
Berkshire	398	Duroc-Jersey	424
Tamworth	400	Chester White	452
Poland-China	417	Yorkshire	468

2d Test.

	Pounds.		Pounds.
Berkshire	327	Chester White	340
Tamworth	331	Yorkshire	341
Poland-China	333	Duroc-Jersey	358

3d Test.

	Pounds.		Pounds.
Yorkshire	350	Chester White	378
Berkshire	370	Tamworth	378
Duroc-Jersey	376	Poland-China	383

4th Test (Dry Matter).

	Pounds.		Pounds.
Berkshire	318	Chester White	337
Tamworth	331	Duroc-Jersey	337
Yorkshire	335	Poland-China	350

5th Test.

	Pounds.		Pounds.
Berkshire	409	Chester White	433
Yorkshire	422	Tamworth	462
Duroc-Jersey	426	Poland-China	474

Before any comment is made on the Ontario results, we will look at the Iowa results, which are based upon dry matter.

Iowa Feeding Trials.—Following are the results of the Iowa tests:

POUNDS DRY MATTER CONSUMED PER 100 POUNDS GAIN IN WEIGHT.

1st Test.

	Pounds.		Pounds.
Duroc-Jersey	386	Poland-China	424
Yorkshire	398	Chester White	460
Tamworth	403	Berkshire	462

2d Test.

	Pounds.		Pounds.
Duroc-Jersey	337	Poland-China	392
Yorkshire	365	Chester White	394
Berkshire	381	Tamworth	407

3d Test.

	Pounds.		Pounds.
Poland-China	441	Chester White	506
Berkshire	481	Duroc-Jersey	506
Yorkshire	505	Tamworth	558

These results suggest some difficult questions. Why, for instance, do Berkshires, Yorkshires, Duroc-Jerseys, and Poland-Chinas range all the way from the top to the bottom of the list in the different tests; and why would an average of the Ontario tests give a rating of the breeds which is entirely different from an average of the Iowa tests? The averages have been purposely omitted, because they are entirely misleading in a case of this kind. For example, one breed may suffer from some unfavorable circumstance in one or more of the tests which is in no way related to or influenced by the breeding of the animals, yet this circumstance may seriously affect the standing of the breed in question.

Eliminating averages and looking over the individual tests with an unprejudiced mind, we can scarcely escape the conclusion that the factor which placed a certain group at the top in any of the tests was in no way related to the breed represented by that group.

This point is further emphasized by a test reported by Professor Burns in Texas Bulletin 131. In this test "razor backs" or scrubs were fed against good average Poland-China grades. The Poland-China grades made more rapid gains and sold for a higher price per pound, but the cost of producing 100 pounds of gain was practically the same for both, being approximately \$6.02 for the scrubs and \$5.94 for the grades, a difference of two twenty-fifths of a cent per pound.

A Trial with One Breed.—If any person wishes to test the question further, let him take 8 or 10 pigs of the same litter, divide them into two groups as nearly even as possible, and feed the two groups exactly the same. The question of breed cannot enter into such a comparison, but in almost any such test it will be found that there is a difference in the amount of feed required for 100 pounds gain in the two groups.

Bacon and Fat Types Compared.—Another interesting point brought out in these breed tests is the fact that the bacon type is able to hold its own against the lard type in economy of production. Take the two bacon breeds, Yorkshire and Tamworth, in the Ontario tests and compare their standing with such breeds as the Poland-China, Chester White, and Duroc-Jersey; or take the Yorkshire in the Iowa tests and compare it with the other breeds. So far as breed tests go, therefore, they fail to demonstrate that it costs any more to put a pound of gain on a hog of bacon type than it does to put a pound of gain on a hog of lard type.

Conclusion.—Breed tests, therefore, have served a useful purpose in demonstrating that no one breed is superior to all other breeds in ability to make cheap gains. A healthy, thrifty hog will make economical gains no matter what breed it represents.

REVIEW.

1. What kinds of tests have been made to determine the best breeds for feeding?
2. What breeds have been used in these feeding trials?
3. Which breeds were ahead in the five Ontario tests? Which were poorest?
4. Which were ahead in the Iowa tests? Which fell behind?
5. What would be the probable result in a feeding trial with several individuals of the same breed?
6. How do the bacon breeds compare with the lard breeds in these tests?
7. What is the conclusion regarding these breed tests?

CHAPTER V.

THE BERKSHIRE BREED.

Description.—The Berkshire is an attractive animal in appearance, and is rather above medium size, though, as a breed, it scarcely equals the Yorkshire and Tamworth in size. The face is moderately dished, the snout medium in length, the jowl full and rather heavy, and the neck short, with considerable crest. The ears should be firmly attached to the head, and are usually erect, though they frequently incline forward in aged animals. The breed generally has good width of shoulder, a broad back resulting from a well-sprung rib, and good thickness through the rump and hams. The Berkshire is noted for a thickly meated, trim ham. In general, it has good depth of body; and should possess a deep, wide chest, with a full heart-girth. In the best representatives of the breed, the bone is all that could be desired, being strong and clean, and the animal generally stands well on its feet.

The *standard color* is black, with white markings in the face, on each foot, and on the tip of the tail. (Figs. 13, 14, 15.) A small splash of white on the arm is not objected to; but when the white is too freely distributed, such as a white blotch on the jowl, shoulder, or other part of the body, it is an objection, in the eyes of most breeders. Occasionally some of the standard white markings are missing, such as the white on the tip of the tail, on one or more of the feet, or the white mark on the face, and the absence of any of these markings would also constitute an objection. The standard of excellence of the American Berkshire Association says nothing about disqualifying an animal for defective markings, so that each breeder

must be his own judge as to how much latitude to allow in the matter of markings. Unless the markings were glaringly defective, it would not seem to be the part of wisdom to reject an animal that was really first-class in other respects.

Origin and History.—Berkshires derive their name from Berkshire in England, though the breed is now to be found in



FIG. 13.—Champion herd of Berkshires, Iowa State Fair.

all parts of the British Isles. Very little is known regarding the origin of the original Berkshire, but the breed was very different from the Berkshire of to-day. The old Berkshire was very much coarser than the present type, had lopped ears, and its color was commonly a sandy or reddish brown spotted with black, or white with black spots. It had a reputation of producing a good quality of meat.

It is claimed by some that improvement was effected by using black *Siamese* boars on the original Berkshire sows, and others claim that white and black-and-white *Chinese* boars were used. A. B. Allen, who bred Siamese swine many years ago, describes the breed as follows:

"They varied in color from deep, rich plum to dark slate



FIG. 14.—Champion pen of Berkshire barrows at the International Exposition.

and black; had two or three white feet, but no white on the legs or other parts of the body. The head was short and fine, with a dished face and rather thin jowl; ears short, slender, and erect; shoulders and hams round, smooth, and extra large; back broad and slightly arched; body of moderate length, deep, well ribbed up, and nearly as round as a barrel; . . . legs fine and short; . . . hair soft, silky, and thin; no bristles, even on

boars; . . . flesh firm, sweet, and very tender, with less lean than the Berkshire."

A breed such as the Siamese, here described, was well qualified to improve a coarse breed like the old Berkshire. Mr. Allen favors the theory that Chinese blood was also used, and, from his investigations in England, fixes the conn-

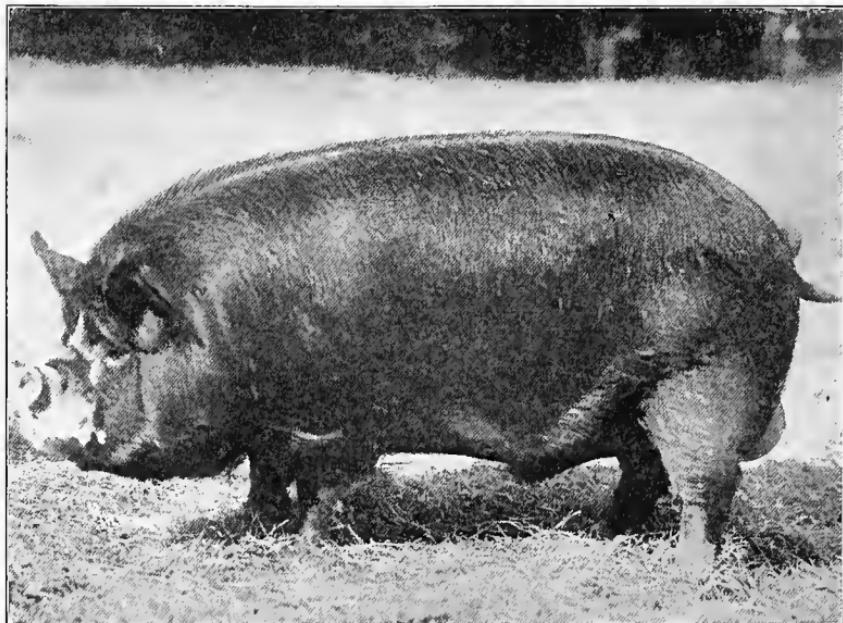


FIG. 15.—Champion Berkshire boar, Iowa State Fair.

mencement of improvement in the Berkshire by crossing at some time previous to 1780.

Early Importations.—Allen states that Berkshires were first imported to America in 1823 by John Brentnall of New Jersey. The first importation to Canada is said to have been made in 1838. F. D. Coburn states that for ten years subsequent to 1831 there was active speculation in importing Berk-

shires and selling them at inflated prices, and that the methods employed by speculators injured the popularity of the breed and retarded its progress. The real merit of the breed eventually overcame the prejudice which had been created, and to-day the breed is very popular in both the United States and Canada.

Distribution.—Berkshires are found in every state and territory of the United States, the most important centres being Illinois, Missouri, Indiana, Texas, Ohio, Kansas, Iowa, New York, Michigan, and Tennessee. They are found also in every Canadian province, Ontario taking the lead. They are distributed all over the British Isles, and have made their way into South America, Hawaii, and some countries on the European Continent.

Types.—Berkshires vary more or less in type, the type being influenced to a considerable extent by the demands of the market in the countries where they are bred as well as by the methods of individual breeders. In the United States it is only natural to expect them to conform to the fat or lard type, and some breeders have gone rather to the extreme in breeding for fine bone, smoothness, and quality and neglecting size and fecundity. The best breeders, however, are succeeding in maintaining size and quality and in producing a really useful animal.

In Canada the tendency is to select for a lengthy, strong-boned type, which looks somewhat coarse and leggy when compared with the extremely fine type, but which is a first-class farmer's hog. The demand for the bacon type in Canada and competition with the bacon breeds have had an influence in bringing about this modification. (Fig. 16.)

The so-called *Large English Berkshire* is not a distinct breed, nor is it necessarily a distinct family or branch of the breed. In England, as in any other country, the Berkshire

will be found to vary more or less in type, and some importers select the larger, stronger-boned animals and import them under the name of Large English Berkshires. As a matter of fact, some of them may be litter mates of animals of the fine-boned type.

Utility.—The Berkshire is better suited for supplying the market demand for fat hogs than it is for producing bacon

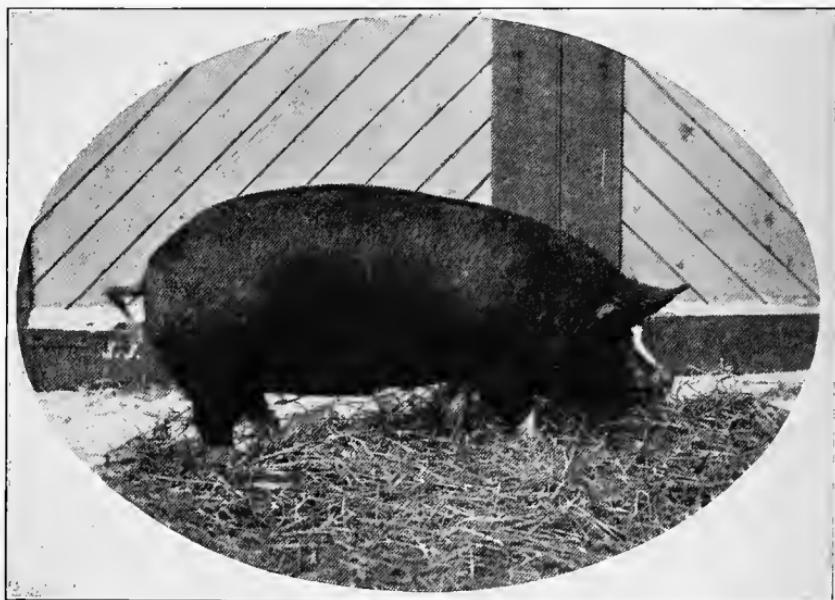


FIG. 16.—A Berkshire sow of nearly bacon type.

hogs. Where backs, shoulders, and hams are the main requirements, the Berkshire fits in exceptionally well, but for the export bacon trade in "Wiltshire sides" it has scarcely enough length of side and has too heavy a neck and shoulder. When crossed with the Large Yorkshire or Tamworth, an excellent farmer's hog is the result, though perhaps it is a little nearer the bacon type than the fat type. Berkshires

have given a good account of themselves in the market classes of leading exhibitions where they have come into competition with other breeds.

In early maturity Berkshires stand well, attaining good weights at an early age and fattening readily. (Fig. 17.)

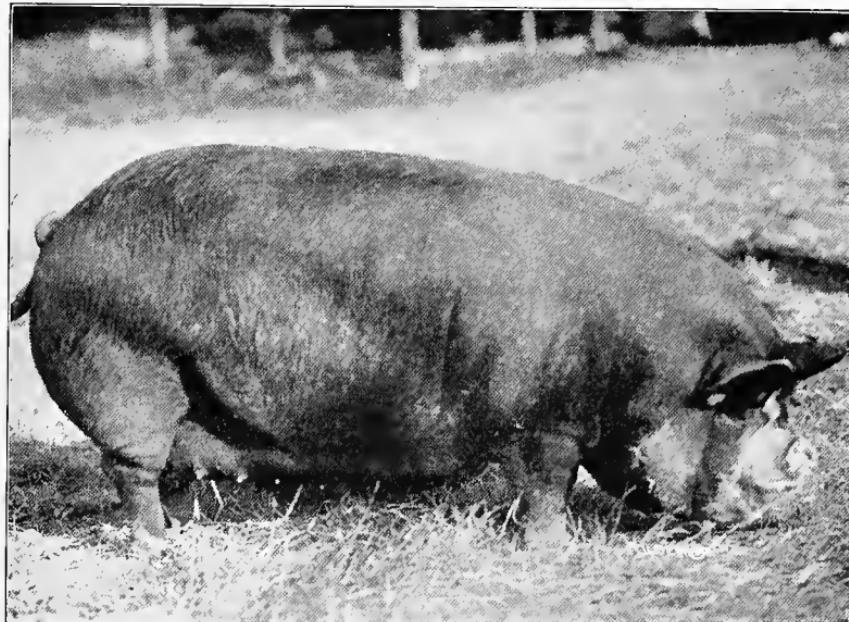


FIG. 17.—Berkshire sow. An Iowa State Fair champion.

Some would place the Poland-China ahead of the Berkshire in point of early maturity, while others would place the Chester White or Duroc-Jersey at the head of the list; but it is probable that among the best representatives of the breeds mentioned there is not any very marked difference in point of early maturity.

The Berkshire ranks with the best as an economical producer of pork. Probably it will never be known which breed is capable of making the cheapest gain, but it is safe to say that the Berkshire will produce pork as cheaply as any other breed.

The *flesh* of the Berkshire is of excellent quality and carries a large proportion of lean to fat. Investigations regarding the quality of meat from different breeds generally agree in giving the Berkshire a high place.

Berkshire sows of the more lengthy type are prolific and generally make good mothers; but the extremely fine, short type of sow seldom produces such large litters. The boars are prepotent, and cross well with almost any other breed, as well as being useful for improving common stock.

Berkshire Score Card.—Following is the standard of excellence adopted by the American Berkshire Association:

	Counts.
<i>Color</i> —Black, with white on feet, face, tip of tail, and an occasional splash on the arm	4
<i>Face and Snout</i> —Short; the former fine and well dished, and broad between the eyes	7
<i>Eye</i> —Very clear, rather large, dark hazel or gray.....	2
<i>Ear</i> —Generally almost erect, but sometimes inclined forward with advancing age; medium size, thin and soft.....	4
<i>Jowl</i> —Full and heavy, running well back on neck.....	4
<i>Neck</i> —Short and broad on top	4
<i>Hair</i> —Fine and soft; medium thickness	3
<i>Skin</i> —Smooth and pliable	4
<i>Shoulder</i> —Thick and even, broad on top, and deep through chest.....	7
<i>Back</i> —Broad, short, and straight; ribs well sprung, coupling close to hips	8
<i>Side</i> —Deep and well let down; straight on bottom lines.....	6
<i>Flank</i> —Well back and low down on leg, making nearly straight line with the lower part of side.....	5
<i>Loin</i> —Full and wide	9
<i>Ham</i> —Deep and thick, extending well up on back and holding thickness well down to hock	10

<i>Tail</i> —Well set up on back; tapering and not coarse.....	2
<i>Legs</i> —Short, straight, and strong, set wide apart, with hoofs erect and capable of holding good weight	5
<i>Symmetry</i> —Well proportioned throughout, depending largely on condition	6
<i>Condition</i> —In a good, healthy, growing state; not over-fed.....	5
<i>Style</i> —Attractive, spirited, indicative of thorough breeding and constitutional vigor	5
Total	100

REVIEW.

1. Give a general description of the Berkshire breed. What is the color? Shape of face? Tendency of ears?
2. Tell of the origin and history of this breed.
3. Tell of the early importation to America.
4. Tell of their present distribution.
5. What differences in type are found among Berkshires?
6. Tell of their suitability to filling the demands for fat hogs and for bacon hogs.
7. Discuss their early maturity; flesh; size of litters.

CHAPTER VI.

THE POLAND-CHINA BREED.

Description.—In size the Poland-China is generally ranked as medium, and, as a breed, it would probably hardly average up with the Berkshire, though it cannot be said that there is much difference between the two breeds in point of size. The face is practically straight, and the jowl full and heavy. The ears should be fine and firmly attached, with the tip drooped, the droop taking in about one-third of the length of the ear. Ears that are loosely attached and droop right from the point of attachment are seriously objected to. The shoulder is heavy, and the side, which is somewhat short, is very deep. The back is wide, and the top-line very slightly arched. (Figs. 18 and 19.)

The hind quarter is heavily fleshed, and the ham should be exceptionally wide and deep. As a rule, the legs are very short, and the bone fine—too fine in some cases.

Years ago, Poland-Chinas were freely marked with white, but the fashionable color to-day is practically the same as that of the Berkshire,—namely, black, with white on face, feet, and tip of tail. A limited number of small white markings on other parts are not seriously objected to.

Origin and History.—The Poland-China originated in Butler and Warren counties in Ohio. The Great Miami and Little Miami rivers drain the two counties mentioned, and the Miami Valley is a very fertile district. The exact origin of the breed is not altogether clear, and lengthy controversies have occurred regarding certain points connected therewith. It is out of the question to discuss the various theories which

have been put forth, and the following brief summary of matters pertaining to the origin of the breed may be regarded as reasonably accurate.

Previous to 1816 the Russia and Byfield breeds were used extensively for crossing upon the common hogs of the Miami Valley. These were both white breeds possessing more or less

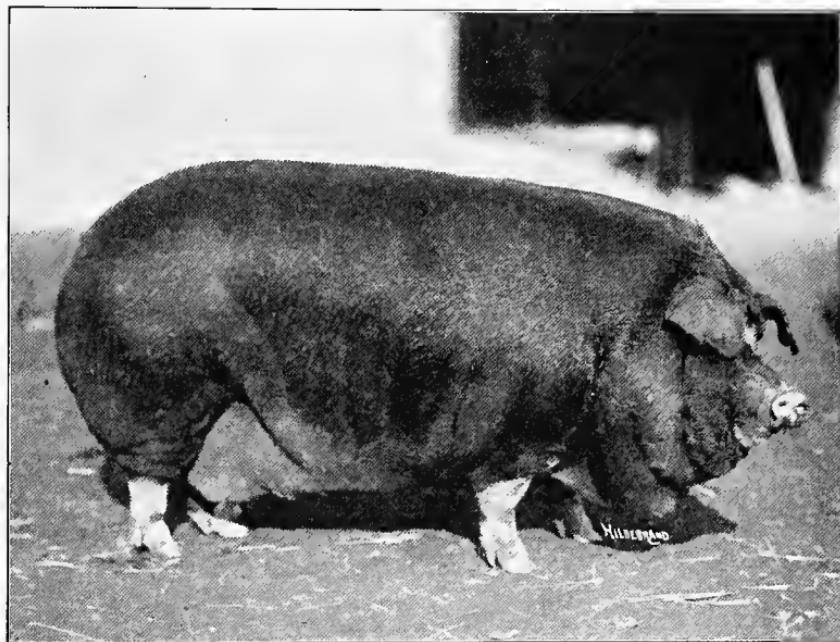


FIG. 18.—Champion Poland-China sow at the International Exposition.

merit as feeders. In 1816 the Society of Shakers of Union Village, Warren County, brought a boar and three sows from Philadelphia. The pigs were represented to the Shakers as being of pure Chinese blood, and they were called *Big Chinas*. The boar and two of the sows are said to have been pure white, and the other sow was white with some sandy and black spots. These Big Chinas and their descendants were crossed

freely upon the hogs then in the county, and the resulting type came to be known as the Warren County Hog. The Big China was a medium-sized breed with fine bone and good feeding qualities, and its use upon the hogs of Warren County effected a marked improvement. It is also stated that, fol-

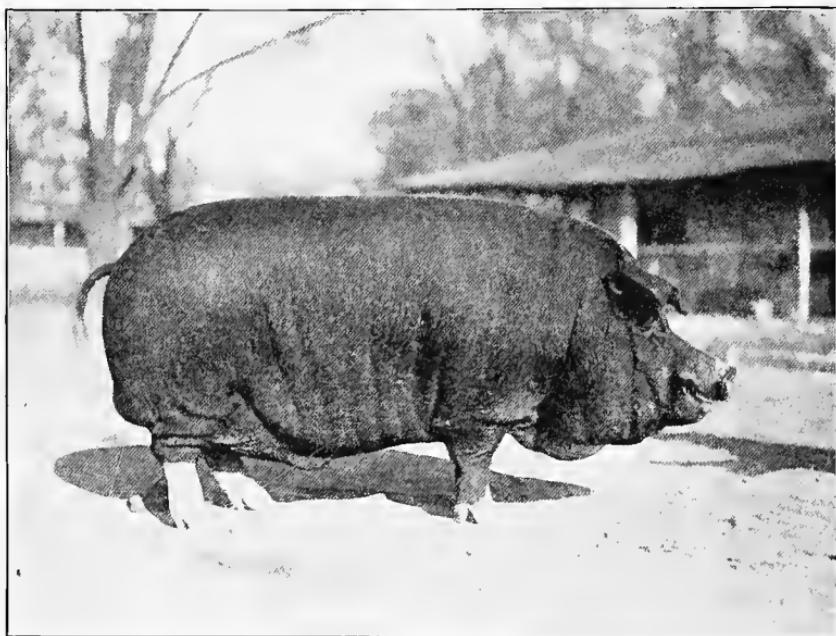


FIG. 19.—Yearling Poland-China boar. Sweepstakes winner at the Louisiana Purchase Exposition.

lowing the introduction of the Big China, other Chinese hogs of smaller and finer type were brought into the county.

In 1835 or 1836 Berkshires were introduced and used quite extensively, and about 1839 or 1840 the *Irish Grazier* was imported and crossed upon these pigs of complicated breeding in Warren County. The Irish Grazier was a white breed of considerable merit, and did its share towards modifying Miami Valley hogs.

It was claimed by some that a *Poland* breed was used for crossing upon Warren County hogs, while others claimed that no such breed was ever introduced, and an extended controversy ensued, which ended in the appointment of an investigating committee, which reported its findings to the National Swine Breeders' Convention held in Indianapolis in 1872. The Committee reported against the theory that a Poland breed had been used, but recommended that the name Poland-China be recognized as the accepted name of the breed. The recommendation was adopted, and since that time the breed, which previously had been known by a great variety of names, has been known as the Poland-China. It is claimed that no outside blood has been infused into this breed since 1845.

Distribution.—The Poland-China is widely distributed over the United States. The principal states for the breed, according to the secretary of the American Poland-China Record Association, are Iowa, Illinois, Texas, Missouri, Kansas, Nebraska, Indiana, Ohio, Minnesota, South Dakota, Wisconsin, Oklahoma, and Michigan, but there are few states where Poland-Chinas are not to be found.

Though represented in Canada, the breed has not yet obtained a strong foothold in that country, and outside of the United States and Canada the breed is but little known.

Types.—The older type of Poland-China was a larger, more rangy, and heavier-boned hog than the Poland-Chinas seen in the show-rings of to-day. Breeders of Poland-Chinas have rather gone to the extreme, on the whole, in the matter of selecting for fineness of bone, and the result, in many cases, is a hog that lacks somewhat in size and fecundity. At the present time the advisability of developing more size and bone in the breed is being widely discussed in the public press; and

thoughtful breeders will give the matter careful consideration. There is little doubt that the best breeders will succeed in maintaining quality without sacrificing utility, and that the over-fine type will fall into disfavor with the general farmer.

Utility.—The Poland-China has been developed especially to meet the market demand for a fat or lard hog. The heavy shoulder, wide back, and largely developed hams render it an exceptionally good yielder from the packer's stand-point.

A cross between the Poland-China and the Berkshire, Duroc-Jersey, or Chester White is generally highly esteemed, and many regard the cross-breds as superior to the pure-breds for feeding.

As to *early maturity*, or the ability to produce a finished fat carcass for the butcher at an early age, no breed excels the Poland-China. It has been bred for early maturity for generations, and has acquired a high reputation in this regard.

The Poland-China is a general favorite with corn-belt farmers. It has been developed upon corn-feeding, and will probably stand heavy corn feeding better than most other breeds. As a machine for turning corn into pork, it is hard to beat, and it is also a good grass hog.

The *meat* of the Poland-China has been criticised freely for carrying too large a proportion of fat to lean, and there seems to be good ground for the criticism. In their efforts to bring the breed to its present stage of perfection as a feeder, breeders have overlooked the production of lean along with fat, but the breed seems to meet the demands of the American packer, and he is willing to pay top market price for it.

Since so much attention has been paid to the development of fine bone and a marked tendency to fatten in this breed, it is not surprising to find it criticised as lacking in fecundity.

Statistics appear to indicate that the Poland-China is not up to the average of other well-known breeds in point of fecundity, the deficiency occurring mainly in the very fine-boned strains. This point gives the breeder of Poland-Chinas food for serious reflection.

Owing to its exceptional tendency to fatten, the Poland-China is valuable for crossing upon hogs which lack this tendency, and it is a useful breed for improving the common stock of the country.

Poland-China Score Card.—Following is the description and scale of points for Poland-Chinas adopted by the National Association of Expert Judges of Swine:

	Counts.		Counts.
Head	4	Feet and legs	10
Eyes	2	Tail	1
Ears	2	Coat	3
Neck	2	Color	3
Jowl	2	Size	5
Shoulders	6	Action and style	3
Chest	12	Condition	2
Back and loin	14	Disposition	2
Sides and ribs	10	Symmetry of points....	3
Belly and flank	4		
Ham and rump	10	Total	100

Detailed Descriptions.—*Head* should be broad, even and smooth between and above the eyes. Slightly dished, tapering evenly and gradually to near the end of the nose. Broad lower jaw; head inclined to shortness, but not enough to give the appearance of stubby nose. And in male a masculine expression and appearance.

Objections.—Head long, narrow between eyes; nose uneven and coarse; too large at muzzle or the head too short; not full or high over eyes, or too wrinkled around or above the eyes.

Eyes.—Full, clear, prominent and expressive.

Objections.—Dull expression, deep set or obscure. Sight impaired by wrinkles, fat, or other cause.

Ears.—Ears attached to the head by a short, firm knuck, giving free and easy action. Standing up slightly at the base to within two-thirds of the tip, where a gentle break or droop should occur; in size neither too large nor too small, but even, fine, thin, leaf-shape. Slightly inclined outward.

Objections.—Large, floppy, straight, upright, or coarse; knuck long, letting the ear droop too close to the head and face, hindering the animal of free use of the ears.

Neck.—Short, wide, even, smooth, well arched. Rounding and full from poll to shoulder, with due regard to the characteristics of the sex.

Objections.—Long, narrow, thin, and drooping from shoulder to poll, with unevenness caused by wrinkles or creases.

Jowl.—Full, broad, deep, smooth, and firm, carrying fulness back to near point of shoulders, and below line of lower jaw, so that the lower line will be as low as breastbone when head is carried up level.

Objections.—Light, flabby, thin, and wedge-shaped, deeply wrinkled, not drooping below line of lower jaw, and not carrying fulness back to shoulder and brisket.

Shoulder.—Broad and oval at the top, showing evenness with the back and neck, with good width from the top to the bottom, and even smoothness extending well forward.

Objections.—Narrow at the top or bottom; not as deep as the body; uneven width. Shields on pigs under eight months of age, or showing too much shield at any age.

Chest.—Large, wide, deep, and full; even under line to the shoulder and sides, with no creases; giving plenty of room for heart and other organs, making a large girth, indicating

much vitality. Brisket smooth, even, and broad, wide between legs, and extending well forward, showing in front.

Objections.—Pinched appearance at the top or bottom, or tucked in back of fore legs; showing too narrow between the legs; not depth enough back of the shoulder. Brisket uneven, narrow, not prominent.

Back and Loin.—Broad, straight or slightly arched, carrying same width from shoulder to ham; surface even, smooth, free from lumps, creases, or projections; not too long, but broad on top, indicating well-sprung ribs; should not be higher at hip than at shoulder, and should fill out at junction with side so that a straight-edge placed along at top of side will touch all the way from point of shoulder to point of ham; should be shorter than lower belly line.

Objections.—Narrow, creased back of shoulders, swayed or hollow, drooping below a straight line; humped or wrinkled; too long or sun-fish shaped; loin high, narrow, depressed or humped up; surface lumpy, creased, ridgy or uneven; width at side not as much as shoulder and ham.

Sides and Ribs.—Sides, full, firm, and deep, free from wrinkles; carrying size down to belly; even from ham to shoulder; ribs of good length, well sprung at top and bottom.

Objections.—Flat, thin, flabby, pinched, not as full at bottom as top; drawn in at shoulder so as to produce a crease, or pinched and tucked up and in as it approaches the ham; uneven surface; ribs flat or too short.

Belly and Flank.—Belly broad, straight, and full, indicating capacity and room, being about the same or on a level at the flank with the under chest line. Under line straight or nearly so, and free from flabby appearance.

Objections.—Belly uneven and flabby, or apparent looseness in the make-up. Pinched up in the flank or flanked too high.

Ham and Rump.—Hams broad, full, deep, and long from rump to hock. Fully developed above and below, being wide at the point of the hip, carrying width well down to the lower part of the hams. Fleshy, plump, rounding fulness perceptible everywhere. Rump rounding and gradually sloping from the loin to the root of the tail. Broad and well developed all along from loin, and gradually rounding to the buttock; lower front part of ham should be full and stifle well covered with flesh. Even width of ham and rump with the back, loin, and body. Even a greater width as to females not objectionable.

Objections.—Ham short, narrow, too round or slim. Not filled out above or below, or unshapely for deep meat; not as wide as the body, back, or loin; too tapering or small. Rump narrow or pointed, not plump or well filled, or too steep from loin to the tail.

Legs and Feet.—Legs medium length, straight, set well apart and squarely under body, tapering, well muscled and wide above knee and hock; below hock and knee round and tapering, capable of sustaining weight of animal in full flesh without breaking down; bone firm and of fine texture; pasterns short and nearly upright. Feet firm, short, tough, and free from defects.

Objections.—Legs long, slim, coarse, crooked; muscles small above hock and knee; bone large, coarse; as large at foot as above knee; pasterns long, slim, crooked, or weak; the hocks turned in or out of straight line; legs too close together; hoofs long, slim, and weak; toes spreading or crooked or unable to bear up weight of animal without breaking down.

Tail.—Tail of medium length and size, smooth and tapering well, and carried in a curl.

Objections.—Coarse and long without a curl; or short, crooked, or stubby; or too small, even, not tapering.

Coat.—Fine, straight, smooth, lying close to and covering the body well; not clipped, evenly distributed over the body.

Objections.—Bristles, hair coarse, harsh, thin, wavy or curly; swirls, standing up, ends of hair split and brown, not evenly distributed over all of the body except belly. Clipped coats should be cut 1.5 points.

Color.—Black with six (6) white points: tip of tail, four white feet, and white in face on the nose or on the point of lower jaw. All to be perceptible without close examination. Splashes of white on the jaw, legs, or flank or a few spots of white on the body not objectionable.

Objections.—Solid black, white mixed or sandy spots. Speckled with white hairs over the body; mottled face of white and black, hair mixed, making a grizzly appearance.

Size.—Large for age. Condition, vigor, and vitality to be considered. There should be a difference between breeding animals and those kept or fitted for the show of at least 25 per cent in size. In show condition, or when fat, a two-year-old boar should not weigh less than 600 pounds, and a sow not less than 500 pounds. Boar one year and over, 400 pounds; sow, 350 pounds. Boar of eighteen months, 500 pounds; sow, 450 pounds. Boars and sows six months old, not less than 160 pounds. All hogs in just fair breeding condition, one-fourth less for size. The keeping and chance that a young hog has cuts quite a figure in his size and should be considered, other points being equal. Fine quality and size combined are desirable.

Objections.—Overgrown; coarse, flabby, loose appearance, gangling, hard to fatten; too fine, undersize; short, stubby, inclined to chubby fatness. Not a hardy robust animal.

Action and Style.—Action vigorous, easy, and graceful. Style attractive; high carriage; in boars the testicles

prominent and of about the same size, and yet not too large and pouchy.

Objections.—Clumsy, slow, awkward movement; low carriage; waddling or twisting walk. A seeming tired or lazy appearance; not standing erect and firm.

Condition.—Healthy; skin clear of scurf, scales, and sores; soft and mellow to the touch; flesh fine, evenly laid on, and free from lumps and wrinkles. Hair soft and lying close to body; good feeding qualities.

Objections.—Unhealthy; skin scaly, wrinkled, scabby, or harsh; flabbiness or lumpy flesh; too much fat for breeding. Hair harsh, dry, and standing up from body; poor feeders; deafness, partial or total.

Disposition.—Lively, easily handled and seemingly kind, responsive to good treatment.

Objections.—Cross, sluggish, restless, wild, or of a vicious turn.

Symmetry or Adaptation of Points.—The adaptation of all the points, size, and style combined to make the desired type or model.

REVIEW.

1. Give a general description of the Poland-China breed. Color. Tendency of ears.
2. Tell of the origin and history of this breed.
3. How did the compound name originate?
4. Tell of their present popularity and distribution.
5. Tell of the older and the recent types.
6. What can be said of their special utility?
7. Discuss their early maturity; meat; size of litters.
8. Why are they valuable for crossing with the "common stock" of the country?
9. Give some very objectionable points, when found, regarding shoulder, back and loin, ham and rump.

CHAPTER VII.

THE CHESTER WHITE BREED.

Description.—At one time the Chester White was rated as the largest breed in the United States, but the tendency of modern breeding has been towards the production of a finer-boned, smoother, and smaller animal than the older type, and at present the Chester White is similar to the Poland-China in size, though it is commonly claimed that it is a larger breed. The face is straight, and the snout is usually a little longer than that of the Poland-China. It has a drooped ear, similar to that of the Poland-China, but the droop, or break, is usually further from the tip. As a rule, too, the ear is somewhat heavier, and it is quite common for it to be somewhat loosely attached.

In general conformation, the Chester White is similar to the Poland-China, though the latter generally excels in depth and fulness of ham, and many Chester Whites are rather longer in the body than the Poland-Chinas. (Fig. 20.)

The color is white, no black hair being admissible, though it is common for black or bluish spots to occur on the skin. These spots do not indicate impurity of blood, but breeders aim to avoid them as much as possible, and, if the spots are large or numerous, they constitute a serious objection. In many specimens the hair has a tendency to be wavy, and in some cases it is almost curly.

Origin and History.—Most authorities recognize three sources of origin for Chester White swine, the history of which may be summarized as follows:

1. *The original Chester White had its origin in Chester*

County, Pennsylvania, hence the name. Large, white pigs were common in Chester County many years ago. They were taken there by the earliest settlers, but it is not clearly known where the original pigs came from. About the year 1818, Captain James Jeffries imported from England a pair of white pigs which are referred to by some as Bedfordshire pigs, and by

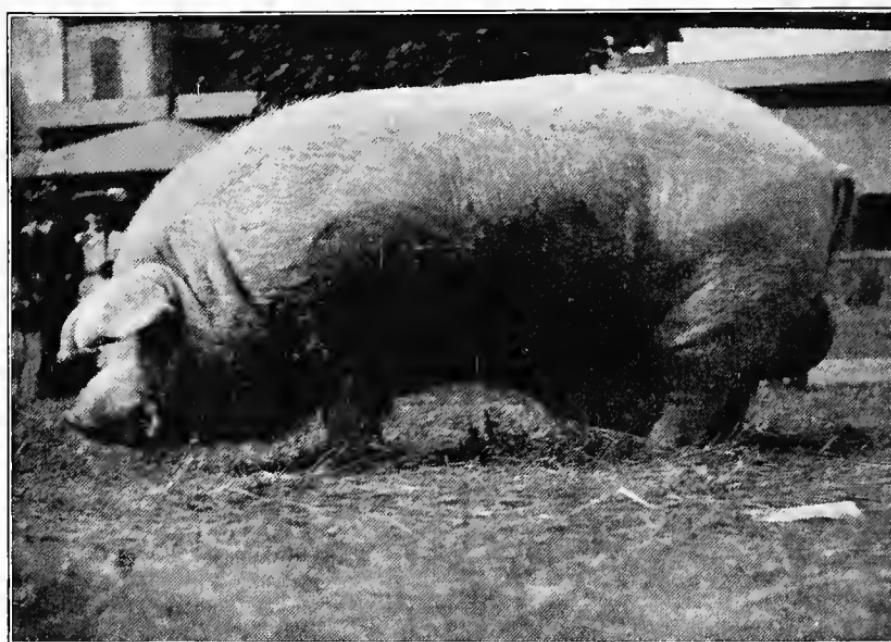


FIG. 20.—Chester White boar, winner of many prizes at State fairs.

others as Cumberland pigs. Captain Jeffries used the boar on the white sows of the district with good results. It is stated that, at a later date, white Chinese pigs were brought into Chester County and crossed on the stock of the district. Eventually the different strains of blood were combined, and from this combination came the original Chester White breed.

2. *The Improved Chester White, or Todd's Improved*

Chester White, can hardly be regarded as a distinct strain of the breed at present. At one time it had a herd record of its own, but in 1894 the articles of incorporation were changed to read American Chester White Record Association. Briefly, the history of the so-called Improved Chester White is as follows: About 1827, Norfolk Thin Rind pigs were imported from England to Connecticut. Two brothers, named Todd, bought a boar of this breed and a sow of what was called the Grass breed, and took them to Ohio, where they were bred together with considerable success. Later, one Joseph Haskins brought to Ohio a boar of the Byfield breed and a sow similar to the original Todd sow. The Todd and Haskins pigs were bred together, and Isaac Todd also used other boars in his herd, among which was one said to be of the Grass breed, and another one called a Normandy boar, though little is known of the breeding of either of them. Both these boars were white in color. In 1865, Isaac Todd introduced Chester White blood, and his son, S. H. Todd, made further use of the Chester White, evolving, by careful breeding and selection, what came to be known as Todd's Improved Chester White.

3. *The Ohio Improved Chester White*, commonly known as the O.I.C. strain, is the product of the efforts of L. B. Silver of Ohio, who, in 1865, commenced breeding Chester Whites, and who aimed to produce a superior type through selection. This branch of the breed has an association and herd record of its own, but it would require a person more than ordinarily expert to distinguish animals of this strain from other Chester Whites, as they appear at the various exhibitions.

Distribution.—The Chester White is widely distributed in the United States. It is popular in the East, and is strongly represented in Ohio, Illinois, Indiana, Iowa, Michigan, Wisconsin, Pennsylvania, and other states. It has also spread to

the South to some extent, and seems to be giving satisfaction, except for its color. The breed is not popular in the Southern states because the white color allows of sunburn and skin troubles. It is also fairly well represented in Canada, where it has gained a stronger foot-hold than the Poland-China.

Types.—The Chester White seems capable of showing



FIG. 21.—A prize-winning Chester White sow. A sow of great scale, strong bone, and attractive character.

more extreme variations of type than most other breeds. In the show-rings of the United States, the short-legged, fine-boned, smooth, medium-sized type seems to be preferred by most judges, who seem inclined to discourage the larger and heavier-boned types. (Fig. 21.)

In Canada more attention is paid to length, and some very lengthy, heavy-boned Chester Whites are sometimes seen in

Canadian show-rings. In 1907, at the Ontario Provincial Winter Fair, held at Guelph, Canada, a pair of Chester White carcasses won sixth prize in the bacon carcass competition, where they had to compete with Yorkshires, Tamworths, and Berkshires. Though they did not make ideal carcasses from a bacon stand-point, quite a number of Yorkshire and Tamworth carcasses, together with all the Berkshire carcasses, were ranked below them. When it is known that the Guelph fair has the largest exhibit of bacon carcasses on the continent, it is easy to understand that these Chester Whites must have been about as different from the type of the American prize-winning Chester White as it was possible for them to be. This is an extreme case, but it illustrates the possibilities of the breed under different systems of selection and feeding.

Utility.—Though the Chester White can be made to approach the bacon type through selection and feeding, it seems like a waste of energy to attempt to make it a bacon breed, when first-class bacon breeds are already available. The Chester White is best adapted to the requirements of the fat-hog trade, and no doubt will continue as such. In Canada it is frequently crossed with the Yorkshire and Tamworth, giving a very satisfactory feeder's hog. In the United States a cross between the Chester White and Poland-China is very popular. In fact, the breed crosses well with almost any other, and the Chester White boar is very effective in improving common stock.

The Chester White compares favorably with other breeds in early maturity and as an economical producer of meat. It is also a good grazer, but, like other white breeds, is more or less subject to skin trouble when exposed to all kinds of weather. It produces a good quality of meat, which, however, is rather lacking in lean.

It is claimed that the Chester White, as a breed, is some-

what more prolific than the Poland-China and the fine type of Berkshire, and the claim is supported by the findings of Dr. A. W. Bitting, who investigated the matter in 1897.

Chester White Score Card.—Following is the scale of points adopted by the Standard Chester White Record Association:

	Counts.		Counts
Head and face	4	Ham and rump	10
Eyes	2	Feet and legs	10
Ears	2	Tail	1
Neck	2	Coat	2
Jowl	2	Color	5
Shoulders	6	Size	5
Chest	9	Action and style	4
Back and loin	15	Condition	4
Sides and rib	8	Disposition	3
Belly and flank	6		
		Total	100

Disqualifications.—*Form*.—Upright ears; small, cramped chest; crease around back of shoulders and over the back, causing a depression easily noticed; feet broken down, causing the animal to walk on pastern joints; deformed or badly crooked legs.

Size.—Chuffy, or not two-thirds large enough for age.

Condition.—Squabby fat; deformed, seriously deformed; barrenness; total blindness.

Score.—Less than sixty points.

Pedigree.—Not eligible to record.

Color.—Black or sandy spots in hair.

Detailed Description.—*Head and Face*.—Head short and wide; cheeks neat but not too full; jaws broad and strong; forehead medium high and wide. Face short and smooth; wide between the eyes; nose neat and tapering and slightly dished.

Objections.—Head long, narrow, and coarse; forehead low and narrow; jaws contracted and weak. Face long, narrow, and straight; nose coarse, clumsy, or dished like a Berkshire.

Eyes.—Large, bright, clear, and free from wrinkles or fat surroundings.

Objections.—Small, deep, or obscure; vision impaired in any way.

Ears.—Medium size; not too thick; soft; attached to the head so as not to look clumsy; pointing forward and slightly outward; fully under the control of the animal and drooping so as to give a graceful appearance.

Objections.—Large; upright; coarse; thick; round; too small; drooping too close to the face, animal not being able to control them.

Neck.—Wide; deep; short and nicely arched.

Objections.—Long, narrow; thin; flat on top; tucked up; not extending down to breastbone.

Jowl.—Full; smooth, neat, and firm; carrying fulness back to shoulder and brisket when the head is carried up level.

Objections.—Light; too large and flabby; rough and deeply wrinkled; not carrying fulness back to shoulder and brisket.

Shoulder.—Broad, deep, and full, extending in a straight line with the side, and carrying size down to line of belly.

Objections.—Narrow at top or bottom, not full nor same depth as body; extending above line of back; shields on boars too coarse and prominent.

Chest.—Large; deep and roomy, so as not to cramp vital organs; full in girth around the heart; the breastbone extending forward so as to show slightly in front of legs, and let down so as to be even with line of belly, showing a width of not less than 7 inches between forelegs of a full-grown hog.

Objections.—Narrow; pinched; heart girth less than flank

girth; too far let down between forelegs; breastbone crooked or too short.

Back and Loin.—Back broad on top; straight or slightly arched; uniform width; smooth; free from lumps or rolls; shorter than lower belly line; same height and width at shoulder as at ham; loin wide and full.

Objections.—Back narrow; creased back of shoulders; sun-fish shaped; humped; swayed; too long, or lumpy rolls; uneven in width; loin narrow, depressed or humped.

Sides and Ribs.—Sides full; smooth; deep; carrying size down to belly; even with line of ham and shoulder; ribs long; well sprung at top and bottom, giving hog a square form.

Objections.—Flat; thin; flabby; compressed at bottom; shrunken at shoulders and ham; uneven surface; ribs flat and too short.

Belly and Flank.—Same width as back; full, making a straight line and dropping as low at flank as at bottom of chest; line of lower edge running parallel with sides; flank full and even with body.

Objections.—Belly narrow; pinched; sagging or flabby; flank thin, tucked up or drawn in.

Ham and Rump.—Ham broad; full; long, wide, and deep; admitting of no swells; buttock full; neat and clean, thus avoiding flabbiness; stifle well covered with flesh, nicely tapering towards the hock; rump should have a slightly rounding shape from loin to root of tail; same width as back, making an even line with sides.

Objections.—Hams narrow; short; not filled out to stifle; too much cut up in crotch or twist; not coming down to hocks; buttocks flabby; rump flat, narrow, too long, too steep, sharp or peaked at root of tail.

Legs and Feet.—Legs short; straight; set well apart and squarely under body; bone of good size; firm; well muscled; wide above knee and hock; below knee and hock round and tapering, enabling animal to carry its weight with ease; pastern short and nearly upright; feet short, firm, tough and free from defects.

Objections.—Legs too short, long, slim, crooked; too coarse; too close together; weak muscles above hock and knee; bone large and coarse without taper; pasterns long; crooked, slim like a deer's; hoofs long, slim, weak; toes spreading, crooked, or turned up.

Tail.—Small; smooth; tapering; well set on; root slightly covered with flesh; carried in a curl.

Objections.—Coarse; long; clumsy; set too high or too low; hanging like a rope.

Coat.—Fine; straight or wavy; evenly distributed and covering the body well; nicely clipped coats no objection.

Objections.—Bristles; hair coarse; thin; standing up; not evenly distributed over all of the body except in the belly.

Color.—White (blue spots or black specks in skin shall not argue impurity of blood).

Objections.—Color any other than white.

Size.—Large for age and condition; boars two years old and over, if in good flesh, should weigh not less than 500 pounds. Sow, same age and condition, not less than 450 pounds. Boars 18 months old in good flesh should weigh not less than 400 pounds. Sows, 350. Boars 12 months old, not less than 300 pounds. Sows, 300. Boars and sows six months old, not less than 150 pounds each, and other ages in proportion.

Objections.—Overgrown; coarse; uncouth; hard to fatten.

Action and Style.—Action easy and graceful; style attract-

ive; high carriage; in boars the testicles readily seen; same size and carriage.

Objections.—Sluggish; awkward low carriage; wabbling walk; in males testicles not easily seen; not of same size or carriage, or only one showing.

Condition.—Healthy; skin clear and bright; free from scurf and sores; flesh fine and mellow to the touch; evenly laid on and free from lumps; good feeding qualities.

Objections.—Unhealthy; skin scaly, scabby, or harsh; flesh lumpy or flabby; hair harsh, dry, and standing up from body; poor feeders; total deafness.

Disposition.—Quiet; gentle and easily handled; with ambition enough to look out for themselves if neglected.

Objections.—Cross; restless; vicious or wild; no ambition.

REVIEW.

1. Give a general description of the Chester White breed. How do the ears differ from the other white breeds?
2. Tell of the origin and early history of this breed.
3. Give an account of the O. I. C. strain.
4. Tell of the distribution of Chester Whites.
5. What can be said of their different types?
6. For what is the breed best adapted?
7. What are the most popular crosses with this breed in Canada? In the United States?
8. Discuss their early maturity, and the size of litters.

CHAPTER VIII.

THE DUROC-JERSEY BREED.

Description.—The Duroc-Jersey is similar to the Chester White and Poland-China in size, the tendency of modern methods of breeding being towards a medium-sized hog with rather fine bone. The snout is of medium length, the face slightly dished or straight, and the ear drooped, much the same as that of the Chester White. The jowl is heavy, the body wide and deep, and the ham heavily fleshed. The legs are short, the bone medium in weight, and the body is noted more for thickness and depth than for length. (Compare Figs. 22 and 23.)

Cherry red is the popular color, but yellowish red and chestnut are often seen. A few black spots on the belly and legs do not disqualify, but are objectionable. Black markings on any other part of the body are very serious objections.

Origin and History.—Red pigs have existed in the United States for a great many years, and there seems to be no satisfactory account of their origin. It is stated that slave traders brought in a red breed of hogs from western Africa, known as the *Guinea* breed. Also, it is said that Henry Clay imported red pigs from Spain in 1837, and that Daniel Webster brought red pigs from Portugal in 1852. Further, it is claimed that the Berkshire, which was freely marked with red or sandy hair in early days, was a factor in the formation of some of the red varieties. Whatever their origin, a large, red breed of hogs attained to considerable prominence in New Jersey, and eventually became known as *Jersey Reds*. The Jersey Red was a large breed with large, lopped ears and good length of

body. It was rather long in the leg and coarse in bone and hair, but was valued on account of its size, strong constitution, and rapid growth.

The Duroc originated in Saratoga County, New York, and is said to be the result of crossing a red boar upon the sows of the district. It is uncertain whether the boar came

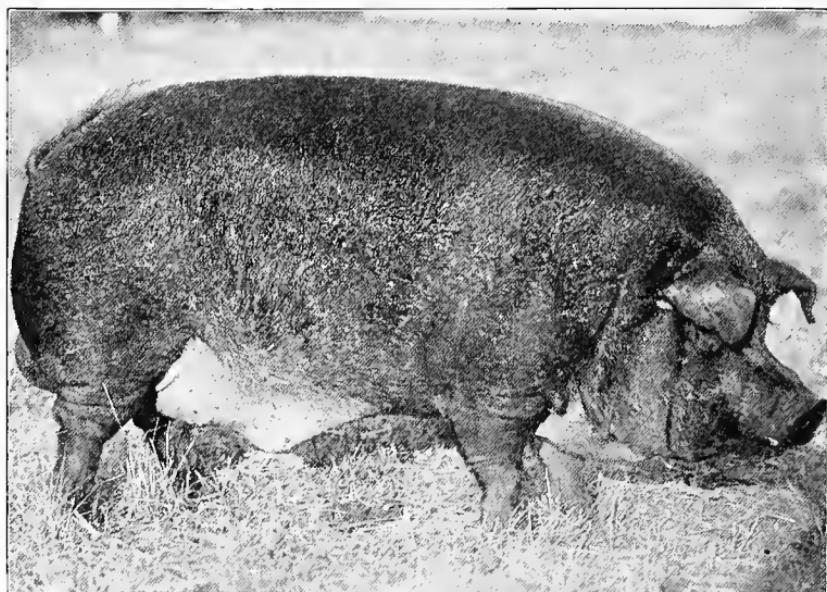


FIG. 22.—Duroc-Jersey boar. An Iowa championship winner.

from another part of New York State or from England. It is said that the boar was named "Duroc" after a famous stallion, and hence the name of the breed.

The breeders of Jersey Reds and Durocs eventually came together, and the two breeds were blended into one under the name of Duroc-Jersey, the official amalgamation taking place in 1883.

Distribution.—The most important centres for Duroc-Jerseys are Iowa, Illinois, Nebraska, Kansas, Missouri, Indiana, Ohio, Minnesota, Oklahoma, Texas, Kentucky, Tennessee, Michigan, and Wisconsin, but the breed is also quite largely represented in many other states. It has also been introduced into Canada, but is not largely represented.

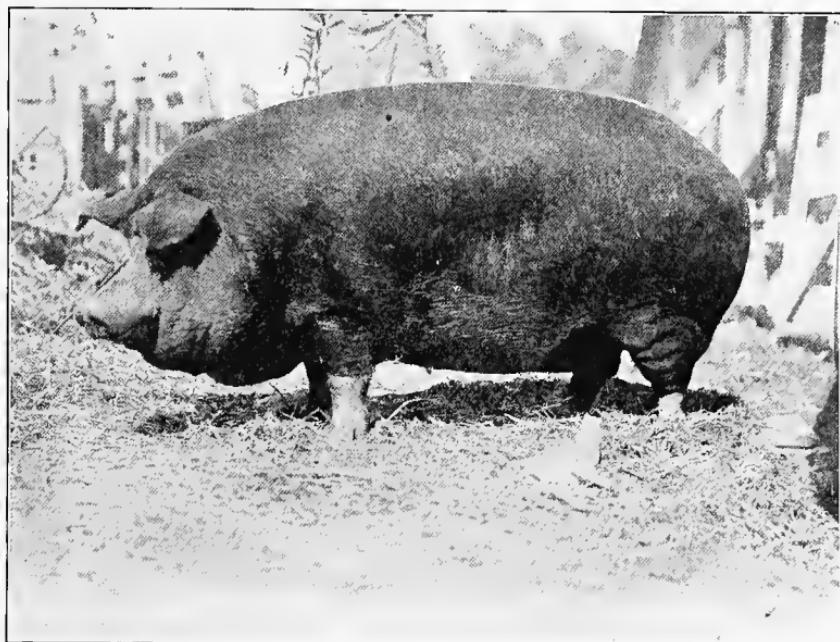


FIG. 23.—Two-year-old Duroc-Jersey sow, an Illinois State Fair Champion.

Types.—Considerable variation is found in the type of Duroc-Jerseys, as is also the case with other breeds. It is claimed by some, that breeders have gone too far in their efforts to produce a fine-boned, smooth animal, in that they have sacrificed too much of size and fecundity in doing so. Be this as it may, breeders are to be found who are producing hogs of more bone and greater size, and their hogs are attract-

ing considerable attention among those interested in the breed.

Utility.—As the Duroc-Jersey is essentially of the fat or lard type, it seems to be meeting the demands of the American packer in a satisfactory manner. It is an early maturing hog, and is capable of making cheap gains. In this respect it is probably quite equal to other breeds. It has a good reputation as a grazer, and also thrives well upon a corn diet. It has an advantage over white breeds in that its skin does not blister with the sun, a fact that is causing it to gain favor in the South. Its meat is similar in quality to that of the Poland-China and Chester White, when fed under similar conditions.

For a fat hog, the Duroc-Jersey is prolific, and it crosses well with other breeds, especially the Berkshire and Poland-China. As improvers of common stock the boars bear a good reputation.

Duroc-Jersey Score Card.—Following is the scale of points and description adopted by the American Duroc-Jersey Record:

	Counts.		Counts.
Head and face	4	Hams and rump	10
Eyes	2	Legs and feet	10
Ears	2	Tail	1
Neck	2	Coat	2
Jowl	2	Color	2
Shoulders	6	Size	5
Chest	12	Action and style	4
Back and loin	15	Condition	4
Sides and ribs	8	Disposition	3
Belly and flank	6		
		Total	100

Disqualifications.—*Form.*—Ears standing erect; small, cramped chest, and crease back of shoulders and over back so as to cause a depression in the back easily noticed; seriously deformed legs or badly broken-down feet.

Size.—Very small, or not two-thirds large enough as given by the standard.

Score.—Less than fifty points.

Pedigree.—Not eligible to record.

Detailed Description.—*Head and Face.*—Head small in proportion to size of body; wide between eyes; face nicely dished (about half-way between a Poland-China and a Berkshire) and tapering well down to the nose; surface smooth and even.

Objections.—Large and coarse; narrow between the eyes; face straight; crooked nose, or too much dished.

Eyes.—Lively, bright, and prominent.

Objections.—Dull, weak, and obscure.

Ears.—Medium; moderately thin; pointing forward, downward, and slightly outward, carrying a slight curve; attached to head very neatly.

Objections.—Very large; nearly round; too thick; swinging or flabby; not of same size; different position and not under control of animal.

Neck.—Short, thick, and very deep and slightly arching.

Objections.—Long, shallow, and thin.

Jowl.—Broad, full, and neat; carrying fulness back to point of shoulders and on a line with breastbone.

Objections.—Too large, loose, and flabby; small, thin, and wedging.

Shoulders.—Moderately broad; very deep and full; carrying thickness well down and not extending above line of back.

Objections.—Small; thin; shallow; extending above line of back. Boars under one year old heavily shielded.

Chest.—Large; very deep; filled full behind shoulders; breastbone extending well forward so as to be readily seen.

Objections.—Flat; shallow, or not extending well down between forelegs.

Back and Loin.—Back medium in breadth; straight or slightly arching; carrying even width from shoulder to ham; surface even and smooth.

Objections.—Narrow; crease behind shoulders; swayed or humped back.

Sides and Ribs.—Sides very deep; medium in length; level between shoulders and hams and carrying out full down to line of belly. Ribs long, strong, and sprung in proportion to width of shoulders and hams.

Objections.—Fatty, creased, shallow, and not carrying proper width from top to bottom.

Belly and Flank.—Straight and full and carrying well out to line of sides. Flank well down to lower line of sides.

Objections.—Narrow; tucked up or drawn in; sagging or fatty.

Hams and Rump.—Broad, full, and well let down to the hock; buttock full and coming nearly down and filling full between hocks. Rump should have a round slope, from loin to root of tail; same width as back and well filled out around tail.

Objections.—Ham narrow; short, thin; not projecting well down to hock; cut up too high in crotch. Rump narrow; flat or peaked at root of tail; too steep.

Legs and Feet.—Medium size and length; straight, nicely tapered; wide apart and well set under the body; pasterns short and strong. Feet short, firm, and tough.

Objections.—Legs extremely long, or very short; slim; coarse; crooked; legs as large below knee and hock as above;

set too close together; hocks turned in or out of straight line. Hoofs long; slim and weak; toes spreading or crooked.

Tail.—Medium; large at base and nicely tapering and rather bushy at end.

Objections.—Extremely heavy; too long and ropy.

Coat.—Moderately thick and fine; straight, smooth, and covering the body well.

Objections.—Too many bristles; hair coarse, harsh, and rough; wavy or curly; swirls; or not evenly laid over the body.

Color.—Cherry red without other admixtures.

Objections.—Very dark red or shading to brown; very pale or light red; black spots over the body; black flecks on belly and legs not desired, but admissible.

Size.—Large for age and condition. Boars two years old and over should weigh 600 pounds; sow same age and condition, 500 pounds. Boar eighteen months, 475 pounds; sow, 400 pounds. Boar 12 months, 350 pounds; sow, 300 pounds. Boar and sow pigs six months, 150 pounds. The figures are for animals in a fair show condition.

Objections.—Rough and coarse and lacking in feeding qualities.

Action and Style.—Action vigorous and animated. Style free and easy.

Objections.—Dull or stupid; awkward and wabbling. In boars, testicles not easily seen nor of same size or carriage; too large, or only one showing.

Condition.—Healthy; skin free from scurf, scales, sores, and mange; flesh evenly laid over the entire body and free from any lumps.

Objections.—Unhealthy; scurfy; scaly; sores; mange; too fat for breeding purposes; hair harsh and standing up; poor feeders.

Disposition.—Very quiet and gentle; easily handled or driven.

Objections.—Wild, vicious, or stubborn.

REVIEW.

1. Compare the Duroc-Jersey breed with other lard breeds as to size, color, snout, ears, and legs.
2. Give an account of the early history of this breed.
3. Tell of the origin of the compound name.
4. What are the most important centres for Duroc-Jersey swine?
5. Tell of the variations in type of this breed.
6. What can you say of their utility?
7. Mention several disqualifying points in the judging of pure-bred Duroc-Jerseys.
8. Contrast the correct form with the objectionable form for hams and rump; sides and ribs; back and loin.

CHAPTER IX.

THE HAMPSHIRE BREED (THIN RIND).

Description.—The Hampshire belongs to the class of medium-sized hogs. The face is straight, and the ear inclines forward but does not droop like that of the Poland-China. The jowl, shoulder, and ham are somewhat lighter than those of a typical fat hog. As a rule, too, it has less width of back, a little more length of side, and slightly less depth of side than a hog of the strictly fat class. The breed may be described as somewhere between the bacon type and the fat type in conformation. (Fig. 24.)

Mr. H. F. Work, at one time secretary of the Breed Association, describes the color as follows: "In color they are either listed or blacks, the most fashionable color consisting of black extremities with a white belt, from four to twelve inches wide, encircling the body and including the fore legs, which should also be white." The term "listed" refers to the presence of the white belt. Mr. Work also states that there are some breeders who try to run their herds all black, and he claims that breeders should not be too particular regarding color, with the exception that white spots should not be tolerated.

Origin and History.—Originally this breed was known by the name *Thin Rind*, but in 1904 the name was changed to *Hampshire*, which is now the official name of the breed.

According to Mr. Work, the Hampshire traces to pigs brought to Massachusetts from Hampshire, England, about 1820 or 1825. It is said that descendants of this importation were taken to Kentucky about 1825. In any case, the breed



FIG. 24.—Herd of Hampshire swine, winners of first prize at the Louisiana Purchase Exposition

has been known in Kentucky for many years, but it seems impossible to obtain definite and reliable information regarding its origin.

As shown by the secretary of the American Hampshire Swine Record Association, the breed has made rapid progress of late years, but, in comparison with the older established breeds, the number in any one state is not large, owing to the fact that the Hampshire has only recently come into prominence. In recent years the breed has found its way into Canada, but it has not had time to become widely distributed in Canada as yet.

Types.—Though Hampshires may vary in color, they appear to be quite uniform in general type. Possibly, as the breed becomes more numerous and better known, variations in type may become more apparent.

Utility.—It is generally claimed that the Hampshire is a bacon hog, but, in this connection, we must bear in mind that what the American packer calls a bacon hog is very different, as a rule, from the hog which is suitable for making Wiltshire sides for export to Great Britain. Judged from the standpoint of suitability for making export Wiltshire sides, the Hampshire falls far short of requirements, as it is too short in the side, too thick in the shoulder and back, and too heavy in the neck to make a really good Wiltshire side. Inasmuch as the terms "bacon hog" and "bacon type" have been used throughout this treatise to apply only to hogs suitable for supplying export Wiltshire sides, we prefer not to class the Hampshire as a hog of bacon type, though it is well suited for supplying bacon for home consumption.

In quality of flesh the Hampshire has a high reputation. It has made a good record in the dressed carcass competitions at the International Live Stock Exposition at Chicago, and

the packers appear to hold it in high esteem. Its flesh carries a high per cent of lean and is generally fine-grained.

In early maturity and feeding qualities the Hampshire seems to be giving good satisfaction to those who are handling it, and it is highly esteemed as a grazer. It is an active, hardy breed, and there is no apparent reason why it should not give as good an account of the feed it consumes as any other breed.

The Hampshire ranks high in point of fecundity and is one of the most prolific of American breeds. Its value for cross-breeding is not well known, but it seems reasonable to suppose that it should cross well with the fat types of hogs.

Hampshire Score Card.—Following is the standard of excellence adopted by the American Hampshire Swine Record Association:

	Counts.		Counts.
Head and face	4	Legs and feet	10
Eyes	2	Tail	1
Ears	2	Coat	2
Neck	2	Color	2
Jowl	2	Size	5
Shoulders	6	Action and style	4
Chest	12	Condition	4
Back and loin	15	Disposition	3
Sides and ribs	8		
Belly and flank	6	Total	100
Hams and rump	10		

Disqualifications.—*Color.*—Spotted or more than two-thirds white.

Form.—Any radical deformity, ears very large or drooping over eyes, crooked or weak legs or broken-down feet.

Condition.—Seriously impaired or diseased, excessive grossness, barrenness in animals over two years of age, chuffy or squabby fat.

Size.—Not two-thirds standard weight.

Pedigree.—Not eligible to record.

Detailed Description.—*Head and Face.*—Head medium length, rather narrow, cheeks not full; face nearly straight and medium width between the eyes, surface even and regular.

Objections.—Head large, coarse, and ridgy; nose crooked or much dished.

Eyes.—Bright and lively, free from wrinkles or fat surroundings.

Objections.—Small, deep, or obscure, or vision impaired by fat or other cause.

Ears.—Medium length, thin, slightly inclined outward and forward.

Objections.—Large, coarse, thick, large or long knuck, drooping or not under good control of the animal.

Neck.—Short, well set to the shoulders, tapering from shoulder to head.

Objections.—Long, thick, or bulky.

Jowl.—Light and tapering from neck to point, neat and firm.

Objections.—Large, broad, deep, or flabby.

Shoulders.—Deep, medium width and fulness, well in line with back.

Objections.—Narrow on top or bottom; thick beyond line with sides and hams.

Chest.—Large, deep and roomy; full girth; extending down even with line of belly.

Objections.—Narrow at top or bottom, small girth, cramped or tucked up.

Back and Loin.—Back straight or slightly arched; medium breadth, with nearly uniform thickness from shoulders to hams and full at loins; sometimes higher at hips than at shoulders.

Objections.—Narrow, creased, or drooped behind shoulders; surface ridgy or uneven.

Sides and Ribs.—Sides full, smooth, firm; carrying size evenly from shoulder to hams; ribs strong, well sprung at top and bottom.

Objections.—Sides thin, flat, flabby, or creased, or ribs not well sprung.

Belly and Flank.—Straight and full, devoid of grossness; flank full and running nearly on line with sides.

Objections.—Belly sagging or flabby; flank thin or tucked up.

Hams and Rump.—Hams of medium width, long and deep; rump slightly rounded from loin to root of tail; buttock full and neat and firm, devoid of flabbiness or excessive fat.

Objections.—Ham narrow; cut too high in crotch, buttock flabby; rump too flat, too narrow, or too steep, or peaked at root of tail.

Legs and Feet.—Legs medium length, set well apart and squarely under body, wide above knee and hock and rounded and well muscled below, tapering; bone medium; pasterns short and nearly upright; toes short and firm, enabling the animal to carry its weight with ease.

Objections.—Legs too long, slim, crooked, coarse, or short; weak muscles above hock and knee bone; large and coarse legs without taper; pasterns too long to correspond with length of leg, too crooked, or too slender; feet long, slim, and weak; toes spreading, too long, crooked, or turned up.

Tail.—Medium length, slightly curled.

Objections.—Coarse, long, clumsy, swinging like a pendulum.

Coat.—Fine, straight, smooth.

Objections.—Bristles or swirls, coarse or curly.

Color.—Black, with exception of white belt encircling the body, including fore legs.

Objections.—White running high on hind legs or extending more than one-fourth length of body, or solid black.

Size.—Large for condition; boar two years old and over, 450; sow, same age, 400; eighteen months' boar, 350; sow, 325; twelve months' boar or sow, 300; six months', both sexes, 140.

Action and Style.—Active, vigorous, quick, and graceful; style attractive and spirited.

Objections.—Dull, sluggish, and clumsy.

Condition.—Healthy; skin free from all defects; flesh evenly laid on and smooth and firm, not patchy, and devoid of all excess of grossness.

Objections.—Skin scurfy, scaly, mangy, or otherwise unhealthy; hair harsh; dwarfed or cramped; not growthy.

Disposition.—Docile, quiet and easily handled.

Objections.—Cross, restless, vicious, or with no ambition.

REVIEW.

1. Compare the Hampshires with the typical fat swine.
2. Tell of their color; what is meant by "listed"?
3. What is the origin of the name "Hampshire"? By what other name is it known?
4. Tell of the origin and early importations of these hogs.
5. Compare the Hampshires with the typical bacon hogs.
6. Tell of their quality of flesh.
7. What is said of their early maturity, feeding qualities, and size of litters?
8. Mention the disqualifications for Hampshires.

CHAPTER X.

THE LARGE YORKSHIRE OR LARGE WHITE BREED.

Description.—The Large Yorkshire is one of the largest of the breeds of swine. The face is slightly dished, and the snout should be of medium length and practically straight. "Turned-up" snouts, which were common at one time, are not popular with Large Yorkshire breeders at present. The jowl should be of good width and muscular, but not flabby nor heavily loaded with fat. The ears are large, and sometimes incline forward, especially in old animals, but an erect ear, firmly attached to the head, is preferred. The ear should not be coarse, and should be fringed with fine hair. The shoulder and back are of only medium width, the side is long, and the ham carries very little surface fat, making it lighter than the ham of the fat or lard hog. (Fig. 25.) The ham generally has a tapering appearance toward the hock, and should be well fleshed on the inside of the thigh, but there should be no wrinkles or flabbiness. The bone is fairly heavy, but should be clean-cut in appearance, and the leg is longer than the leg of a fat hog.

The color is white. Black hairs should disqualify, but black or blue spots on the skin do not disqualify. The aim of the breeders is to reduce these skin spots to a minimum, and they object seriously to an animal which shows considerable patches of dark-colored skin.

Origin and History.—The Large Yorkshire is of English origin, and is descended from a race of large, coarse-boned, leggy, white hogs which were common in Yorkshire and adjacent counties for a great many years, but whose origin

seems to be unknown. Owing to the great size of the original type, it was possible to cross them with finer breeds and still retain plenty of size in the improved animal. The main improvement in the breed has taken place within the past sixty or seventy years, and it is said that the first important step was the crossing of the Yorkshire with the White Leicester,

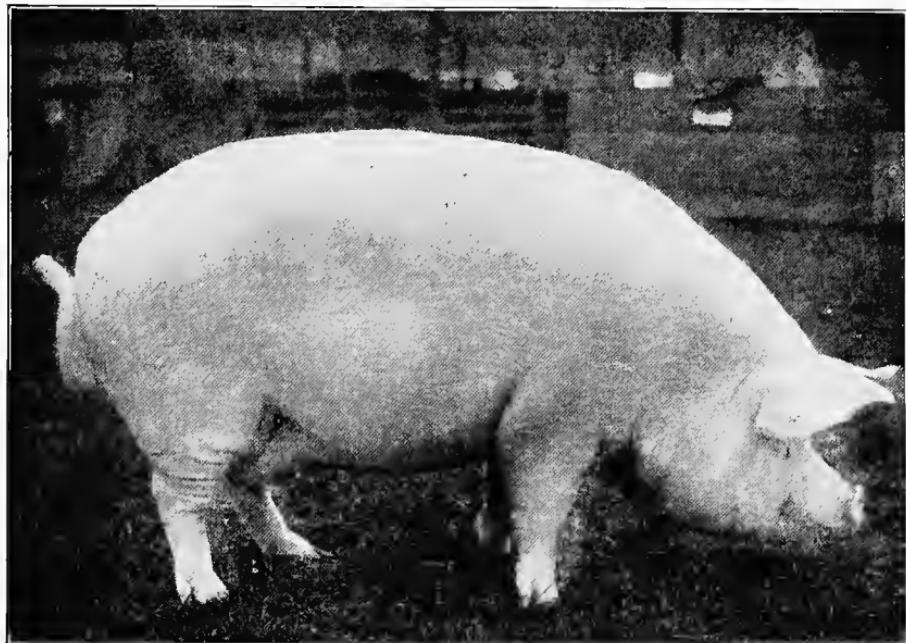


FIG. 25.—Large Yorkshire sow, champion at the English Royal Show. The illustration shows a little weakness in hind pasterns, but the sow is not standing well.

which was a large breed, but finer in the bone and more easily fattened than the old Yorkshire. It is also said that the White Leicester resulted from crossing a white Chinese breed with the original Yorkshire.

Further improvement was effected by crossing with the Small White breed of England,—at least, such is the claim made by some authorities, though we have no very definite

information regarding the various steps taken in improving the breed. Careful selection in the hands of skilful breeders has done much to improve the breed within recent years.

Though "Large White" hogs have been brought into the United States at various times during the past century, the first importation of the improved type of Large Yorkshire was made in 1892.

Distribution.—The headquarters for the breed is Minnesota, though representatives are to be found in nearly all the states of the Union. Outside of Minnesota, the states of North Dakota, South Dakota, Iowa, New York, Ohio, Michigan, Wisconsin, Virginia, and Massachusetts are probably the most important centres for the breed.

In Canada the breed has made greater progress than in the United States, and is largely represented in every province, especially in Ontario. The fact that Canada has been making a specialty of export bacon is responsible, in a large measure, for the prominence which the breed has attained.

Large Yorkshires also occupy a very important place in Denmark, and there are comparatively few countries of any importance from a live-stock stand-point where the breed is not represented.

Types.—Large Yorkshires are inclined to vary more or less in type, and it requires skill in selection to keep them true to the best type. It used to be quite common to find short, turned-up snouts among representatives of the breed, but, since this style of snout is commonly associated with a heavy jowl, neck, and shoulder, the best breeders are striving to eliminate it. Another type sometimes met with has a long, scrawny neck, narrow chest, and long, coarse-boned legs. This type generally has plenty of length and a smooth shoulder, but it is apt to be a slow feeder, and possesses too much bone

and too thick a skin, together with a lack in quantity and quality of flesh. The best type of Large Yorkshire has sufficient length to make a good Wiltshire side, and has constitution and quality to such a marked degree that it is unexcelled from a feeder's stand-point. Generally speaking, American breeders incline towards a rather shorter and thicker type than is popular with Canadian breeders. (Fig. 26.)

Utility.—The Large Yorkshire is highly valued for bacon production, where a long side abounding in lean meat, and a



FIG. 26.—Champion and reserve champion Large Yorkshire sows at the Louisiana Purchase Exposition.

light shoulder and neck, are especially desirable. For quality of bacon, it is rivalled only by the Tamworth. The large proportion of lean to fat, the thick, fleshy belly, and great length of side render the breed peculiarly desirable from the bacon-curer's and the consumer's stand-point. At the Ontario Provincial Winter Fair, held annually at Guelph, Canada, Large Yorkshires and their grades always take a prominent place in the bacon carcass competition, and carry off a large share of the prizes.

The Large Yorkshire is spoken of quite commonly as being slower in maturing than the fat types of hogs, but this is not a fair way of stating the case. From a bacon-curer's stand-point, Large Yorkshires will reach desirable market weight and condition at as early an age as any existing breed, and there are few breeds which equal them in this respect. Therefore, so far as the farmer, who is feeding hogs for the export bacon trade, is concerned, no breed excels the Large Yorkshire in point of early maturity. For the production of a very fat carcass at an early age, the Large Yorkshire is not so well adapted as the fat or lard types. It is a special purpose breed, and for that special purpose will mature just as early, or earlier, than almost any other breed.

From the fact that it grows rapidly and develops bone and muscle more rapidly than it forms fat, feeders are inclined to regard the Large Yorkshire as an expensive hog to feed; but experiments go to show that such is not the case, and that, under most circumstances, it is capable of giving as large gains for feed consumed as any other breed. Probably it is not so well adapted to grazing as some other breeds, and a hot sun is apt to blister its skin. It is possible, too, that it would not thrive so well as some other breeds upon an exclusive corn ration. Where a mixed ration is used, and especially where pen feeding is practised, it gives a good account of the feed it consumes.

The large size and the strong bone of the Large Yorkshire make it valuable for crossing upon breeds that have become unduly fine in the bone and that lack size. It crosses well with almost any of the fat breeds, increasing the size and the proportion of lean without injuring the feeding qualities. Large Yorkshire sows are prolific and are good nurses, and the boars are exceptionally prepotent, stamping their char-

acter and color upon their progeny to a remarkable degree, no matter with what they are crossed.

The Large Yorkshire Score Card.—Standard of excellence and scale of points for Large Yorkshires adopted by the American Yorkshire Club:

	Counts.
<i>General Outline</i> —Long and deep in proportion to width, but not massive; slightly arched in the back, symmetrical and smooth, with body firmly supported by well-placed legs of medium length.	5
<i>Outline of Head</i> —Moderate in length and size, with lower jaw well sprung, and considerable dish toward snout, increasing with advanced maturity	4
<i>Forehead and Poll</i> —Wide	1
<i>Eye</i> —Medium size, clear and bright	1
<i>Jowl</i> —Medium, not carried too far back toward neck, and not flabby.	1
<i>Snout</i> —Turning upward with a short curve, increasing with age.....	1
<i>Ear</i> —Medium in size, standing well out from head, or medium erection and inclining slightly forward	1
<i>Neck</i> —Of medium length, fair width and depth, rising gradually from poll to withers, muscular, but not gross, evenly connecting head and body	3
<i>Outline of Body</i> —Long, deep, and of medium breadth; equally wide at shoulder, side, and hams; top line slightly arched, under line straight	7
<i>Back</i> —Moderately broad, even in width from end to end; strong in loin, short ribs of good length	10
<i>Shoulder</i> —Large but not massive, not open above.....	6
<i>Arm and Thigh</i> —Broad and of medium length and development.....	2
<i>Brisket</i> —Wide and on a level with under line.....	3
<i>Side</i> —Long, deep, straight and even from shoulder to hip.....	8
<i>Ribs</i> —Well arched and deep.....	5
<i>Heart Girth and Flank Girth</i> —Good, and about equal.....	8
<i>Hind Quarters</i> —Long, to correspond with shoulder and side, deep, with moderate and gradual droop to tail.....	5
<i>Ham</i> —Large, well let down on thigh and twist and rear outline somewhat rounded	10
<i>Twist</i> —Well down and meaty	1
<i>Tail</i> —Medium, not much inclined to curl	1
<i>Legs</i> —Medium in length, strong, not coarse, but standing straight and firm	5
<i>Hair</i> —Abundant, long, of medium fineness, without any bristles.....	4

<i>Skin</i> —Smooth and white, without scales, but dark spots in the skin do not disqualify	2
<i>Color</i> —White on every part.....	1
<i>Movement</i> —Active, but not restless.....	5
Total	100

REVIEW.

1. Give a general description of the Large Yorkshire breed.
2. Tell of the history of the development of this breed.
3. Tell of their importation and present distribution.
4. What is said of their variation in type?
5. Tell of their importance as bacon hogs.
6. What is said regarding their slowness of maturing?
7. Why is the breed not popular in the corn belt? Why not popular in the South?
8. Tell of the value of the breed in crossing with other types.
9. Contrast the breed with the fat type swine: jowl, outline of body, shoulder, side, ribs, and ham.

CHAPTER XI.

THE TAMWORTH BREED.

Description.—The Tamworth ranks with the Large Yorkshire in size. It has a rather long, straight snout, and usually has little or no dish to the face. The ear is large, firmly attached, generally inclined slightly forward, and fringed with fine hair. The ear should be quite thin, and it is rather more pointed than that of the Large Yorkshire. The Tamworth has a very light jowl, and a light neck and shoulder. (Fig. 27.) The back and loin are of medium width, and the side of good length, but only moderate depth as compared with a fat hog. Quite commonly the ham is deficient (Fig. 28), and breeders are making an effort to strengthen this point. The bone is fairly heavy, and the leg looks long compared with that of a fat hog.

According to the standard of the National Pig Breeders' Association of Great Britain, the Tamworth should have "golden-red hair on a flesh-colored skin, free from black," but the shade of red varies considerably in individuals and a chestnut shade is quite common. The color generally grows darker with age, and the color of some aged animals is such a dark shade of chestnut that the casual observer might easily mistake it for a dull black. (Fig. 27.)

Origin and History.—The Tamworth is of English origin, and takes its name from Tamworth in Staffordshire. The breed is of ancient and uncertain origin, no well-authenticated account of where it came from being available. Originally it was an extremely leggy, narrow type of hog, and it is not clear whether improvement was effected entirely by selection

or whether cross-breeding was resorted to. The Tamworth is one of the oldest of English breeds, but it was not given a separate class at the Royal Show until 1885.

Distribution.—Tamworths were brought to the United States nearly thirty years ago, but they have not made rapid progress. Possibly the long snout tends to prejudice the



FIG. 27.—Tamworth boar. An English Royal winner.

farmer against them, but the fact that the production of bacon hogs receives scant encouragement in the United States is an important factor in deterring the progress of the breed. Representatives of the breed are to be found in a number of states, notably in Illinois, Kentucky, Iowa, Kansas, Texas, Wisconsin, and Ohio.

Tamworths have made much more progress in Canada

than in the United States, though they are not so numerous as the Large Yorkshire. They are to be found in practically every province of Canada, but Ontario is the principal centre for the breed. England and Canada take the lead in the production of Tamworths.

Utility.—The Tamworth is especially adapted to the

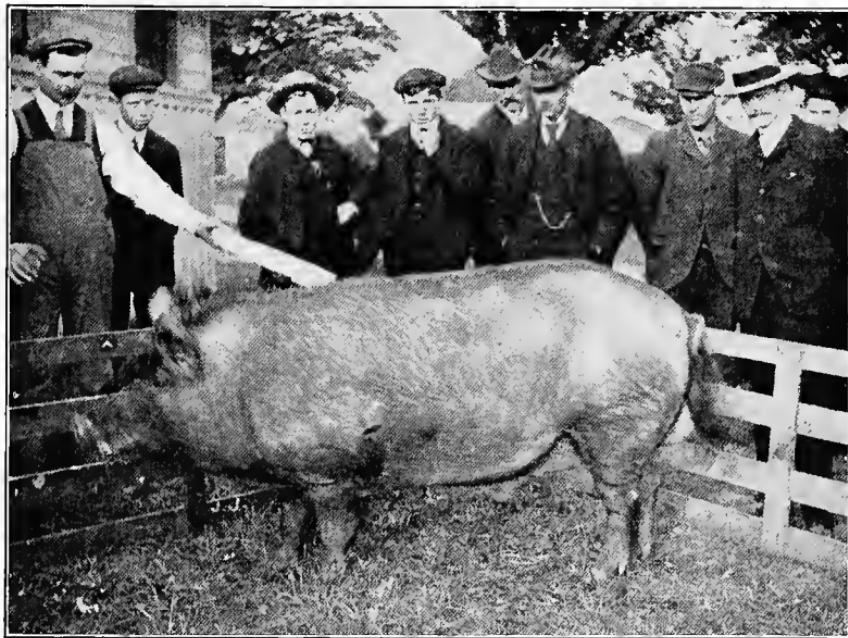


FIG. 28.—Tamworth boar, a Canadian-bred prize winner.

production of export bacon, or a class of bacon which carries a large proportion of lean to fat.

In early-maturing qualities it is similar to the Large Yorkshire, producing a bacon carcass fit for export at as early an age as any other breed, but for producing a fat carcass at an early age the Tamworth is not so well suited as some other breeds. For bacon production, therefore, the Tamworth

matures early, and it is from the bacon stand-point that this breed must always be judged.

There is a popular belief that the Tamworth does not make economical use of feed, but experimental work shows that this belief is not well founded, and that the Tamworth compares very favorably with other breeds as an economical

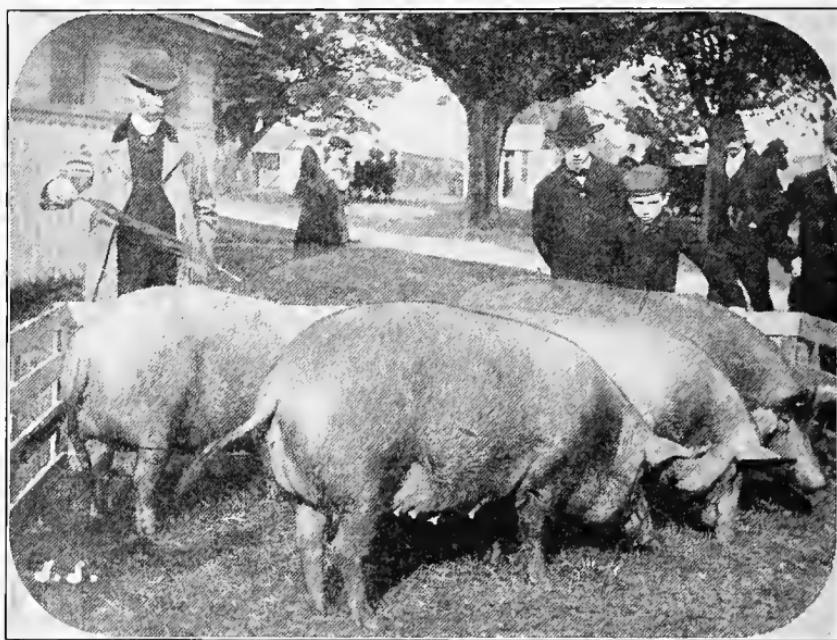


FIG. 29.—Group of Tamworth sows.

producer of meat. Like the Large Yorkshire, it is probably rather better adapted to pen feeding than to pasturing, but its ability to stand heavy corn feeding is practically unknown.

It is claimed by its admirers that the Tamworth produces higher-class bacon than any other breed, but where it has come into competition with the Large Yorkshire in dressed carcass competitions the Large Yorkshire has carried off the larger

share of the prize money. There is no question, however, that the Tamworth produces bacon of exceptionally fine quality; well mixed with lean, and fine in the grain. The Large Yorkshire and the Tamworth are the only strictly bacon breeds with which we are familiar in America.

Being a large breed with strong bone (Figs. 29 and 30),

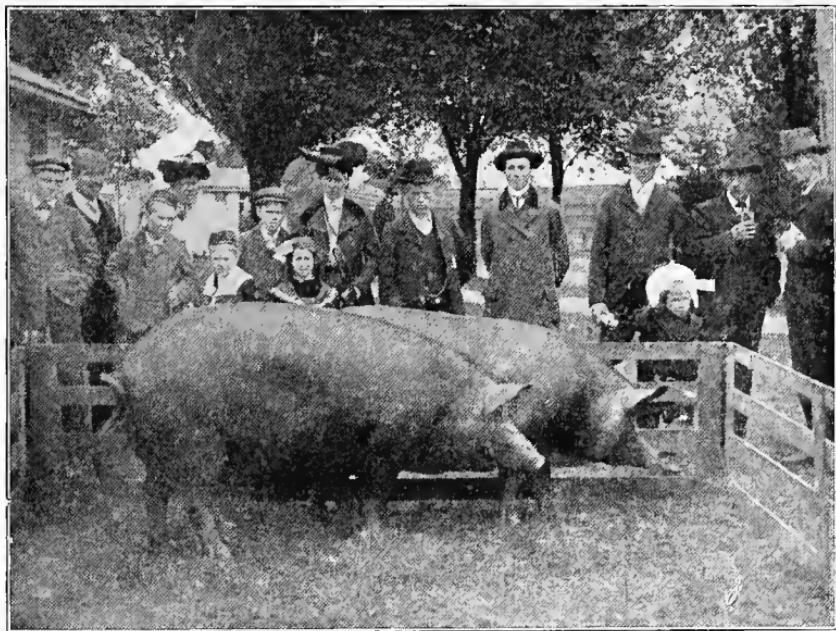


FIG. 30.—Pair of Tamworth sows, winner at leading Canadian fairs.

the Tamworth is suitable for crossing upon finer and fatter breeds, and is very popular for this purpose where it is best known. The boars are prepotent to quite a marked degree, and the sows are good mothers, being prolific and good nurses.

The Tamworth Standard.—Following is the standard of excellence for Tamworths adopted by the National Pig Breeders' Association of Great Britain:

Color—Golden-red hair on a flesh-colored skin, free from black.

Head—Fairly long, snout moderately long and quite straight, face slightly dished, wide between ears.

Ears—Rather large, with fine fringe, carried rigid and inclined slightly forward.

Neck—Fairly long and muscular, especially in boar.

Chest—Wide and deep.

Shoulders—Fine, slanting, and well set.

Legs—Strong and shapely, with plenty of bone and set well outside body.

Pasterns—Strong and sloping.

Feet—Strong and of fair size.

Back—Long and straight.

Loin—Strong and broad.

Tail—Set on high and well tasselled.

Sides—Long and deep.

Ribs—Well sprung and extending well up to flank.

Belly—Deep, with straight under line.

Flank—Full and well let down.

Quarters—Long, wide, and straight from hip to tail.

Hams—Broad and full, well let down to hocks.

Coat—Abundant, long, straight, and fine.

Action—Firm and free.

Objections—Black hair, very light or ginger hair, curly coat, coarse mane, black spots on skin, slouch or drooping shoulders, wrinkled skin, infant knees, hollowness at back of shoulders.

REVIEW.

1. Give the points of resemblance and of difference between the Tamworth and the Large Yorkshire breeds.
2. Tell of the standard color of Tamworths.
3. Give the origin and history of this breed.
4. When were they first imported? What is their present distribution in America?
5. What is the special use of the breed.
6. Why do swine of the bacon type seem to mature more slowly than those of the fat type?
7. What do experiments show regarding their economical use of feed?
8. What is claimed for their quality of bacon?
9. What uses are made of Tamworths in crossing?

CHAPTER XII.

THE VICTORIA BREED.

Description.—The Victoria is a medium-sized breed, being similar in size to the Berkshire. It has a rather short snout, dished face, and a medium-sized, erect ear, which is firmly attached to the head. (Fig. 31.) The jowl is full, the neck short, the shoulder wide, the body broad and deep, and the ham well developed. The legs are short, and the bone rather fine and of good quality.

The color is white, with occasional dark spots on the skin.

Origin and History.—At one time there were two breeds of Victoria swine, but only one breed is now recognized. The breed which is now known originated in the hands of George F. Davis, Dyer, Indiana, and was formed by combining the blood of the Poland-China, Berkshire, Chester White, and Suffolk, and by careful selection of resulting types which were deemed satisfactory. The breed had its origin about 1870.

About 1850 a breed known as the Victoria was originated by Colonel F. D. Curtis of New York State. It is said to have resulted from a combination of Irish Grazier, Byfield, Yorkshire, and Suffolk blood. This breed is not now generally recognized as a distinct breed.

Distribution.—According to Professor Plumb, the Victoria is found mainly in Indiana, Ohio, and Illinois, with odd herds in a few other states. For some reason, the breed does not seem to make much progress and is not at all widely known.

Utility.—The Victoria belongs to the fat class of hogs. There seems to be a dearth of experimental data bearing upon the early maturity and feeding qualities of the Victoria, but

the fact that it has not gained more rapidly in popularity would indicate that farmers do not think that it possesses any advantages over other breeds. The quality of the meat is said to be good, and the breed also bears a good reputation for being prolific. The value of the breed for crossing purposes is not well known.

Victoria Score Card.—Following is the scale of points adopted by the Victoria Swine Breeders' Association:

	Counts.		Counts.
Color	2	Flank	2
Head	3	Ham	12
Ears	2	Tail	2
Jowl	1	Legs	3
Neck	3	Feet	3
Shoulders	7	Hair	3
Girth aronnd heart ...	6	Action	4
Back	12	Symmetry	10
Sides	6		
Ribs	7	Total	100
Loin	12		

Detailed Description.—*Color.*—White, with occasional dark spots in the skin.

Head and Face.—Head rather small and neat. Face medium dished and smooth; wide between eyes; tapering from eyes to nose.

Eyes.—Medium size; prominent, bright; clear and lively in young, and quiet expression in aged animals.

Ears.—Small, thin, fine, silky; upright in young pigs, pointing forward and slightly outward in aged animals.

Neck.—Medium wide, deep, short, well arched, and full at top.

Jowl.—Medium full, nicely rounded, neat, and free from loose, flabby fat.

Shoulders.—Broad, deep, and full, not higher than line of back, and as wide as top of back.

Chest.—Large, wide, deep, and roomy, with large girth back of shoulders.

Back and Loin.—Broad, straight, or slightly arched; carrying same width from shoulders to ham; level and full at loin, sometimes slightly higher at hip than shoulders.

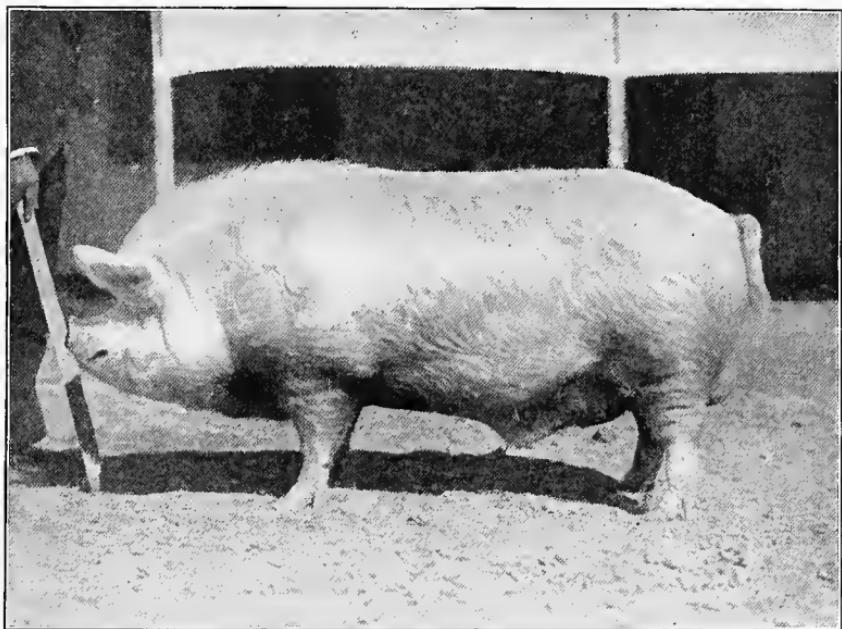


FIG. 31.—Two-year-old Victoria boar, winner of many first prizes in the United States.

Ribs and Sides.—Ribs well sprung at top; strong and firm; sides deep, full, smooth, and firm; free from creases.

Belly and Flank.—Wide; straight and full; as low or slightly lower at flank than at chest. Flank full and nearly even with sides.

Hams and Rump.—Hams long; full and wide; nicely rounded; trim and free from loose fat. Buttocks large and

full; reaching well down to hocks. Rump slightly sloped from end of loin to root of tail.

Legs and Feet.—Legs short; set well apart and firm; wide above knee and hock, tapering below. Feet small, firm, and standing well up on toes.

Tail.—Small; fine and tapering; nicely curled.

Coat.—Fine and silky; evenly covering the body.

Size.—Boar two years old and over when in good condition should weigh not less than 500 pounds; sow same age and condition, 450 pounds. Boar twelve months old, not less than 300 pounds; sows in good flesh, 300 pounds. Pigs 5 to 6 months old, 140 to 160 pounds.

Action.—Easy and graceful, but quiet.

Condition.—Healthy; skin clean, and white or pink in color; free from scurf; flesh firm and evenly laid on.

Disposition.—Quiet and gentle.

Disqualifications.—*Color.*—Other than white or creamy white, with occasional dark spots in skin.

Form.—Crooked jaws or deformed face; crooked or deformed legs; large, coarse, drooping ears.

Condition.—Excessive fatness; barrenness; deformity in any part of the body.

Pedigree.—Not eligible for record.

REVIEW.

1. Describe Victoria swine.
2. Are the ears drooping or erect? What other breeds are like them in this respect?
3. Tell of the origin and history of this breed.
4. What can you say of their popularity? Where are they mainly found?
5. What is said of their utility?

CHAPTER XIII.

THE CHESHIRE BREED.

Description.—The Cheshire (Fig. 32) is about medium size, but some specimens attain heavy weights. It is claimed that the Cheshire weighs well for its appearance, and that it is a heavier breed than is generally supposed. The face is slightly dished, and the ear rather small and erect. The bone is fine and of fair quality. The body is not noted for depth, but usually has good length, and the shoulders and hams are generally well developed.

The color is white. Black spots on the skin are objectionable, but do not disqualify.

Origin and History.—The Cheshire originated in Jefferson County, New York, and dates from about 1855. In a letter to Mr. F. D. Coburn, Mr. J. H. Sanders of Chicago, who bred Cheshires for some years, expresses the belief that the Cheshire is simply a derivative of the Yorkshire. Yorkshires were brought into Jefferson County and crossed with the white pigs of the district, and it is also believed that Suffolk blood entered into the combination which eventually resulted in the breed known as the Cheshire.

Distribution.—The Cheshire is found mainly in New York State, with a few herds scattered here and there in other states. It has made very slow progress, and is practically unknown outside of the United States.

Types.—In his letter to Mr. Coburn, previously referred to, Mr. Sanders states that in his herd he has produced “all the different types of Yorkshire, from the Large Yorkshire down to the Lancashire Short-face.” As bred at present, the

type probably does not vary in Cheshire any more than in other breeds.

Utility.—The Cheshire, as generally seen, belongs more to the fat than to the bacon class, though it should not be difficult to develop it into a fairly good bacon breed. It appears to be a good feeder, and its meat is admitted to be of excellent quality. The sows are fairly prolific, and the boars appear



FIG. 32.—Cheshire barrow.

to be prepotent, but very little is known regarding their value for crossing.

The Cheshire Score Card.—Following is the standard of excellence and scale of points adopted by the Cheshire Swine Breeders' Association:

	Counts.
<i>Head</i> —Short to medium in length, short in proportion to length of body	8
<i>Face</i> —Somewhat dished and wide between the eyes.....	8
<i>Jowl</i> —Medium in fulness	3

<i>Ears</i> —Small, fine, erect, and in old animals slightly pointing forward.	5
<i>Neck</i> —Short and broad	3
<i>Shoulders</i> —Broad, full and deep.....	6
<i>Girth around Heart</i>	8
<i>Back</i> —Long, broad and straight nearly to root of tail.....	10
<i>Sides</i> —Deep and full; nearly straight on bottom line.....	7
<i>Flank</i> —Well back and low down, making flank girth nearly equal to heart girth	3
<i>Hams</i> —Broad and nearly straight with back and running well down towards hock	10
<i>Legs</i> —Small and slim, set well apart, supporting body well on toes..	10
<i>Tail</i> —Small, slim, and tapering.....	3
<i>Hair</i> —Fine, medium in thickness and quantity.....	3
<i>Color</i> —White, any colored hairs to disqualify.....	2
<i>Skin</i> —Fine and pliable, small blue spots objectionable but allowable	3
<i>Symmetry</i> —Animal well proportioned, handsome, and stylish, and when grown and well fattened should dress from 400 to 600 pounds	8
 Total	 100

REVIEW.

1. Describe Cheshire swine.
2. Tell of the origin of the breed.
3. Where are they now found?
4. Tell of their variation, and their stability as compared to other breeds.
5. Tell of their type, and quality of meat.

CHAPTER XIV.

THE ESSEX BREED.

Description.—The Essex belongs to the small breeds, being decidedly smaller than such breeds as the Berkshire or Poland-China. The snout is short, the face slightly dished, the forehead broad, and the ears small, fine, and erect, but inclined to droop slightly with age. The jowl is heavy, the neck very short, the back broad, and the shoulders and hams largely developed. The legs are very short, and the bone fine, and the pig as a whole is compact, smooth, short, thick, and chunky.

The color is all black, no white being admissible. (Fig. 33.)

Origin and History.—The Essex is an English breed and takes its name from the county of Essex, where it was first known. The original Essex pig was a coarse, long-legged, hard-feeding animal, generally black and white in color. In 1830 Lord Western imported black Neapolitan pigs from Italy and crossed them with the Essex, effecting a very marked improvement. It is claimed that in the course of time Lord Western's pigs became somewhat weak in constitution and lacking in fecundity.

Soon after Lord Western commenced improving the Essex pigs, one of his tenants, named Fisher Hobbes, commenced breeding the Essex-Neapolitan, and evolved a strain superior to the pigs bred by Lord Western. The strain bred by Hobbes gained the name of Improved Essex, and acquired great popularity. The Improved Essex was imported into the United States in large numbers at one time, but importations have practically ceased.

Distribution.—It is not largely represented in the United States, but it is to be found scattered here and there in quite a number of states. A few herds exist in Canada, and the breed is to be found in Australia, in several European countries, and, of course, in England.

Types.—To meet the modern demand, many breeders of

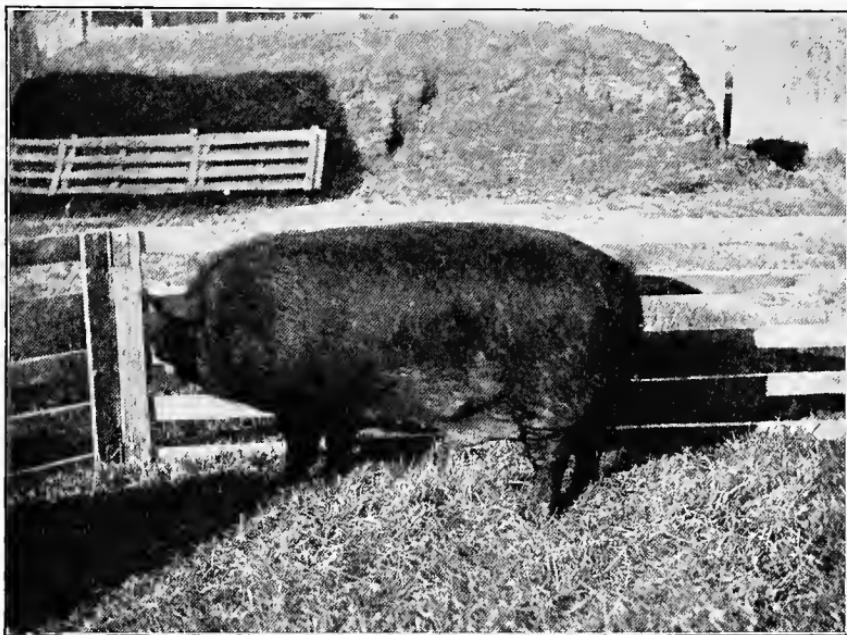


FIG. 33.—Improved Essex boar, a good representative of the modern type of the breed.

Essex swine are striving to develop a type with more size, heavier bone, and greater length. Judging by some of the exhibits at fairs during recent years, this effort is meeting with some success, and Essex pigs are to be seen which give more promise of present-day utility than the older type.

Utility.—The Essex belongs to the quick-maturing kind and is easily kept fat. Its lack of size prevents it from be-

coming popular with the general farmer, and it is perhaps better suited to the requirements of the cottager, who wishes to keep a pig with a minimum outlay for feed. He does not have so many pounds of pork, but he has a fat hog with a small outlay. It has never been demonstrated that the Essex requires less feed for a pound of gain than other breeds, but there is no doubt that it is an economical producer of meat. The meat is fine-grained, but excessively fat.

The Essex is suitable for crossing upon extremely coarse breeds, and in the past it played an important part in the improvement of other breeds. At present there is less need for this sort of work, and the field of usefulness for the Essex has been greatly restricted. It is being used, however, for improving the Razor-back of the South.

The Essex is not regarded as prolific, but a great deal depends upon how the sows are managed.

Essex Score Card.—Following is the scale of points adopted by the American Essex Association:

	Counts.
<i>Color</i> —Black	2.
<i>Head</i> —Small, broad, and face dished	3
<i>Ears</i> —Fine, erect, slightly drooping with age	2
<i>Jowl</i> —Full and neat	1
<i>Neck</i> —Short, full, well arched	3
<i>Shoulders</i> —Broad and deep	7
<i>Girth around Heart</i>	6
<i>Back</i> —Straight, broad, and level.....	12
<i>Sides</i> —Deep and full	6
<i>Ribs</i> —Well sprung	7
<i>Loin</i> —Broad and strong	12
<i>Flank</i> —Well let down	2
<i>Ham</i> —Broad, full, and deep	12
<i>Tail</i> —Medium, fine, and curled	2
<i>Legs</i> —Fine, straight, and tapering	3

	Counts.
<i>Feet</i> —Small	3
<i>Hair</i> —Fine and silky, free from bristles.....	3
<i>Action</i> —Easy and graceful	4
<i>Symmetry</i> —Adaptation of the several parts to each other.....	10
 Total	 100

REVIEW.

1. Characterize Essex swine as to size.
2. Give a general description of them.
3. Where did the breed originate?
4. Tell of the efforts to improve the breed.
5. Where is the breed mostly found?
6. What useful features have Essex swine?

CHAPTER XV.

THE SUFFOLK BREED.

Description.—The Suffolk is a small breed. The face is dished, the snout small and very short, the ears short, small, thin, upright, soft, and silky, the neck very short, and the body thick, short, and smooth, set upon very short, fine-boned legs.

The hair should be fine and silky, and of a pale yellowish-white color. The skin is of a pinkish shade, and should be entirely clear of dark spots.

Origin and History.—The Suffolk is of the same origin as the Small Yorkshire, being an off-shoot of the Small White English breed. There is no such breed as a white Suffolk recognized in England, but the name Suffolk is sometimes applied locally to the Small Black breed, of which the Essex is a representative.

Distribution.—The Suffolk was brought to the United States many years ago, but it has not made much progress. It is found mainly in the Mississippi Valley, but herds are not numerous. In Canada the breed has nearly disappeared.

Utility.—What is said regarding Small Yorkshires under this heading applies to the Suffolk as well, since the breeds are very similar. (See pp. 117–118.)

Suffolk Score Card.—Following is the scale of points adopted by the American Suffolk Association:

	Counts.
Color—White	2
Head—Small, broad, and face dished.....	3
Ears—Fine, erect, slightly drooping with age.....	2
Jowl—Full and neat	1

	Counts.
<i>Neck</i> —Short, full, and slightly arched.....	3
<i>Shoulders</i> —Broad and deep	7
<i>Girth around Heart</i>	6
<i>Back</i> —Straight, broad, level	12
<i>Sides</i> —Deep and full	6
<i>Ribs</i> —Well sprung	7
<i>Loin</i> —Broad and strong	12
<i>Flank</i> —Well let down	2
<i>Ham</i> —Broad, full, deep	12
<i>Tail</i> —Medium, fine, and curled.....	2
<i>Legs</i> —Fine, straight, and tapering	3
<i>Feet</i> —Small	3
<i>Hair</i> —Fine and silky, free from bristles.....	3
<i>Action</i> —Easy and graceful	4
<i>Symmetry</i> —Adaptation of the several parts to each other.....	10
 Total	 100

REVIEW.

1. Describe the Suffolk breed.
2. What is thought to be the origin of the breed?
3. Where is it mainly found in America?
4. To what breed is this one most similar?
5. Can you give any reason why this breed is not popular?

CHAPTER XVI.

THE SMALL YORKSHIRE BREED.

Description.—The Small Yorkshire may be termed the smallest breed in the United States. It has a very short,

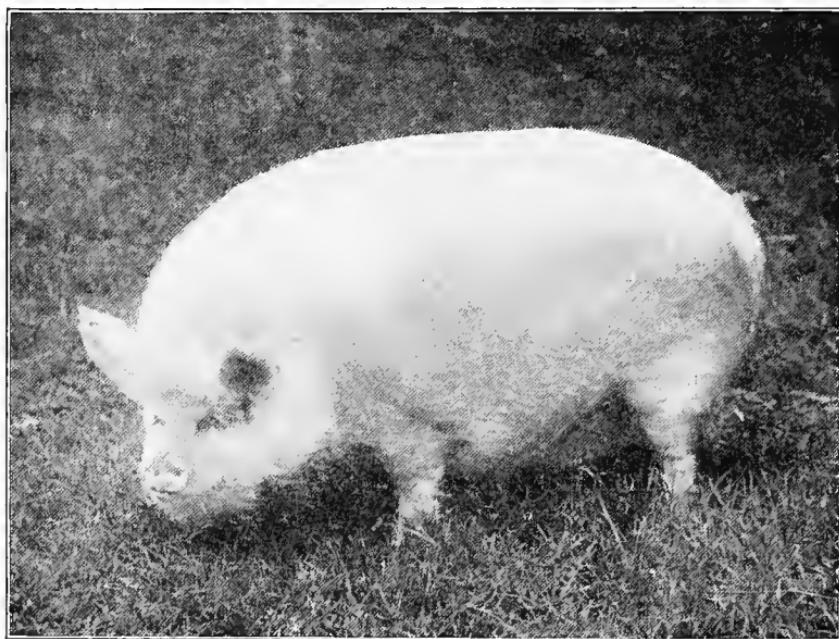


FIG. 34.—Small White sow, first prize winner.

turned-up snout, wide face, small, erect ears, heavy jowl, and a very short neck. The body is short, thick, deep, and smooth, and the legs are very short and very fine in the bone. (Figs. 34 and 35.)

The color is white, and the hair is abundant but fine.

Origin and History.—The Small Yorkshire comes from

England, where it goes by the name of "Small White," the name "Small Yorkshire" being of American origin. The breed is believed to be of Chinese origin, but modified by the methods of English breeders. Various types and strains of Small Whites have been bred in England, but at present they are all classed as one breed.

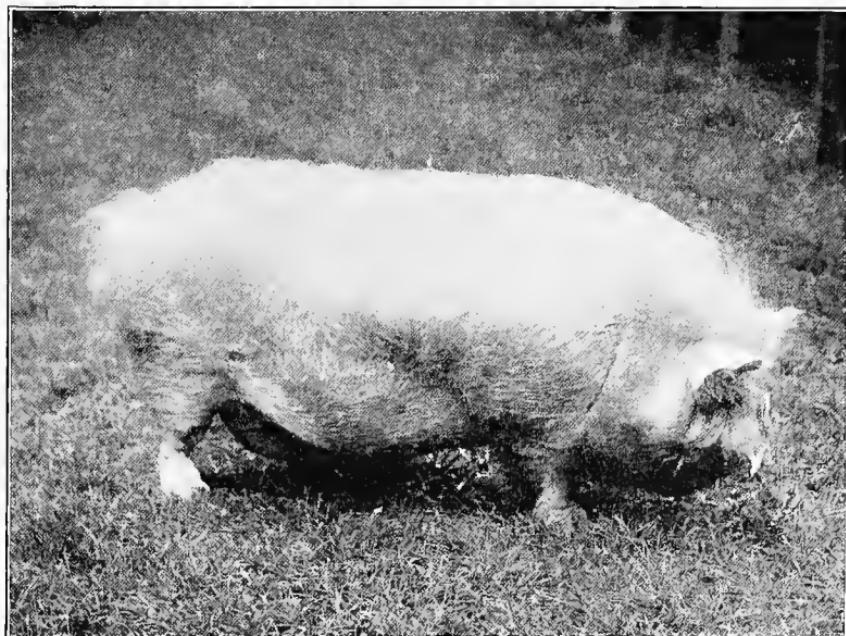


FIG. 35.—Small White boar, a winner at the English Royal Show.

Distribution.—The Small Yorkshire was brought to the United States about 1860, but its progress has been slow. Small herds are to be found, mainly in the East, but the breed does not attract much attention.

Utility.—There does not seem to be any very important place for the Small Yorkshire to fill in America. The breed matures early and fattens easily, but produces excessively fat

meat. Like the Essex, it is probably most suitable for the cottager who wants a pig that can be matured with a small amount of feed. There is no American breed that requires crossing with a breed like the Small Yorkshire, unless it is the "Razorback," and the Essex seems rather better adapted to this purpose, as its skin will stand the hot sun of the South better than that of a white breed. The Small Yorkshire is not noted for fecundity, and, unless some unforeseen conditions arise, the breed seems destined to gradually disappear.

Small Yorkshire Score Card.—Following is the description and scale of points for Small Yorkshires adopted by the American Yorkshire Club:

	Counts.
<i>General Outline</i> —Wide and deep in proportion to the length, straight above and below, and short in head, neck, body, and limbs.....	5
<i>Outline of Head</i> —Short, abrupt, inclining to fine, and possessed of much dish and downward spring under the jaws.....	4
<i>Forehead and Poll</i> —Wide	1
<i>Eye</i> —Medium size; clear and bright.....	1
<i>Jowl</i> —Large, smooth, and carried well back toward the neck.....	1
<i>Snout</i> —Short, turning upward somewhat, with a deep indenture or curve immediately above it.....	1
<i>Ear</i> —Small, thin, erect, and inclining slightly forward rather than backward at the tips.....	1
<i>Neck</i> —Short, wide, and deep, the width slightly increasing towards the shoulders	3
<i>Outline of Body</i> —Short, broad, deep, and straight above, below, and on the sides	7
<i>Back</i> —Very broad, of even width and straight from withers to tail head	10
<i>Shoulder</i> —Large, smoothly and evenly developed, and blending perfectly with neck and crops	6
<i>Arm and Thigh</i> —Moderately wide, tapering nicely down and inclining to short	2
<i>Brisket</i> —Wide and on level with under line.....	3
<i>Side</i> —Deep, thick in every part, straight and even from shoulder to hip	8
<i>Ribs</i> —Widely and deeply sprung	5

	Counts.
<i>Heart and Flank Girth</i> —Excellent in proportion to the length of body and about equal	8
<i>Hind Quarters</i> —Relatively long; broad in every part and deep, with but little lowering toward the tail head.....	5
<i>Ham</i> —Large; well let down at thigh and twist and inclined to straight behind	10
<i>Twist</i> —Well down and full	1
<i>Tail</i> —Fine, short, and inclined to curl.....	1
<i>Legs</i> —Short, fine rather than coarse, strong, straight, and placed well apart	5
<i>Hair</i> —Abundant, fine, even in quality.....	4
<i>Skin</i> —Smooth and white and free from creases and scales.....	2
<i>Color</i> —White on every part.....	1
<i>Movement</i> —Gentle and easy but not sluggish.....	5
 Total	 100

REVIEW.

1. Name three breeds which are considered small.
2. Describe the small Yorkshires.
3. What is their English name?
4. Tell of their introduction to the United States and their present popularity.
5. Of what use is this breed?
6. Why is the breed not a popular one?

CHAPTER XVII.

THREE MINOR BREEDS.

THREE breeds of minor importance in America are the Mule-foot hog, Large Black Pig, and the Middle White or Middle Yorkshire.

MULE-FOOT HOG.

Description.—A marked peculiarity of the Mule-foot hog is its solid hoof, and from this peculiar feature the breed takes its name. In general conformation, it is claimed that the Mule-foot hog is between the fat type and the bacon type, but it is not noted for great length of side.

The color is black, but white points are admissible. More white than black is a disqualification, and any considerable amount of white is regarded as objectionable.

Origin and History.—The National Mule-foot Hog Record Association, which has its office in Indianapolis, has issued the following statement: “Up to the present date, the Mule-foot hog is a hog without an authentic history. Rumors and reports offer Denmark, Holland, South Africa, Mexico, South America, and the Sandwich Islands as the country of his birth. . . . Reports are so contradictory that this Association cannot, without further research, endorse any of them. Every effort will be made by the Association to discover the origin of the Mule-foot hog, and to furnish its friends with a true and complete history.”

Distribution.—So far, animals of this breed are not numerous nor widely distributed. Indiana, Missouri, Arkansas, Texas, and Louisiana are probably the principal states for the

breed, but the breed is not largely represented in any state as yet.

Utility.—The National Mule-foot Hog Record Association makes the following claims for the breed:

"As to the special qualifications and fine points of the Mule-foot hog, we know it to have greater vitality than any other breed in the United States. We have never known a full-blood Mule-foot hog to have hog cholera. It is an easy feeder, develops early and rapidly, is in strong demand on the market at a premium. . . . The sows are good, gentle mothers and raise large litters of pigs, which, if turned out, will hustle for a living, or they will grow fat and thrive, paying big returns, under good care and attention."

It must be remembered that the claims set forth above are made by admirers of the breed. The Arkansas Station tested Mule-foot hogs with virulent cholera germs, and found them quite as susceptible to the disease as hogs of other breeds.

LARGE BLACK PIG.

Description.—The Large Black is a large breed, all black in color, and possessing very large drooping ears. In general conformation it approaches the bacon type, having a good length of side, medium width of back and shoulder, a rather light neck and jowl, and fairly heavy bone. (Figs. 36 and 37.)

Origin and History.—The Large Black pig is the latest addition to the recognized pure breeds of swine in Great Britain. The origin of the breed is not well known, but it has been bred for a great many years in the east and south of England.

Distribution.—The Large Black is hardly known outside of England, and is not widely distributed even in England,

being confined mainly to the southern part of the country. Some years ago representatives of the breed were brought to the Central Experimental Farm, Ottawa, Canada, but did not prove very satisfactory. At present the breed is practically not represented on the American continent.

Utility.—The main claims for the Large Black are its bacon



FIG. 36.—Large Black sow, winner of first prize.

qualities, its fecundity, and its value as a scavenger. Its bacon is highly esteemed in England, containing, as it does, a large percentage of lean. It is worthy of note, however, that at Ottawa the bacon of the Large Black was not equal to that of the Large Yorkshire or Tamworth. The sows are excellent nurses, and the breed is regarded as a first-class farmer's breed in England.

MIDDLE WHITE (MIDDLE YORKSHIRE).

Description.—The Middle White, as the name implies, is intermediate in size between the Large White and the Small White. It is recognized in England as a distinct breed, but it is a difficult breed to describe on account of its variations.

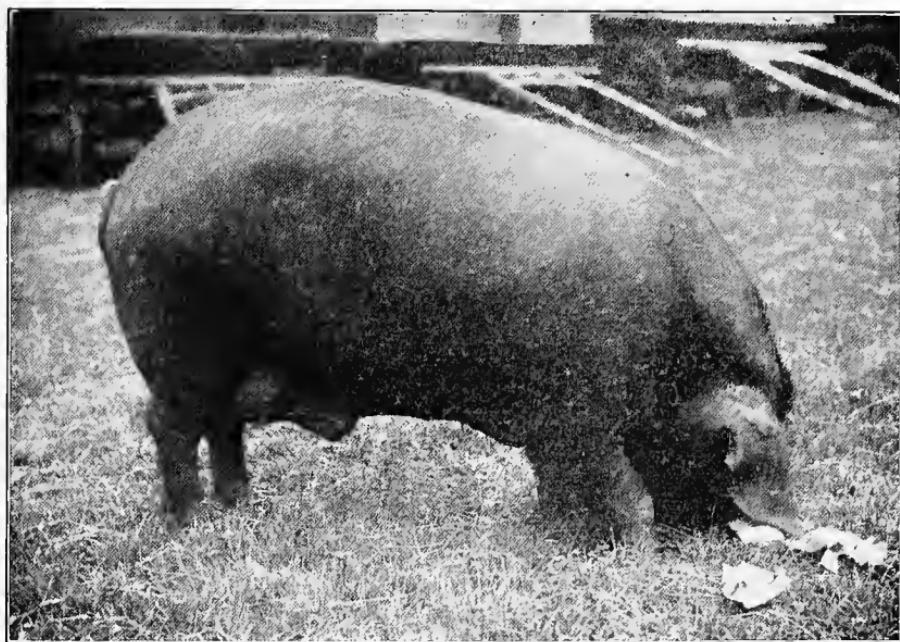


FIG. 37.—Large Black boar, a Show winner

Some representatives of the breed might easily pass as Large Whites, and from this extreme they shade down nearly all the way to the Small White type. There is little doubt that many so-called Large White pigs carry some Middle White blood, and that many Middle Whites, or pigs containing a large percentage of Middle White blood, have been brought to America and passed as Large Whites. Generally speaking,

they are smaller than the Large Whites, have a shorter side, shorter leg, finer bone, and a heavier neck and jowl. They usually have a shorter snout than the Large White, and have more dish in snout and face. They belong to the fat type of hog. (Figs. 38, 39, and 40.)

Origin.—The Middle White originated from a cross be-

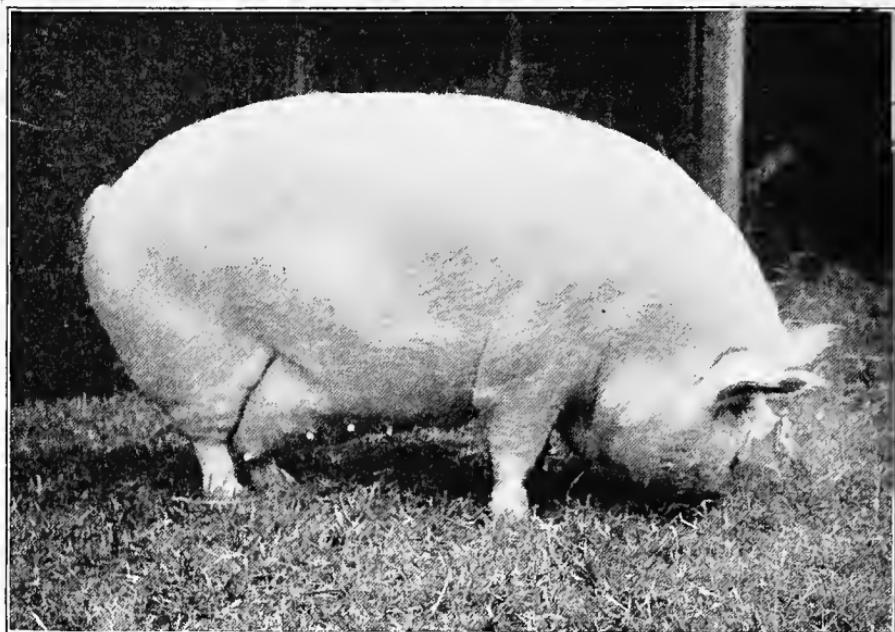


FIG. 38.—Middle White sow. A typical specimen of the breed.

tween the Large and Small White breeds. Even at the present, pigs may appear in Large White litters which are classed by their breeders as Middle Whites, so that it sometimes happens that Large Whites and Middle Whites may come from the same litter, especially in those herds where Middle White blood is occasionally used to refine the Large White. Sometimes Middle Whites are produced by one cross of Small

White upon Large White, and animals produced in this way should scarcely be regarded as a distinct breed.

Distribution.—The Middle White is unknown outside of England, its native country, and, if any have been brought to America, they were introduced under the name of Large Yorkshire.

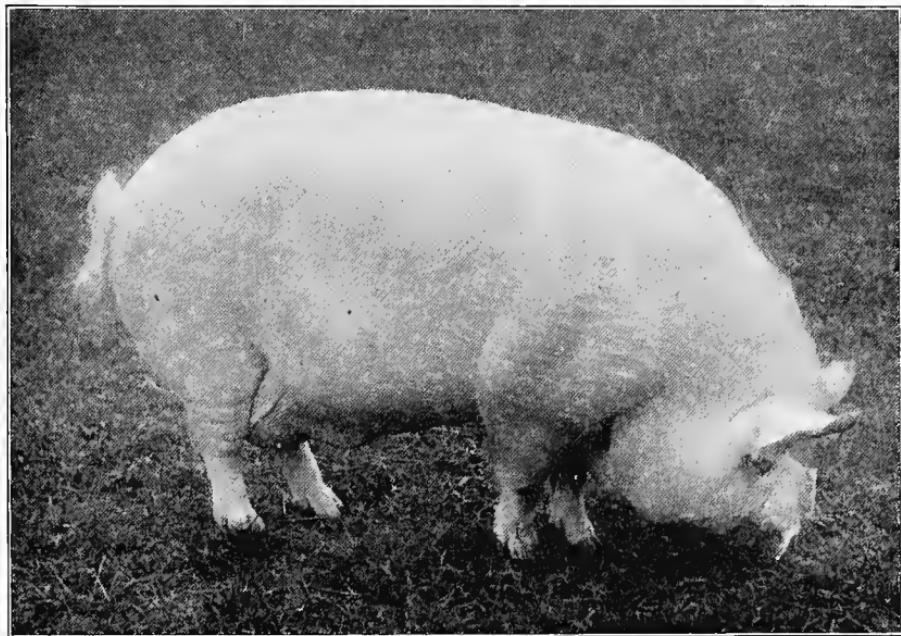


FIG. 39.—Middle White boar, an English Royal Show champion.

Utility.—The utility of the Middle White is necessarily limited. The practice of crossing, followed by many breeders, has told against the usefulness of the breed. Middle Whites which have been bred pure for a number of generations would no doubt prove quite satisfactory, but so many of them possess recent crosses of other blood that the breed as a whole lacks prepotency and trueness to type. The mixing of Middle White

blood with that of Large White, as practised by many English breeders, cannot be too strongly condemned. A so-called Large Yorkshire boar produced in this way may look more attractive to the inexperienced breeder of Large Yorkshires than a pure Large Yorkshire, but he makes a very unsatisfactory sire. Breeders of Large Yorkshires soon learn to avoid boars showing any evidence of Middle White blood.

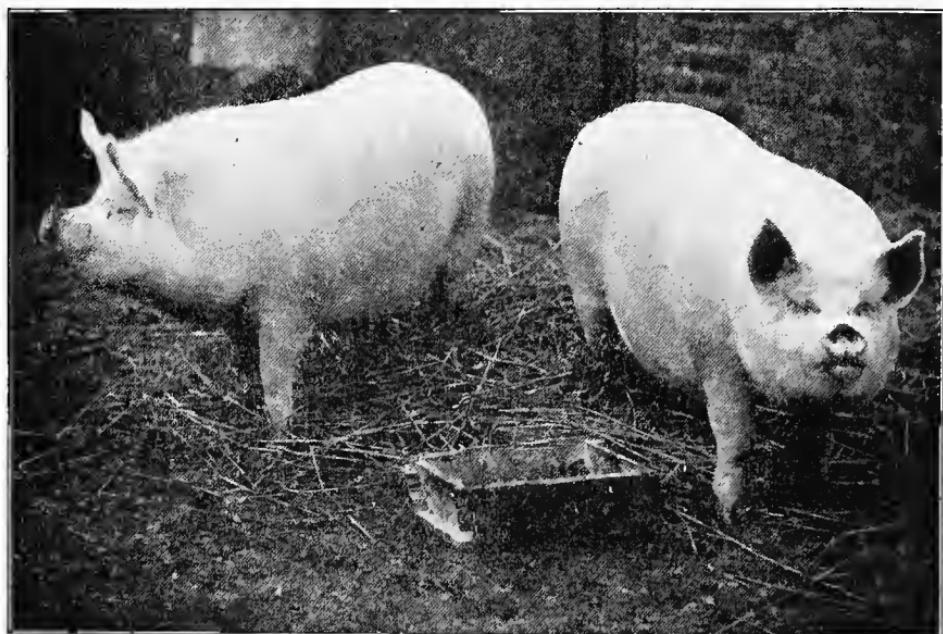


FIG. 40.—Pair of Middle White barrows, prize winners.

KEY TO THE BREEDS OF SWINE.

For use of beginners in making quick recognition.

HOOFS CLOVEN (including all but one breed).

A. Color all black.

B. Fat type; ears small and erect.....ESSEX

BB. Bacon type; ears large and drooping.....LARGE BLACK

AA. Color mostly black, with some white.

- B. White in form of belt or band around body and fore legs HAMPSHIRE
- BB. White markings on face, feet, etc.
 - C. Face dished; ears erect..... BERKSHIRE
 - CC. Face straight; ear tips drooped... POLAND-CHINA

AAA. Color red or mostly so.

- B. Fat type; heavy jowl; snout medium in length DUROC-JERSEY
- BB. Bacon type; very light jowl; snout long and straight TAMWORTH

AAAA. Color white or nearly so.

- B. Ears drooped; face straight CHESTER WHITE
- BB. Ears erect, except in a few when old; face dished or snout turned up.
 - C. Bacon type; adults large, sides long, jowl not fat LARGE YORKSHIRE
 - CC. Fat type; sides not long, jowls fleshy.
 - D. Occasional black spots on skin under the white hair..... VICTORIA
 - DD. Hair soft, silky, yellowish white; skin, pink, no dark spots; breed small SUFFOLK
 - DDD. Black skin spots few or none; legs long; snout straight, face only slightly dished; depth of body not great..... CHESHIRE
 - DDDD. Skin and hair white; snout short and upturned; legs short; face much disbed; good depth of body.
 - E. Adults smallest of all breeds SMALL WHITE, SMALL YORKSHIRE
 - EE. Adults medium in size..
 - MIDDLE WHITE

Hoofs solid (one breed only) MULE Foot

SIZE OF BREEDS.

Very large—Tamworth, Large Yorkshire, Large Black.

Medium large—Berkshire, Chester White, Poland-China, Duroc-Jersey.

Medium—Hampshire, Cheshire, Victoria, Middle White, Mule-foot (?)

Small—Suffolk, Essex, Small Yorkshire.

REVIEW.

1. Describe the Mule-foot hog.
2. What is said of the origin of the breed?
3. Where is the breed now found?
4. What are the special claims for the breed?
5. Describe the Large Black breed.
6. In what country was it first known as a distinct breed?
7. What is said of its present distribution?
8. What is claimed for the breed?
9. Describe the "Middle White" breed.
10. What was their origin?
11. Where are they now found?
12. Of what use are they?

PART IV

RESULTS OF EXPERIMENTS IN

SWINE FEEDING

CHAPTER XVIII.

MISCELLANEOUS INVESTIGATIONS.

IT IS out of the question to review in detail all the work of experiment stations in swine feeding, but there are certain phases of the work which may be dealt with profitably in a somewhat general way. The problems which face the swine feeder are numerous, and the experiment stations have been working for years to find solutions for some of them. To solve any problem in stock feeding is a tedious matter, because animals differ so much individually in their ability to utilize feed, and it requires many repetitions and the employment of large numbers of animals to answer an apparently simple question. Great care is necessary, therefore, in interpreting the results of live-stock experiments, and it will not do to draw general conclusions where only a limited amount of work has been done.

INFLUENCE OF FEED UPON THE BODY OF THE PIG.

In his excellent book, "Feeds and Feeding," Professor Henry gives an account of work done along this line by Sanborn at the Missouri Agricultural College, Henry at the Wisconsin Experiment Station, Shelton in Kansas, Duggar in Alabama, and Fortier in France.

Corn, which is the standard hog feed of the United States, is a feed rich in carbohydrates, or fat-forming constituents, but rather low in protein, or muscle-forming constituents. It is also low in ash, or bone-forming material. The question arose, therefore, whether a feed such as corn would not have a

tendency to produce more fat in the body of a hog than would feeds which contain a higher percentage of protein and ash. Without going into details, it may be said that corn was fed in opposition to mixtures containing such feeds as dried blood, wheat middlings, peas, skim-milk, bran, and cow-peas, which are feeds much richer than corn in protein.

Results.—The methods employed in the investigation varied somewhat, but the general results were as follows:

1. The pigs fed the protein-rich ration generally dressed a somewhat lower percentage of their live weight than those fed the corn ration.

2. In nearly every case the pigs fed the protein-rich ration had the largest quantity of blood, and in every case they had heavier livers than the others. Their kidneys were also heavier, as a rule, though there were some exceptions.

3. In the Wisconsin and Kansas experiments, the tenderloin muscles were removed and weighed, and in both cases these were heavier in the case of the protein-fed pigs. The tenderloin muscle is an indication of the amount of lean throughout the carcass, and hence it was demonstrated that the carcasses of the protein-fed pigs contained more lean than the others.

4. As a rule, the corn-fed pigs gave more leaf-lard than the others.

5. At the Wisconsin and Kansas stations, the breaking strength of the thigh-bones was tested by a machine designed for such purposes, and in every case the bones from the pigs fed the mixed ration proved stronger than those of the corn-fed pigs, the difference being as high as 32 per cent in one trial.

Limitations.—Though the experiments described demonstrate very clearly that it is possible to modify the carcass of the pig by a judicious selection of feeds, we must not assume

that lean meat or fat can be developed to any extent which the feeder may desire. Nature has set a limit in this connection, and what may be accomplished by the feeder in the way of developing lean meat cannot go beyond a certain point. The theory that any breed of hogs can be fed in such a way as to produce choice bacon for the English market is not borne out by these or any other experiments, nor by the experience of practical breeders who really understand the demands of the market.

A peculiar feature of swine is their tendency to develop fat. If the very best specimens of the bacon type are fed largely upon corn, they quickly assume the fat or lard type, and in one or two generations of such treatment the tendency to become shorter in side and thicker in body becomes so firmly fixed that it is very difficult to change them back to the bacon type again under any system of breeding and feeding. On the other hand, breeders of bacon hogs know that it requires careful selection and feeding to maintain the type. Even under the most favorable conditions there is a tendency for the bacon type to change gradually in the direction of the fat type, unless care is exercised in selection. It is safe to say, therefore, that it is easier to increase the proportion of fat in a hog's carcass than it is to increase the proportion of lean, and that the extent to which the lean may be increased by the character of the feed is very limited and is fixed by the individuality of the animal. Further, any attempt to increase the amount of lean through feeding must be started when the pig is very young in order to be successful.

Causes of Soft Bacon.—In the manufacture of "Wiltshire sides" Canadian packers have experienced a great deal of difficulty with sides turning soft in the process of curing. In a soft side the fat is soft and spongy, and sometimes the lean

is affected. A really soft side is practically worthless, and even a slight degree of tenderness detracts very seriously from the value of the bacon.

The Ontario Agricultural College, Guelph, and the Central Experimental Farm, Ottawa, Canada, have conducted exhaustive experiments in connection with the causes of soft bacon, and following are the principal points brought out in the investigation:

1. *Lack of Maturity*.—Generally speaking, the more immature a hog is, the greater the tendency to be soft. Almost invariably the largest percentage of softness occurs among the light sides of bacon.

2. *Lack of Finish*.—Thin hogs have a marked tendency to produce soft bacon. Marketing hogs before they are finished is, no doubt, responsible for a great deal of softness.

3. *Unthriftiness* in hogs, no matter what the cause may be, almost invariably produces soft bacon.

4. *Lack of exercise* has a tendency to produce softness, but this tendency can be largely overcome by judicious feeding.

5. *Exclusive meal feeding* is perhaps one of the most common causes of softness, especially when hogs are not given exercise. Some kinds of meal are more injurious than others, but wherever exclusive meal feeding is practised and the exercise is limited, more or less softness is always sure to result.

6. *Corn*.—Of the grains in common use, corn has the greatest tendency to produce softness. Its injurious tendency can be modified by mixing it largely with other meal, or by feeding skim-milk, green feed, and roots, but its tendency to produce softness is so strong that it must be regarded as an undesirable food for bacon hogs.

Corn appears to give a good quality of meat in the case of the lard hog, but it must be remembered that the bacon hog is marketed at lighter weights and in thinner condition

than the lard hog, and possibly this may explain why corn is unsatisfactory for feeding bacon hogs. It is possible also that the difference in the methods of curing may have an influence.

7. *Beans* seem to have a more marked effect than corn in producing softness, and should not be used for finishing bacon hogs.

FEED REQUIREMENTS OF GROWING AND FATTENING SWINE.

Professor Wm. Dietrich, of the Illinois Experiment Station, has done much careful work upon feeding standards for swine.* Below are given some of the leading features of the standard evolved by him, though it is admitted that certain modifications may be necessary as the result of further investigation.

The standard starts with pigs two months old and carries them along until they are eight months old, at which time they are ready for market.

Water.—As a rule, pigs are allowed to take as much water as their appetite dictates, but Professor Dietrich believes that in warm weather pigs ordinarily drink too much water and in cold weather they do not drink enough, so that he prescribed definite quantities of water for each week of the pig's life from two months to eight months of age. The standard calls for 12 pounds of water daily per 100 pounds, live weight, for pigs two months old, and during the next 26 weeks, or until the pig is eight months old, there is a gradual and uniform decrease in the amount of water to 4 pounds per day for 100 pounds, live weight, for pigs eight months old. The reduction in water given daily per 100 pounds, live weight, is about .3 of a pound for each week.

Crude Protein.—For pigs two months old the standard

* Illinois Circulars 126 and 133 give details of the standards.

calls for .6 of a pound of digestible protein per day per 100 pounds, live weight. During the next seven weeks there is a uniform increase each week until the pigs are receiving .7 of a pound per day per 100 pounds, live weight. During the next four weeks there is a uniform decrease to the starting-point of .6 of a pound daily per 100 pounds, live weight. Eleven weeks have now elapsed since the commencement of the feeding period, and at the beginning of the twelfth week, the protein is increased to .65 of a pound per day per 100 pounds, live weight, and is maintained at this point until the pig is six months old. After the pig is six months old, it is fed largely upon carbonaceous feeds, though it has been found an advantage to supply rather more protein than is found in corn.

It will be seen that the weekly increase of digestible protein during the first seven weeks is about .014 of a pound. The weekly decrease during the eighth, ninth, tenth, and eleventh weeks is .25 of a pound. Then there is an increase for the twelfth week of .25 of a pound, and the allowance is then kept uniform until the pig is six months old.

Carbohydrates.—For pigs two months old the standard calls for a daily allowance of 2.2 pounds of digestible carbohydrates per 100 pounds, live weight, with a uniform increase, week by week, until the pigs are 6 months old, at which time the daily allowance is 2.6 pounds of digestible carbohydrates per 100 pounds, live weight. The author of the circular states that their latest investigations indicate that the carbohydrate allowance might start at 2.4 pounds and end at 2.8 pounds. After the pigs are 6 months old the ration is largely carbonaceous. According to the standard given, the weekly increase in digestible carbohydrates amounts to about .02 of a pound.

Ether Extract or Fat.—The fat content of the ration was found difficult to control, but the author states that pigs will

apparently make larger gains when they are given a little more fat in their ration than is supplied by ordinary farm feeds. Soy beans are recommended as a source of protein and fat. Linseed meal should also be a desirable feed from this standpoint.

Mineral Matter.—The mineral matter is not under control, but to make sure that the hogs have an abundant supply, it is recommended to give the hogs free access to salt, charcoal, air-slaked lime, bone-meal, wood-ashes, clean soil, and soft coal cinders.

How to Use the Standard.—Following is an abbreviated description of the method of using the standard, as given in circular 133:

Suppose that a bunch of pigs is two months old and weighs 685 pounds. The standard shows that at this time the pigs require daily, per 100 pounds, live weight, 12 pounds of water, .6 pound of digestible crude protein, and 2.2 pounds of digestible carbohydrates. Multiplying these quantities respectively by the total live weight, namely, 685 pounds, and pointing off to the proper figure, we find that this bunch of pigs will require a total of 82.2 pounds of water, 4.11 pounds of digestible crude protein, and 15.07 pounds of digestible carbohydrates per day. Next, we must make a selection of feeds which we think will be suitable, and, by reference to any table which gives the amount of digestible constituents in one pound of each of the feeds, we must take such quantities of the different feeds as to bring the protein and carbohydrates up to the standard, and add sufficient water to bring it to the standard also. We have now arrived at the amount of feed which this bunch of pigs should consume in one day when two months old. But each day the pigs will require a slight increase in feed, and, since it is not practicable to weigh the pigs every day and calculate our ration each day, we must

estimate what the pigs will probably weigh at the end of the week, formulate a ration in accordance with this estimate, and gradually work them up to the quantity the standard calls for by the end of the week. Suppose we estimate that the pigs will gain 65 pounds during the week, making a total of 850 pounds. Referring to our standard, we find that the daily water requirement per 100 pounds, live weight, has decreased .3 of a pound by the end of the week, the digestible protein has increased .014 (say .015), of a pound, and the carbohydrate requirement has increased .02 of a pound. Hence, by the end of the week the pigs should be receiving daily, 11.7 pounds of water, .615 of a pound of protein, and 2.22 pounds of carbohydrates per 100 pounds of their live weight. Multiplying these amounts by 850 (estimated weight) and dividing by 100, we get the total daily requirement per 100 pounds, live weight, for the bunch of pigs at the end of the week—which amounts to 99.45 pounds of water, 5.2275 pounds of digestible protein, and also 18.87 pounds digestible carbohydrates.

We must now refer to table of digestible constituents, and add feeds in such proportions as to bring our ration into conformity with the standard. Having arrived at our ration for the beginning of the week, and also estimated it for the close of the week, we can make each day's feeding approach sufficiently close to the standard. At the close of the week the hogs are weighed, their gain estimated for the following week, the ration adjusted to the weight and age of the hogs, as it was done for the first week, and the operation repeated for each succeeding week.

Features of the Standard.—There are two things about the standard which call for remark. In the first place, the writer's experience is that the hog is a pretty good judge of the amount of water he requires, and the chances are that water

will be dropped from the standard in the course of time. This remark is based upon certain experimental work, but the work is not sufficiently advanced to warrant a definite statement.

In the second place, the standard is very complex, and it would be difficult for the busy farmer to calculate rations and follow the intricacies of the standard. On the other hand, Professor Dictrich deserves great credit for the thoroughness of his investigations, and the standard is especially valuable on account of the light it throws upon the protein requirement of young pigs. There is no doubt that many a promising litter has been stunted through ignorance of this important point. No doubt the standard will eventually be modified and simplified until it is brought within the reach of the average intelligent feeder.

HOGS FOLLOWING STEERS.

Many farmers who fatten steers regard the hog as a necessary adjunct to the business if a profit is to be obtained. The hogs work over the droppings of the steers and fatten upon the undigested grain in the manure of the cattle.

Illinois.—The number of hogs per steer, which can be used to advantage, will vary with the character of the ration fed the steers. H. W. Mumford, in Bulletin 103 of the Illinois Experiment Station, states: "Where enough pigs are provided to consume undigested feed in the droppings of steers, it requires fully twice as many where corn is fed whole as it does where meal is fed to the steers." The same writer secured gains on hogs following steers ranging from 111.5 pounds of pork to 6.3 pounds of pork per steer, in a feeding period of six months. The largest gain was made by hogs following steers fed shelled corn, and the smallest by hogs following steers fed corn meal and silage.

Indiana.—Circular 12 of the Indiana Experiment Station gives a summary of nine hundred and twenty-nine replies to questions bearing upon beef production, sent out by the Experiment Station. Eighty-eight per cent of those sending replies reported that it is not profitable to feed cattle unless hogs follow. The average number of hogs per steer was 1.5, which is regarded as high by the authors of the bulletin, unless additional feed is supplied the hogs. Indiana experiments indicate that the waste will not support more than one hog to a steer. The average age of hogs preferred by cattle feeders for following steers was about 5 months, and the average weight 92 pounds.

Missouri.—Bulletin 76 of the Missouri Experiment Station is similar to the Indiana circular, and embraces the experience of nearly a thousand cattle feeders in Missouri, Iowa, and Illinois. Director Waters summarizes the replies to the questions of the number of hogs per steer, as follows: "An approximate average number of hogs per steer would be like the following, on the basis of two-year-old cattle and 100- or 150-pound hogs: Snapped ear corn, 2 to 3 hogs per steer; ear corn, $1\frac{1}{2}$ hogs per steer; shelled corn, 1 to $1\frac{1}{2}$ hogs per steer; crushed or ground corn, $\frac{1}{3}$ to $\frac{1}{2}$ hog per steer."

When steers are given feeds rich in protein in addition to corn, such as clover, alfalfa, or cow-pea hay, or concentrates such as linseed meal, a small allowance of cottonseed meal, etc., hogs make better gains than when feeds poor in protein are fed to the steers with corn. In summer feeding, access to a pasture will take the place of other supplemental feeds, clover and alfalfa being especially beneficial.

Feed Required for Maintenance.—Investigations at the Wisconsin Station indicate that a pig can be maintained for *one* day (neither gaining nor losing in weight) on about one per

cent of its live weight of feed in the form of wheat middlings. That is to say, one pound of feed equal in value to one pound of wheat middlings will support a pig weighing 100 pounds for one day, but will provide nothing for gain in weight. Proportionately larger amounts would be required for heavier pigs. Further, it was shown that a 50-pound pig used only 18 per cent of the feed it consumed for the support of its body, leaving 82 per cent of what it consumed for producing gain in weight. The percentage of feed required for body maintenance increased as the pig became heavier and a 200-pound pig required 36 per cent of its feed for maintenance, leaving only 64 per cent for production. This is a striking illustration of the ability of young animals to use feed economically.

Spayed vs. Unspayed Sows.—Bulletin 70 of the Utah Station reports a test in which three spayed sows were fed in comparison with three unspayed sows. The gains were slightly in favor of the unspayed sows, but the difference was very slight. The results of this test, coupled with the results of feeding barrows and sows, point to the conclusion that spaying sows is an unnecessary and unprofitable operation.

Barrows vs. Sows.—The Wisconsin Station compared the gains made by 98 sows and an equal number of barrows. The sows made an average gain during the feeding period of 102 pounds, and the barrows, 107 pounds. Professor Henry, in "Feeds and Feeding" quotes results from feeding 1216 pigs in Denmark, which showed practically no difference between barrows and sows as to gain, shrinkage, or quality of carcass. The Utah Station conducted tests in which the average gains made by sows were higher than those made by barrows.

REVIEW.

1. Give results of feeding corn in contrast with a protein-rich ration.
2. What can you say of the tendency of corn to produce fat?
3. Briefly discuss seven causes of soft bacon.
4. Discuss the question of water for swine by the Dietrich standard.
5. Discuss crude protein for the same; also carbohydrates.
6. Tell of the needs of fat and of mineral matter for the same.
7. Can you apply the Dietrich standard to the feeding of a pen of pigs?
8. Mention two objectionable features of the standard.
9. Give some conclusions regarding the question of hogs following steers.

CHAPTER XIX.

CORN.

Pounds of Pork from a Bushel of Corn.—As in nearly all live-stock investigations, wide variations have occurred in connection with this apparently simple problem. Farmers have been asked to report results through the agricultural papers, and numerous results have been obtained from experiment stations. Professor Robbins, of the Iowa Experiment Station, presents a very concise summing up of the question in the columns of *The Breeder's Gazette*, where he gives the following table:

	Number of tests.	Number of hogs.	Number of days fed.	Average weight of hogs at start	Gain per day	Corn for 100 lbs. gain.	Gain per bushel of corn.
Farmers.....	8	322	56	lbs. 157	lbs. 1.09	lbs. 544	lbs. 10.3
Experiment stations	18	144	79	149	1.09	548	10.2
Farmers and exper- iment stations.....	26	466	68	153	1.09	546	10.25

The results given in the table are from tests where only whole corn was fed, no supplementary feeds or pasture being used. The results from farmers and experiment stations agree very closely, and confirm the general belief that hogs on full feed of whole corn should gain about one pound per day, and make ten pounds of pork from a bushel of corn. This is not a large return from a bushel of corn, but the method of feeding is not the most economical.

Whole Corn vs. Ground Corn.—The Wisconsin Experiment Station has conducted exhaustive experiments with whole corn and ground corn for fattening swine. The experiments

extend over a period of ten years. Eighteen separate tests were made, in which a total of 280 pigs were used. Bulletin 145 gives a summary of the results.

The feed required to produce 100 pounds of gain varied from 360 pounds to 820 pounds, the poorest gains being made in the case of young pigs, weighing 84 pounds when the trial began, which were fed upon corn alone, and the best gains for feed consumed were made by young pigs which were fed equal parts by weight of corn and middlings with a small allowance of skim-milk.

The 140 pigs fed ground corn ate 5510 pounds more grain and made 2036 pounds more gain than the 140 pigs fed whole corn.

The pigs fed whole corn consumed an average of 501 pounds of grain for each 100 pounds of gain, and the pigs fed ground corn consumed 471 pounds of grain for each 100 pounds of gain.

Eleven trials out of the eighteen showed a saving from grinding, the amount saved varying from 2.5 per cent to 18.5 per cent. The remaining seven trials showed a loss from grinding, the loss varying from 1.1 per cent to 11.1 per cent.

The average of the eighteen trials shows a saving of 6 per cent from grinding corn.

Of the 140 pigs fed whole corn, 45 pigs gained more than the average, and 95 pigs gained less than the average. Of the 140 pigs fed ground corn, 91 pigs gained more than the average, and 49 pigs gained less than the average.

The authors of the bulletin point out that the economy of grinding corn will depend upon the price of corn and the cost of grinding, and the following table is given to assist the farmer in determining when to grind:

*Saving Effected per Bushel by Grinding Corn for
Fattening Pigs.*

	cts.										
When corn is worth: . . .	25	30	35	40	45	50	55	60	65	70	75
Saved by grinding:	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5

The authors conclude that where there is plenty of time for maturing pigs, it is doubtful whether it pays to grind the corn. Pigs eat more corn when it is ground, and make somewhat more rapid gains. Ground corn is recommended for finishing hogs that have been fed shelled corn until near the close of the feeding period.

Ear Corn, Shelled Corn, and Corn Meal (Soaked and Dry).—In Bulletin 106, the Iowa Experiment Station reports results of two years' work with hogs of different ages. As a result of these tests the following recommendations are made regarding farm practice:

“These results clearly indicate the most profitable farm practice where corn is the main part of the ration for hogs. The fastest and most profitable gains were secured by feeding dry ear corn until the hogs were close to 200 pounds in weight. The scoop shovel was all that was needed to prepare corn for them. Then, if the hogs were to be fed longer and the weather permitted, the most profitable gains were secured by changing them to soaked shelled corn. Spring pigs, to be sold the next fall and winter, thus gave the best results when fed dry ear corn until sold. Fall pigs, and the spring pigs carried over to be fattened the following spring, were handled most profitably by feeding dry ear corn until the weather became mild enough for soaking corn in the following spring, and then feeding soaked shelled corn until the finish. This was especially true when the hogs were run on pasture. The old sows made

faster and more economical gains on dry corn meal than on ear corn, but the benefit from this was largely lost when it was finally necessary to ship them to market on ear corn. They were handled most profitably by feeding soaked shelled corn. It should be borne in mind that corn soaked twelve hours gave better results than that soaked twenty-four hours."

"Hogs fed on dry ear corn required a longer time to eat than those fed soaked corn or corn meal, owing to the more thorough mastication of the dry ear corn. Young hogs and pigs reduced the dry kernels from the ear corn to a finer state of division than did the older hogs."

"It proved useless to grind corn for hogs of any age when the weather was warm enough to permit soaking. In every case where grinding has shown a saving of corn, simple soaking twelve hours in water has shown a still greater saving."

Trials Differ.—While not quite the same as the findings of the Wisconsin Experiment Station, the Iowa results are somewhat similar to those of Wisconsin, and they bring out a very interesting and important point regarding young animals. The fact that young hogs masticate their feed more thoroughly than older ones helps to explain why they made better use of whole corn than did the older hogs, and also affords a reason for the fact that young hogs almost invariably make cheaper gains than older ones.

Trial in Maryland.—The Maryland Experiment Station (Bulletin 150) reports a test of shelled corn and ground corn, and reports as follows: "It appears that in this experiment there was little difference in economy between shelled corn and corn meal, but this small difference is in favor of corn meal."

Other experiment stations, including Alabama, Maine, New York, Ohio, West Virginia, Kentucky, and Missouri, have conducted tests in connection with this problem. Out of eleven trials at these stations, where the total feed consumed

is reported, four trials resulted in favor of whole corn and seven in favor of ground corn. In one trial where whole corn gave better results, the corn was soaked.

Hogging off corn means turning the hogs into a field of standing corn and allowing them to pull down the stalks and consume the corn at will.

The Minnesota Experiment Station has issued a most interesting bulletin on this subject. Two experiments were conducted in which hogs allowed the run of a cornfield were compared with hogs fed in a dry lot on ear corn. In the first experiment no shelter was provided for either lot, but they were given straw for bedding. In the second experiment the yard hogs were given shelter, but the field hogs were treated as before.

Shorts were fed to each lot as a supplement to the corn, at the rate of one pound of shorts per day per hundred pounds weight of the pigs.

In the first trial there were 26 field hogs and 13 yard hogs; and in the second trial, 32 field hogs and 8 yard hogs.

The first trial commenced October 11th and ended November 29th. The second trial commenced September 19th and ended November 9th.

In each trial the field hogs were given an acre of corn at a time, instead of being allowed the run of the whole field.

The ear corn consumed by the field hogs had to be estimated by taking samples.

The average daily gain per hog in the two trials was as follows:

First trial: Field lot, 1.3 pounds; ear-corn lot, .98 pound.

Second trial: Field lot, 1.44 pounds; ear-corn lot, 1.09 pounds.

The amount of feed consumed per 100 pounds of gain was as follows:

Feed Consumed Per Hundred Pounds Gain.

		Shorts	Ear corn	Total
		lbs.	lbs.	lbs.
First trial.....	Field lot.....	139	696	835
	Yard lot.....	169	831	1000
Second trial.....	Field lot.....	103	532	635
	Yard lot.....	146	573	719
Average of two trials{	Field lot.....	121	614	735
	Yard lot.....	157	702	859

The larger amount of feed for 100 pounds gain in the first trial, as compared with the second trial, is due to the fact that the weight of the ear corn when first husked was used in the first year's calculations, whereas the second trial is calculated upon a cured corn basis, that is, corn dry enough for market.

Results.—It will be seen that the field hogs made larger and more economical gains than the yard hogs in each experiment.

In the second experiment a third group of hogs was used. These hogs were fed in a dry lot upon snapped corn,—that is, the ears of corn without the husks removed. This lot occupied an intermediate position, both in rate and economy of gain, the snapped corn giving better results than the ear corn.

A summary appearing in Bulletin 104 gives the following notes:

“The cost of fencing cornfields may be from \$1.00 to \$2.50 less per acre than the cost of husking.”

“It requires no more labor to prepare for subsequent crops, fields that have been ‘hogged off’ than those that have been treated by the ordinary methods of harvesting.”

“Hogs waste no more corn in field than when fed in yard. They pick the corn as clean as most men do in husking.”

"Three pounds of rape seed (per acre) sown in corn at last cultivation, furnishes considerable succulent feed, which may take the place of high-priced shorts."

"It is not expected that all corn raised be fed off with hogs, but the amount they can clean up from the time it is nicely glazed until the weather becomes unfavorable may be economically fed in this way."

"Hogs should not, as a rule, be turned into more corn at one time than they can eat up clean in two or three weeks. The shorter period is preferable."

Best Conditions.—It is recommended that varieties of corn be grown that will mature sufficiently by the first of September, so as to prolong the feeding period.

Pigs weighing from 100 to 140 pounds are best for the purpose. Small pigs are not suitable.

The table which follows is designed to show, approximately, the number of days required to "hog off" an acre of corn by a given number of pigs weighing 125 pounds.

	With corn shrunk to January 1, and yielding:								
	30 bu. per acre.	35 bu. per acre.	40 bu. per acre.	45 bu. per acre.	50 bu. per acre.	55 bu. per acre.	60 bu. per acre.	65 bu. per acre.	70 bu. per acre.
	Days	Days	Days	Days	Days	Days	Days	Days	Days
Will keep 10 hogs	22.5	26.2	30.0	33.7	37.5	41.2	45.0	48.7	52.5
Will keep 20 hogs	11.2	13.1	15.0	16.8	18.7	20.6	22.5	24.3	26.2

Tests in Missouri.—The Missouri Experiment Station (Bulletin 95) reports five tests in "hogging off" corn. In two of the tests rye was sown among the corn at the last cultivation at the rate of one bushel per acre; in two other plots cow-peas were sown at the last cultivation at the rate of one bushel per acre; and in one plot rape was sown at the rate of 9 pounds per acre. The following table shows the principal details:

Corn with Forage.

Feeding Period.	Aug. 27 to Sept. 27.	Aug. 27 to Sept. 26.	Sept. 20 to Nov. 15.	Sept. 20 to Dec. 3d.	Sept. 20 to Nov. 1.
Forage.	Corn and rye.	Corn and cow-peas.	Corn and cow-peas.	Corn and rye.	Corn and rape.
No. of hogs per acre.....	10	10	12	12	12
Total gain per acre.....	610 lb.	568 lb.	276 lb.	302 lb.	220 lb.
No. days corn lasted.....	31	30	57	75	51
Average wt. per hog at commencement of test..	140.6	141.4	102.5	100.3	93 lb.

Teachings.—It will be noted that there was a very wide variation in the amount of pork produced per acre, and that the heavier hogs gave better results than the lighter ones.

This method of harvesting corn helps to reduce the labor bill.

It is recommended to use movable hurdles and give the hogs access to what they will harvest in about 10 days, the hurdles being moved as required.

“Hogging off” corn gives best results when the weather is dry.

It is recommended to accustom the hogs gradually to new corn before turning them into the field.

Hogs may be turned into the cornfield as soon as the dent has formed on the kernel.

REVIEW.

1. Give the number of pounds of pork from a bushel of corn as determined by the Iowa trial.
2. What does the economy of grinding corn for swine depend upon?
3. Give the conclusion regarding this after the Wisconsin trial.
4. What did the Iowa trial show regarding grinding and soaking of corn?
5. What is meant by “hogging off corn”?
6. Give the result of the Minnesota trial regarding this.
7. Give the points in the Minnesota summary.
8. Give the best conditions for practising this method of feeding.
9. Give the teachings of the Missouri test.

CHAPTER XX.

SUPPLEMENTARY FEEDS WITH CORN.

IT HAS been already noted that corn is essentially a fat-forming feed, and that it is not a good bone and muscle former. The evil effects of exclusive corn feeding are most conspicuous in the case of young, growing pigs, and numerous experiments have been conducted in combining other feeds with corn, which would tend to overcome its objectionable features. The influence of exclusive corn feeding upon the composition of the body has been discussed, but its influence upon the growth and economical gains of the animal has yet to be considered.

Blood Meal and Pea Meal.—In “Feeds and Feeding,” Henry, of the Wisconsin Experiment Station, reports gains and feed consumed by three lots of pigs fed as follows:

Lot 1: $\frac{1}{3}$ blood meal, $\frac{2}{3}$ corn meal.

Lot 2: $\frac{1}{2}$ pea meal, $\frac{1}{2}$ corn meal.

Lot 3: Corn meal only.

During the trial,

Lot 1 gained 202 pounds, and required 409 pounds of feed for 100 pounds of gain.

Lot 2 gained 180 pounds and required 449 pounds of feed for 100 pounds of gain.

Lot 3 gained 155 pounds and required 481 pounds of feed for 100 pounds of gain.

Blood meal is very rich in protein, and peas are much richer in protein than corn. The effect of using such feeds with corn is very noticeable in the larger gains and smaller feed requirements for 100 pounds gain.

Bone Meal and Hard-wood Ashes.—Henry also reports three trials in feeding bone meal with corn, and hard-wood ashes with corn, against corn alone, six pigs from the same litter being used in each trial. Regarding these trials the author writes:

“As the trials progressed, it became evident that none of the pigs were properly nurtured, though the difference in favor of those getting bone meal or ashes was very marked. The pigs allowed neither ashes nor bone meal were most plainly dwarfed. . . . These dwarfs became so fat that the jowls and bellies of some of them nearly touched the ground.”

The following table, taken from “Feeds and Feeding,” shows some striking differences:

	When bone meal was fed.	When ashes were fed.	When neither was fed
Corn meal required to produce 100 pounds of gain, pounds.....	487	491	629
Average breaking strength of thigh- bones, pounds.....	680	581	301
Average ash in thigh-bones, grams..	166	150	107

It will be seen from the above table that the appetite of the hog for such substances as ashes is not without significance.

Wheat Middlings and Skim-Milk.—J. G. Fuller, of the Wisconsin Experiment Station, reports an experiment with two lots of Berkshire pigs. They were young pigs, weighing about 51 pounds each when the experiment began. One lot was fed corn meal only, and the other was fed a mixture of corn meal, wheat middlings, and skim-milk. The following conclusions are drawn from the experiment:

If the pigs were valued at the same price per pound, the mixed ration lot would return a profit practically four times that of the corn lot.

The amount of dry matter required for a pound of gain was twice as great in the corn group as in the mixed ration group.

The mixed ration group made 4.2 times as great a gain as the pigs in the corn group.

On an average, the thigh-bones of the mixed-ration group were 50 per cent stronger than those from the corn group.

The constitution of the pigs in the corn group was seriously impaired.

Finally, it is highly impracticable to raise growing pigs upon a ration of corn alone.

Soy-Bean Meal and Wheat Middlings.—Humphrey and Fuller, of the Wisconsin Experiment Station, report three tests in which soy-bean meal was compared with wheat middlings as a supplement to corn. The soy bean is very rich in protein and fat, and the object of the experiment was to compare it with wheat middlings, which are generally recognized as being a good supplement to corn.

Two pounds of corn meal were fed with each pound of soy-bean meal or wheat middlings, and skim-milk was also fed to both lots. Part of the time the hogs were on pasture, and part of the time in pens. The authors draw the following conclusions:

“Soy-bean meal makes an excellent supplement to corn meal for growing and fattening pigs.”

“Soy-bean meal is from 8 to 10 per cent more valuable than wheat middlings for economical pork production when the cost of the two feeds is the same.”

“For firmness, fine grain and texture of flesh, and even distribution of fat and lean, the ration of wheat middlings and corn meal is superior to that of soy beans and corn meal.”

Looking over these conclusions, we must admit that soy-

beans have not made a very good showing, because, in most localities, wheat middlings would be very much cheaper. The influence upon the texture and firmness of the meat is also worthy of consideration.

Barley, Shorts, Meat Meal, and Tankage.—The Iowa Experiment Station reports an experiment with forty-eight well-grown hogs divided into four lots. The rations of the different lots were as follows:

- Lot 1. Corn, two parts; barley, one part; shorts, one part.
- Lot 2. Corn.
- Lot 3. Corn, nine parts; Armour's meat meal, one part.
- Lot 4. Corn, nine parts; Swift's tankage, one part.

Meat meal and tankage are by-products of the packing house, and are both very rich in protein. The meat meal used in this experiment contained 66.36 per cent of protein, and the tankage 53.54 per cent. Such highly concentrated feeds must be used in small quantities. The hogs averaged 218 pounds each at the commencement of the trial, which lasted thirty-two days.

The average daily gain per hog in each group was as follows: Meat meal, 2.6 pounds; tankage, 2.3 pounds; barley and shorts, 2.2 pounds; corn alone, 1.8 pounds.

The feed consumed per 100 pounds gain is shown in the following table:

	Corn.	Barley.	Shorts.	Meat meal.	Tankage	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Lot 1. Corn, barley and shorts.....	198.9	99.5	99.5			397.9
Lot 2. Corn alone.....	463.5					463.5
Lot 3. Corn and meat meal.....	333.3			37.0		370.3
Lot 4. Corn and tankage.....	358.8				39.9	398.7

Feeds were valued as follows:

Corn, 43 cents per 56 pounds, or 76.8 cents per hundred-weight.

Barley, 35 cents per bushel, or 72.9 cents per hundred-weight.

Shorts, \$18.00 per ton, or 90 cents per hundred-weight.

Meat meal, \$35.00 per ton, or \$1.75 per hundred-weight.

Tankage, \$33.00 per ton, or \$1.65 per hundred-weight.

According to these values, the cost of 100 pounds gain was as follows: lot 1, \$3.15; lot 2, \$3.56; lot 3, \$3.21; lot 4, \$3.41.

Conclusion.—It will be noted that the group fed corn alone made the smallest daily gains and the most expensive gains.

The cheapest gains were made by the lot fed corn, barley, and shorts, though this lot stood third in rate of gain.

The largest gains were made by the meat meal group, but the high price of the meat meal runs up the cost out of proportion to the rate of gain.

In this experiment, meat meal proved superior to tankage as a supplementary feed with corn.

Meat Meal.—A second experiment by the Iowa Experiment Station was conducted with different proportions of Armour's meat meal with corn as compared with corn alone. Thirty-six pigs, averaging 137 pounds in weight, were divided into four groups and fed 100 days.

Lot 1. Corn meal 7 parts, meat meal 1 part.

Lot 2. Corn meal $8\frac{1}{2}$ parts, meat meal 1 part.

Lot 3. Corn meal 10 parts, meat meal 1 part.

Lot 4. Corn meal alone.

The average daily gain per pig, the feed consumed per 100 pounds gain, and the cost of 100 pounds gain were as follows:

	Average daily gain.	Feed per 100 lbs. gain			Cost of 100 lbs. gain.
		Corn.	Meat meal	Total.	
Lot 1. Corn 7, meat meal 1.....	lbs.	lbs.	lbs.	lbs.	
	1.74	381.6	54.5	436.1	\$3.73
Lot 2. Corn 8½, meat meal 1.....	1.78	409.2	47.9	457.1	\$3.81
Lot 3. Corn 10, meat meal 1.....	1.85	409.9	40.9	450.8	\$3.68
Lot 4. Corn alone.....	1.16	556.6		556.6	\$3.97

In computing the cost, corn meal was valued at 71.4 cents per hundred-weight, and Armour's meat meal at \$37.00 per ton.

It will be noted that the lot receiving 10 parts corn to 1 part meat meal made the most rapid and the cheapest gains.

As in the first experiment, the hogs fed corn alone made the slowest and most expensive gains.

The report of the experiment states: "The pigs in all lots were uniformly very fat, and the difference in gain between the lots getting meat meal and the one getting corn alone seems to have been mostly in growth, although the meat meal pigs showed smoother, glossier hair."

Meat Meal, Tankage, and Shorts.—A third experiment of the Iowa Experiment Station had for its object the comparison of Armour's meat meal and Swift's digester tankage with shorts, as supplements to a corn ration with young growing pigs. As the pigs were young, averaging 60 pounds in weight, it was not thought advisable to feed any of them corn alone in dry lots. The lots that were fed corn as the only concentrate were pastured on timothy or clover pasture. Altogether, 100 pigs were used, and divided into ten groups of ten pigs each.

Tankage and meat meal were fed in the proportion of one part tankage or meat meal to five parts corn meal.

Shorts were fed in two proportions,—namely, one of shorts to two of corn meal, and one of shorts to one of corn meal.

The experiment lasted 112 days.

Leading Points.—There are many interesting details of this experiment which cannot be given here, and only the leading points will be referred to.

1. Meat meal and tankage proved practically equal as supplements to corn in point of producing gains, as will be seen from the following statement:

Ration.	Gain per hog.
Corn and meat meal on pasture.....	164.9 lbs.
Corn and tankage on pasture.....	162.9 lbs.
Corn and meat meal in dry lot.....	128.8 lbs.
Corn and tankage in dry lot.....	128.8 lbs.

2. The number of bushels of corn replaced by one ton of supplementary feed was as follows:

Ration	
Corn 2, shorts 1.....	One ton shorts replaced 46.6 bu. corn
Corn 1, shorts 1.....	One ton shorts replaced 45.3 bu. corn
Corn 5, meat meal 1....	One ton meat meal replaced 57.9 bu. corn
Corn 5, tankage 1.....	One ton tankage replaced 64.4 bu. corn

From this stand-point, tankage proved most effective.

3. When the hogs were upon pasture, shorts compared favorably with meat meal. The average total concentrates required for 100 pounds gain in the case of hogs fed corn and shorts on pasture was 403.9 pounds; in the case of the hogs fed meat meal and corn it was 409.6 pounds; for the hogs fed tankage and corn, it was 398.4 pounds.

4. In the dry lots the highly nitrogenous feeds, meat meal and tankage, showed to best advantage as compared with shorts, the average total feed requirements for 100 pounds gain being

494.7 pounds for the shorts and corn lots, 409.9 pounds for the meat meal and corn lot, and 460.4 pounds for the tankage and corn lot.

5. Among the conclusions drawn from the experiment, the following statements occur:

"Meat meal and tankage of similar chemical composition are almost equal, pound for pound, as a supplement to a corn ration for growing pigs and fattening hogs."

"Hogs fed on rations composed of corn and meat meal, and corn and tankage, were fully as acceptable to the buyers, both from the stand-point of the quality and condition of the flesh, as those fed on any other rations used."

"Both meat meal and tankage are more valuable adjuncts to the corn ration for dry lot feeding than when pigs or hogs are being developed and fattened on pasture, especially if the pasture be composed of leguminous crops."

"A ration of one-half corn and one-half shorts produced greater gains with less feed per 100 pounds of gain, both on pasture and dry lot feeding, than a ration of two-thirds corn and one-third shorts."

Skim-Milk.—From a test with skim-milk, tankage, linseed meal, soy-bean meal, and wheat middlings as supplements to corn meal, conducted at the Indiana Experiment Station, the following conclusions are drawn:

"Skim-milk, tankage, linseed meal, soy-bean meal, and middlings proved to be very efficient supplements to corn meal."

"Hogs fed on corn meal and skim-milk consumed more feed, made a greater increase in live weight with a smaller amount of feed and dry matter, and at less expense than similar lots fed on corn meal supplemented by tankage, linseed meal, soy-bean meal, or middlings."

"Tankage ranked second to skim-milk, followed very closely by middlings, soy-bean meal, and linseed meal as supplements to corn meal."

"There was less cash outlay for tankage than for any other commercial nitrogenous feed, and a greater proportion of corn could be used with it."

"The value of skim-milk was found to be:

26.5 cents per cwt. as compared with linseed meal	at \$1.50 per cwt.
24. cents per cwt. as compared with soy-bean meal	at \$1.50 per cwt.
22.9 cents per cwt. as compared with tankage	at \$2.00 per cwt.
28. cents per cwt. as compared with middlings	at 1.25 per cwt.

"Skim-milk has proved to be the most efficient supplement to shelled corn or corn meal used in the experimental feed lots at the station for the past five years in fattening hogs."

"Tankage has been the most efficient commercial feed used as a supplement to corn in fattening hogs under market conditions prevailing during the past five years."

Shorts, Skim-Milk, Tankage, Ground Bone, Alfalfa Pasture.—The Nebraska Experiment Station conducted a series of experiments with shorts, skim-milk, Swift's digester tankage, and steamed ground bone.

Following are the rations used:

Corn meal alone.

Corn meal 75 per cent, shorts 25 per cent.

Corn meal 25 per cent, skim-milk 75 per cent.

Corn meal 90 per cent, tankage 10 per cent.

Corn meal 95 per cent, tankage 5 per cent.

Corn meal 90 per cent, steamed ground bone 10 per cent.

During part of the time the hogs were on alfalfa pasture, so that it is possible to study the effect of alfalfa with corn. The last experiment brings out the comparison very clearly, as is shown in the following table:

	On alfalfa pasture.		In dry lot.	
	Feed for 100 pounds gain.	Cost.	Feed for 100 pounds gain.	Cost.
Corn meal alone.....	lbs. 343	\$2.38	lbs. 543	\$3.88
Corn 75 per cent, shorts 25 per cent.....	336	\$2.64	533	\$4.18
Corn 25 per cent, skim milk 75 per cent.....	{ 249* } 704†	\$3.19	{ 385* } 1063†	\$4.87
Corn 90 per cent, tankage 10 per cent.....	322	\$2.72	487	\$4.10
Corn 90 per cent, ground bone 10 per cent.....	336	\$2.62	533	\$4.17

*Corn.

† Skim-milk.

In computing the cost, corn was valued at 40 cents per bushel, shorts at \$20.00 per ton, skim-milk at 20 cents per hundred pounds, tankage at \$40.00 per ton, and ground bone at \$30.00 per ton.

Results.—It will be noted that while the hogs were upon alfalfa pasture the amount of corn required for 100 pounds of gain, with the lot fed corn meal alone, compares very favorably with the other groups; but when the hogs were put into dry lots the feed for 100 pounds gain in the corn group is much higher than in the tankage group. The same is true of the corn and shorts group as compared with the corn and tankage group, so that here we find the same result as was found in the Iowa experiments.

If the same values for feeds were used in the Nebraska experiments as were used in the Iowa experiments, the supplementary feeds would make a better showing.

It must also be remembered that in Nebraska the hogs were kept upon alfalfa pasture until they were well grown, and, in consequence, were in the best possible shape to stand exclusive corn feeding in the dry lots.

Following are some points taken from Professor Burnett's conclusions in connection with the investigation:

When pigs were in a dry lot, the use of tankage as about 5 per cent of the ration generally reduced the cost of the pork produced.

All these experiments tend to show the suitability of corn and alfalfa as a ration for hogs.

The lot receiving corn and steamed ground bone show gains at practically the same cost as the lot receiving 5 per cent tankage. The lot receiving ground bone required more feed for 100 pounds of gain, but the ground bone cost less per ton.

Skim-milk at 20 cents per 100 pounds proved the most expensive supplementary feed used.

Where supplementary feeds were used, the hogs generally made more rapid gains and reached heavier weights in a given length of time.

In a test of the breaking strength of the bones of the hogs in the Nebraska experiments, it was found that they stood in the following order in point of strength of bone: Corn and ground bone, corn and tankage, corn and skim-milk, corn and shorts, corn alone.

Tankage vs. Linseed Meal.—The Indiana Experiment Station reports four tests in which Swift's digester tankage was fed in comparison with linseed meal as a supplement to corn.

The proportion of tankage to corn meal was 1 to 10 in the first test, 1 to 32 in the second, 1 to 20 in the third, and 1 to 15 in the fourth.

In each test the proportion of linseed meal to corn meal was twice as great as the proportion of tankage to corn meal, the linseed meal being poorer in protein than the tankage.

Corn was valued at \$18.00 per ton, tankage at \$40.00 per ton, and old process linseed meal at \$30.00 per ton.

In two tests linseed meal proved slightly more economical than tankage, and in the other two tankage had a fairly marked advantage.

The averages of the four tests show the feed requirements and cost of 100 pounds of gain to be as follows:

Corn meal and tankage: 370 lbs. corn, 24.5 lbs. tankage, costing \$3.82.

Corn meal and linseed meal: 363.6 lbs. corn, 46.2 lbs. linseed meal, costing \$3.96.

Conclusions.—It is noted in the summary that hogs fed on a ration of corn meal and tankage consume more feed and make more rapid gains than hogs fed a ration of corn meal and linseed meal.

Also, that a ration of corn meal and tankage gives a better finish than one of corn meal and linseed meal.

Soy-Bean Meal vs. Linseed Meal.—Indiana also reports two tests comparing soy-bean meal with linseed meal as supplements to corn.

In the first test, 5 parts of corn meal were fed with 1 part of linseed meal or soy-bean meal. In the second test, 8 parts of corn meal were fed with 1 part of linseed meal, and 7 parts of corn meal with 1 part of soy-bean meal.

Linseed meal and soy-bean meal are both valued at \$30.00 per ton, and corn meal at \$18.00 per ton.

On an average of the results of the two trials, it required for 100 pounds of gain:

Corn meal and linseed meal, 378 pounds, costing \$3.71.

Corn meal and soy-bean meal, 360 pounds, costing \$3.55.

The percentage of protein in linseed meal and soy-bean meal is very similar, and, though soy-bean meal showed an advantage

over linseed meal in these tests, the difference is slight.

Linseed Meal.—E. B. Forbes, of the Missouri Experiment Station, reports results of an experiment in which 100 pounds of a mixture of five parts corn to one part linseed meal proved equal to nearly 148 pounds of corn alone.

Tankage.—The Indiana Experiment Station was among the first to test tankage as a supplement to corn. In this trial, feeds were valued as follows: Corn meal, \$20.00 per ton; shorts, \$16.00 per ton; tankage \$30.00 per ton. This method of valuing feeds is very much more in favor of tankage, as compared with corn, than the system followed in Nebraska.

The cost of 100 pounds of gain was as follows:

Lot I. 10 parts corn meal, 1 part tankage	\$3.80	Lot III. Corn meal only	\$5.20
Lot II. 5 parts corn meal, 1 part tankage	4.00	Lot IV. 10 parts mixture of corn and middlings, 1 part tankage	3.60

There were four pigs in each lot, and lot I gained 4.63 pounds per day; lot II, 4.91 pounds; lot III, 2.68 pounds; and lot IV, 4.55: a striking illustration in favor of tankage.

Cottonseed Meal.—The Alabama Station reports tests with cottonseed meal as a supplementary feed with corn. In two tests the feed was mixed in the proportion of one part cottonseed meal to 9 parts corn, by weight. The average for two years shows feed for 100 pounds gain as follows:

Corn alone	727 lbs.
Corn and cottonseed meal	436 lbs.

In a third test, a third group was added to which was fed 1 part cottonseed meal to 2 parts corn. Feed required for 100 pounds gain was as follows:

Corn alone	581 lbs.
Corn $\frac{9}{10}$, cottonseed meal $\frac{1}{10}$,	389 lbs.
Corn $\frac{2}{3}$, cottonseed meal $\frac{1}{3}$,	354 lbs.

None of the pigs showed any ill effects from cottonseed meal in the three tests noted, but in another test, all of the pigs, but one, fed cottonseed meal, were dead before the experiment had

been in progress 81 days. It is stated that there is a risk in feeding cottonseed meal. It is claimed, however, that cottonseed meal can be fed with safety, even in large amounts, for periods of not more than 25 days. When no deaths occurred, cottonseed meal proved equal to tankage as a supplementary feed with corn.*

Summary.—Many other instances of the effect of supplementary feeds with corn might be given if space permitted. Sufficient tests have been quoted to establish a few important points which may be enumerated as follows:

1. Corn alone falls far short of being an ideal ration for hogs. It is especially injurious to young pigs, resulting in lack of growth, weakness of bone, and expensive gains.
2. When wisely combined with a feed relatively rich in protein, corn makes one of the best hog feeds obtainable.
3. Pasture, either grass or clover, makes a good supplement to corn, clover and alfalfa being especially desirable.
4. Very high-priced protein feeds, such as tankage and meat meal, must be used in small proportions, and give best relative returns when used in dry-lot feeding.
5. When hogs are on pasture, a comparatively cheap feed, such as wheat middlings, will supplement corn to better advantage than expensive feeds like tankage and meat meal.
6. Where soy-beans can be grown to advantage, they constitute a valuable feed to use as a supplement to corn.

REVIEW.

1. What is the need of supplementary feed to be used with corn?
2. What is found to be the effect of blood meal and pea meal? Why?
3. What is the special need of such feed as bone meal and hard-wood ashes as a supplement to corn?
4. Give the effect of using each feed discussed in this chapter along with corn.

* There is evidently considerable risk in feeding cottonseed meal to hogs, though the exact danger point has not been determined. It is not profitable to run much risk in the use of this feed, since the difference in cost between cottonseed meal and other feeds that are considered safer is now very small.

The North Carolina Station has shown that giving iron sulfate in the drinking water, 1 pound to 50 gallons of water, or slop, will overcome the poisonous effects of cottonseed meal for pigs. See "Productive Feeding of Farm Animals," by Woll.

CHAPTER XXI.

VARIOUS GRAINS, MEALS, AND BY-PRODUCTS.

Peas or Canada Field Peas.—This grain is comparatively little known in the United States, and is used to a smaller extent for pig feeding in Canada than it was some years ago, mainly owing to the high price it commands for other purposes. (Fig. 41.)

At the Utah Experiment Station, hogs fed ground peas and bran, equal parts, made an average daily gain of 1.09 pounds and required 363 pounds of meal for 100 pounds of gain; while hogs fed corn and bran made an average daily gain of .63 pound and required 455 pounds of meal for 100 pounds of gain.

At the South Dakota Station, the daily gain of pigs fed whole soaked peas was 1.21 pounds, and for soaked corn meal 1.40 pounds; but the grain required for 100 pounds gain was 421 pounds for the pea group and 458 pounds for the corn lot.

The Ontario Agricultural College found that feeding pea meal alone was injurious to pigs, the heavy, close nature of the meal making it indigestible. This peculiarity of pea meal is generally recognized. Pea meal alone was less satisfactory than corn meal alone, but when mixed with one-third of its weight of wheat middlings, it gave much better results than corn meal.

The pea meal is very rich in protein and should make a good supplementary feed with corn.

Barley.—Barley is richer in bone- and muscle-forming constituents than corn, having a higher percentage of ash and protein. In fattening constituents it is scarcely equal to corn.

The Wisconsin Experiment Station reports two feeding trials with barley and corn. In the first trial the grains were fed alone, and in the second they were fed with skim-milk.

The first of the two trials shows that it required 471

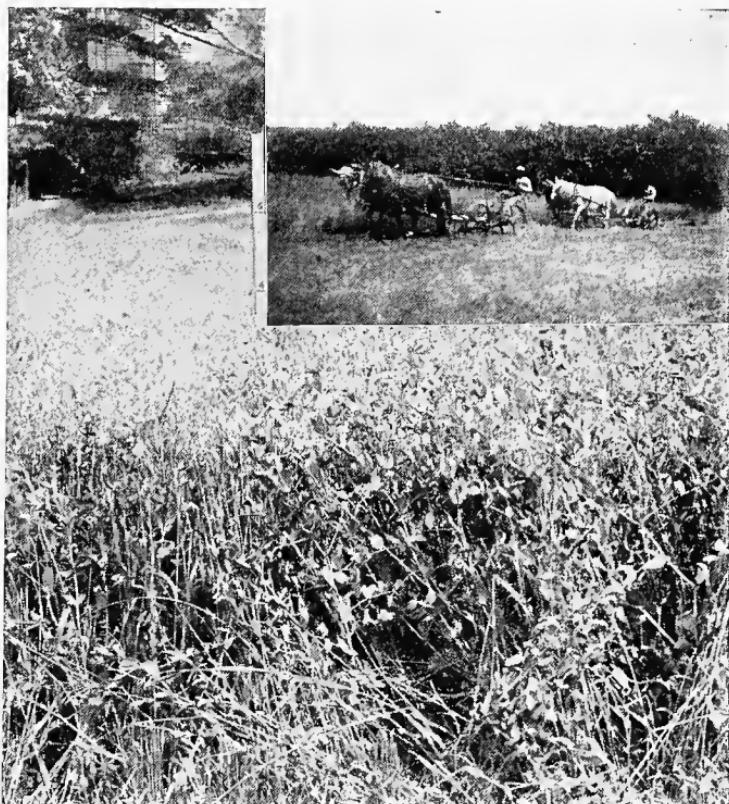


FIG. 41.—Oats and peas sown in early spring may be cut when ripe, and the two threshed out together. The grinding for hog feed may be either together or separately.

pounds of barley to produce 100 pounds of gain, and 435 pounds of corn to produce 100 pounds of gain.

In the second trial it required 330 pounds of barley and 398 pounds of skim-milk for 100 pounds gain, and 306 pounds of corn and 371 pounds of milk for 100 pounds gain. In each trial, therefore, it required more barley than corn for 100 pounds gain.

The South Dakota Station found barley and corn practically equal as pork producers, it requiring 453 pounds of corn and 457 pounds of barley, respectively, for 100 pounds of gain.

Colorado and Ontario experiments were in favor of barley as compared with corn.

The first Wisconsin trial gave the most marked results in favor of corn, and it is worthy of note that the hogs in this trial averaged over 200 pounds in weight at the commencement of the trial. Where younger hogs were used, barley made a better showing as compared with corn. There is little doubt that, considered as a fat former, corn is superior to barley, and hence well-grown pigs would be able to stand exclusive corn feeding much better than younger pigs. The writer's experience would lead him to prefer barley to corn as a meal ration for growing pigs, and this view is borne out by the experiments noted. The extensive use made of barley for swine feeding in Canada, Great Britain, Denmark, and other countries, is strong evidence of its value.

One disadvantage of barley is the fact that it is not eaten so readily by pigs as one might wish, and should be mixed with some other feed to increase its palatability. Barley is well adapted to mixing with corn as a ration for almost any class of pigs.

Wheat.—Wheat has been experimented with, more or less, as a feed for swine, and results show that there is comparatively little difference between wheat and corn in feeding value. Wheat contains less fibre than barley, but ground wheat alone can hardly be regarded as a satisfactory ration, owing to the fact that it is likely to cause digestive troubles. It gives much better results when mixed with other meal, and combines well with corn. As a general thing, feeding sound wheat is out of the question, owing to its relatively high price. It is only

under exceptional circumstances that it can be counted among feeds for swine.

The Wyoming Station secured better gains for feed consumed from wheat than from corn in each of two tests, reported in Bulletin 74.

Frosted Wheat.—In some years, considerable of this product is placed upon the market. In the northern belt, wheat may be sufficiently injured by frost to render it unfit for milling, and yet be practically equal to sound wheat for feeding purposes. Frozen wheat varies much in character, depending on the degree of maturity reached by the grain before frost.

In his evidence before the Committee on Agriculture, J. H. Grisdale, of the Central Experimental Farm, Canada, gives details of swine feeding experiments with frozen wheat, fed alone and combined. This table brings out the main points:

Character of Ration.	Average weight of pigs at commencement	Average daily gain.	Pounds meal per 100 pounds gain.
	lbs.	lbs.	lbs.
Lot 1. No. 1 frozen wheat 2 parts, shorts 1 part.....	99.1	.76	390
Lot 2. No. 1 frozen wheat 2 parts, corn 1 part.....	76.	.77	370
Lot 3. No. 2 frozen wheat 2 parts, corn 1 part.....	118.2	1.03	390
Lot 4. No. 2 frozen wheat only	140	1.23	360
Lot 5. No. 2 frozen wheat only	85	.71	380
Lot 6. No. 2 frozen wheat 2 parts, barley 1 part.....	104.1	.81	410
Lot 7. No. 1 frozen wheat 2 parts, oats 1 part.....	112.1	1.02	390
Lot 8. No. 1 frozen wheat 2 parts, oats 1 part.....	74.2	.66	390
Lot 9. No. 2 frozen wheat with 3 lbs. skim-milk daily per pig	99.	.86	340
Lot 10. No. 1 frozen wheat only	150.4	.94	410
Lot 11. No. 1 frozen wheat only	96.3	.79	390
Lot 12. Equal parts No. 1 frozen wheat, No. 2 frozen wheat, and corn.....	124.8	.94	470

It is unsafe to make comparisons of the different rations, but the table fails to show any advantage of the No. 1 frozen wheat over the No. 2.

The most remarkable feature of the experiment is the uniformly good results obtained with all the groups, indicating frozen wheat to be a valuable feed for swine.

The same would probably be found of wheat slightly affected with smut disease, and of otherwise shrunken wheat. (Fig. 42.)

Frozen Wheat vs. Barley.—At the Ontario Agricultural College, the writer fed three lots of pigs to compare frozen

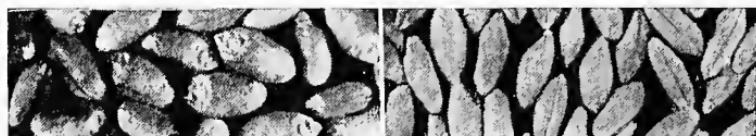


FIG. 42.—Good plump wheat at the left; a poor type at the right, with narrow shriveled kernels, suitable for hog feed.

wheat with barley. The frozen wheat tested only $43\frac{1}{2}$ pounds per bushel.

Lot 1 contained 18 pigs and was fed ground barley and wheat middlings.

Lot 2 contained 20 pigs and was fed ground frozen wheat and wheat middlings.

Lot 3 contained 18 pigs and was fed ground barley and frozen wheat, equal parts, with middlings.

The proportion of middlings varied, being reduced as the experiment progressed, but was the same for all lots.

The pigs in lot 1 averaged 41 pounds in weight at the start, lot 2, 37.7 pounds, and lot 3, 54.5 pounds.

Lot 1 made an average daily gain per pig of 1.08 pounds, lot 2, 1.1 pounds, and lot 3, 1.18 pounds.

The amount of meal consumed per 100 pounds gain was as follows:

Lot 1, 430.9 pounds; lot 2, 431.4 pounds; lot 3, 432.9 pounds.



FIG. 43.—Black-hulled white kafir, much grown in dry climates to use in place of corn. (Experiment Station, Kans.)

Both in rate of gain and feed consumed per 100 pounds gain, the three rations may be said to have given practically the same results. In this experiment, therefore, we find that frozen wheat has proved quite equal to barley when fed with middlings.

Oats.—Owing to their high percentage of fibre, oats do not possess a high value for fattening hogs. When used at all, they should be used as a comparatively small part only of the

ration, and they show to best advantage when used to lighten and give more bulk to a heavy, close-textured meal, such as pea meal, or even corn meal. They are especially useful for making up part of the ration of boars or breeding sows, where the aim is to maintain vigor without unduly fattening.

Rye.—Extensive Danish experiments, summarized by Professor Henry in "Feeds and Feeding," indicate that rye and barley are about equal in value for pig feeding. Very little experimental work with the grain of this cereal has been done in America. Rye meal is best fed in combination with other kinds of meal.

Kafir.—At the Kansas Experiment Station, it was found that corn meal had a feeding value of from 17 to 29 per cent higher than kafir meal. The addition of soy-bean meal to kafir to the extent of one-third of the ration materially improved its value, but did not make it equal to a similar mixture of corn meal and soy-bean meal. (Fig. 43.)

Buckwheat.—The Central Experimental Farm, Canada, reports two trials in which buckwheat was compared with wheat. In the first trial, ground buckwheat was fed against ground wheat, and in this trial 445 pounds of ground buckwheat were required for 100 pounds gain, and 410 pounds ground wheat for 100 pounds gain.

In the second trial, one lot of pigs was fed a mixture of one-half ground buckwheat and one-half mixed meal, and the other lot a mixture of one-half ground wheat and one-half mixed meal. In this trial it required 405 pounds of the buckwheat mixture for 100 pounds of gain, and 380 pounds of the wheat mixture for 100 pounds of gain. This is a much better showing for buckwheat than might be expected, since buckwheat has a thick, fibrous hull which the hog cannot digest.

Ground wheat showed an advantage of only about 8½ per cent over ground buckwheat, and the wheat mixture an advantage of 6½ per cent over the buckwheat mixture.

Emmer.—This grain is commonly known as “spelt” or “speltz.” Genuine spelt is a distinct plant, possessing general characters similar to emmer, but is a smaller yielder and possesses about ten per cent more hull than emmer.

The South Dakota Station reports one experiment with emmer, under the name of “speltz.” One lot of hogs was fed whole emmer, one ground emmer, and one emmer and corn. Whole emmer required 771 pounds of feed for 100 pounds of gain, ground emmer 826 pounds, and emmer and corn 529 pounds. It will be seen that a marked improvement was effected when corn was added to the emmer. Apparently emmer has too much hull or husk (about 21 per cent) to make a first-class hog feed. Its rational use would be for mixing with concentrated, heavy meals to give more bulk to the ration.

Millet Seed.—The South Dakota Station (Bulletin 83) reports a comparison of millet seed with barley and wheat. The authors of the bulletin state that millet seed can be grown profitably as a fattening ration for swine, but it does not furnish as good a ration as barley or wheat. It is also stated that it required one-fifth more millet than it did barley meal, and a trifle more barley meal than it did wheat to make a pound of gain, and that a bushel of 56 pounds of millet seed is equal to a bushel of 48 pounds of barley for hog feed. Millet meal produced a softer quality of fat than did either barley or wheat meal.

Beans.—Beans are best thoroughly cooked before they are fed to swine. Bulletin 243 of the Michigan Experiment Station reports results from feeding cull beans to growing pigs

and fattening pigs. Without going into details, it may be stated that an exclusive ration of beans is not regarded as satisfactory. For growing pigs, a ration consisting of three parts beans and four parts corn meal did not prove so satisfactory as a mixture of two parts beans, two parts wheat middlings, and three parts corn meal. The last-named mixture gave an average daily gain per pig of about one and one-third pounds per day, which is regarded as satisfactory.

Three trials of beans compared with equal parts beans and corn meal were made with fattening hogs. The results of the three trials are briefly summarized in the following table:

	Fed beans alone.	Fed equal parts beans and corn.
	lbs.	lbs.
Average live weight of hogs.....	163	159
Average daily gain per hog.....	1.1	1.52
Average feed consumed per 100 pounds gain.....	420.9	406.4

The addition of corn meal increased the efficiency of the ration about $3\frac{1}{2}$ per cent.

The relative cost of the two feeds and the cost of cooking would have to be considered by the feeder in coming to a decision regarding the economy of the rations.

Wheat Middlings.—Wheat middlings, frequently called “shorts,” is one of the very best feeds for young pigs. It is rich in bone- and muscle-forming constituents, and does not tend to make growing pigs too fat. Its value as a supplement to corn has already been noted, and it combines well with almost any kind of meal. As a single feed for fattening, it is not economical, but it is conducive to thrift and growth when used as a part of a meal ration for fattening pigs. The

younger the pig the greater the value derived from feeding middlings.

Wheat Bran.—Bran is too bulky and fibrous to constitute a large part of a pig's ration, but is useful for mature animals, such as stock boars and breeding sows, or where it is desired to give bulk to a ration that is considered too heavy in character. As a rule, however, middlings can be used to better advantage than bran for the purposes mentioned.

Flour.—Various brands of low-grade flour are occasionally put upon the market. Low-grade flour has a higher feeding value than middlings, but is entirely unsuitable for feeding alone, owing to its pasty nature. The writer's experience is that it will cause digestive derangement when fed alone, and must be diluted to a large extent with other feeds. Bulletin 167 of the Virginia Experiment Station reports better results from soaking low-grade flour than from feeding it freshly mixed with water.

Hominy Feed.—Purdue Experiment Station reports three tests with hominy feed and shorts compared with corn meal and shorts. The meal was mixed in the proportion of two parts of hominy feed or corn to one part of shorts. "Hominy feed or chop consists of bran coating, germ, and part of the starch portions of the corn kernel secured as a by-product in the manufacture of hominy." According to analyses made at Purdue, hominy feed contains about the same per cent of protein as corn, but a higher per cent of fat and a slightly lower per cent of carbohydrates.

The average of three trials shows the following result:

	Hominy feed.	Corn meal.
Average daily gain per head.....	.759 pound	.636 pound
Meal consumed per 100 pounds gain....	505 pounds	598 pounds

Four tests were also made with hominy feed and tankage compared with corn meal and tankage, mixed in the proportion of 20 parts hominy feed or corn meal to 1 part of tankage. The average of the four tests shows the following:

	Hominy feed and tankage.	Corn meal and tankage.
Average daily gain per head.....	1.4 pounds	1.2 pounds
Meal consumed per 100 pounds gain....	372 pounds	451 pounds

The results are summarized as follows:

“Hominy feed produces more rapid growth on hogs than does corn meal.”

“Hominy feed produces gains on less grain than does corn meal.”

“As a general rule the high cost of hominy feed hinders its more general use as a hog feed, and prevents its economical substitution for corn, except when the latter is very high in price.”

It is also pointed out that hominy feed, like corn, should be supplemented by some feed high in protein, such as tankage and skim-milk.

Corn-and-Cob Meal.—The Iowa Experiment Station reports a test of corn-and-cob meal both dry and soaked, and a summary of the results is given below. The test lasted 140 days.

Kind of feed.	Average daily gain per pig.	Pounds corn required
		for 100 pounds gain
	lb.	lbs.
Dry corn.....	.74	456
Soaked corn.....	.63	513
Soaked corn meal.....	.72	555
Soaked corn-and-cob meal.....	.56	583
Dry corn meal.....	.61	595
Dry corn-and-cob meal.....	.51	604

In the table given above the cob has been deducted from the figures for corn-and-cob meal, so that the actual corn is compared in all cases.

It cost 6 cents per bushel to grind the corn-and-cob meal, and 2 cents per bushel to grind corn meal. The results of the test were regarded as so conclusive against corn-and-cob meal that no further tests were made.

The Missouri Experiment Station also gives a decidedly adverse report upon feeding corn-and-cob meal to hogs, but Kansas and New Hampshire report in its favor.

Gluten Meal.—The Central Experimental Farm, Canada, reports unfavorably upon gluten meal as a feed for swine. J. H. Grisdale says regarding it: "Gluten has been fed in limited quantities, but has not proven very satisfactory for either bacon production, young pigs, or breeding stock. It seems to be rather unpalatable, and produces soft bacon."

The Cornell Station also gives an unfavorable report of this feed as compared with corn when both feeds were fed with skim-milk.

Linseed Meal (Oil Meal).—Linseed meal has been already referred to under supplementary feeds with corn. It is seldom advisable to feed linseed meal to a greater extent than one-fifth of the total meal ration, and, as a rule, half this quantity will be found more economical. It is highly recommended by some as a feed for nursing sows, and for young pigs after weaning. The writer has had only fair success in its use as a substitute for skim-milk with young pigs.

In experiments with substitutes for skim-milk for young pigs, the Central Experimental Farm, Canada, obtained an average daily gain of six-tenths of a pound per pig with a mixture consisting of four parts wheat middlings and one part linseed meal. It required 280 pounds of the mixture for 100

pounds of gain, which is a very satisfactory showing. The linseed meal was not so satisfactory as skim-milk, but gave better results than other substitutes for skim-milk tested at the same time.

Cottonseed Meal.—This very concentrated feed possesses some property which renders it fatal to hogs when used in considerable quantities. A small allowance per day may be fed without injurious results, but great care is necessary. The Arkansas and Texas Experiment Stations have probably made the most thorough investigations with cottonseed meal, and their recommendations are worthy of note.

Arkansas Bulletin 85 gives the following quantities of cottonseed meal per pig per day as being "well within the danger limit":

Pigs under 50 pounds, $\frac{1}{4}$ pound per day.

Pigs from 50 to 75 pounds, $\frac{1}{3}$ pound per day.

Pigs from 75 to 100 pounds, $\frac{2}{3}$ pound per day.

Pigs from 100 to 150 pounds, $\frac{1}{2}$ pound per day.

Texas Bulletin 78 makes the following recommendations:

"1. For animals on heavy feed, that not more than one-fourth the weight of the grain ration consist of cottonseed meal. 2. That this feeding continue not more than 50 days, or that the proportion of meal be reduced if feeding is to be continued longer. 3. That the meal be mixed with other feed and all soured together. 4. That as much green feed as possible be supplied to the hogs. 5. That a close watch be kept, and the meal taken from any animals not eating or not gaining well."

"Feeders who have had experience with the meal will probably be able to exceed these recommendations, which, however, allow the use of enough meal to greatly improve a corn diet. One pound of cottonseed meal to five of corn furnishes the nutrients in the most desirable proportions for fattening, while one or two of corn are more nearly correct for young, growing stock."

Cottonseed Meal with Corn and Rice.—Bulletin 135 of the Texas Experiment Station reports further trials of cottonseed meal with corn chop and rough red rice. One group of

hogs weighed 99 pounds each, and the other 131 pounds each when the test commenced. At the start, one group of ten hogs was fed 6.5 pounds cottonseed meal and 16.5 pounds of corn chop daily, and the other group of ten hogs was fed 7.5 pounds of cottonseed meal and 16.5 pounds of rice. Towards the close of the experiment, lot 1 was fed 12.5 pounds of cottonseed meal and 78 pounds of corn chop, and lot 2 was fed 15 pounds of cottonseed meal and 70 pounds of rice daily. At first the feed was given fresh, but a month later all feed was fermented.

The hogs made satisfactory gains, and no evil effect was observed at any time. The author states that the Station has hopes that further experience will remove any need for uneasiness when feeding cottonseed meal (see Caution, pp. 162 and 163).

Hogs following cattle which are fed a considerable amount of cottonseed meal in their ration do not appear to be injuriously affected, though there seem to be exceptions to this rule. Just how much cottonseed meal can be fed to cattle without injury to the hogs following them, does not appear to be definitely settled. Prof. E. T. Robbins, of the Iowa Experiment Station, writing to the *Breeder's Gazette*, reviews the experience of cattle feeders in connection with this problem, and states: "Even when fed to steers under the best of circumstances it may possibly, in the opinion of some feeders, be associated with an unaccountable mortality among the hogs." In summing up, he says: "The general consensus of opinion is to the effect that if fed in no larger amounts than 2 to 3 pounds daily per steer, with as many hogs as steers in the feed lot, all danger to the hogs is practically eliminated."

Oat Feed.—This by-product of the oatmeal mill sometimes has a considerable feeding value, but, owing to the fact that it often contains a large proportion of oat hulls, it is not a very satisfactory feed to buy for swine. Experiments with oat feed are not satisfactory, because the product is anything

but constant in composition. The same remarks apply to all by-products of oatmeal mills, under whatever name sold.

Brewers' and Distillers' Grains.—Grisdale, of the Central Experimental Farm, reports economical gains from "spirit grains" when fed in combination with a meal ration. Generally speaking, these products are rather bulky and fibrous for swine, unless used in a limited quantity as a supplement to a grain ration, in much the same way as alfalfa hay or roots.

Sugar-Beet Pulp.—In the wet state this product may be regarded as similar in feeding value to roots, and may be employed in exactly the same way. The dried pulp is hardly a satisfactory feed for swine.

Beet-Sugar Molasses.—Beet molasses is unpalatable and generally unsatisfactory for swine. Bulletin 199 of the Cornell Experiment Station reports apparent poisoning of hogs fed beet molasses; and Utah (Bulletin 101) reports scouring, and bad-flavored pork.

Black-Strap Molasses.—Texas Bulletin 131 reports a test with ground corn compared with ground corn and black-strap molasses. Three groups of hogs were used. Lot 1 was fed equal weights of ground corn and molasses. Lot 2 was fed two parts ground corn to one part of molasses by weight. Lot 3 was fed ground corn alone. There were eight hogs in each lot, and the test lasted 91 days. The average weight of the hogs at the commencement of the test was approximately 120 pounds each. Ground corn was valued at \$28.20 per ton, and molasses at \$16.66 per ton.

The average daily gains per hog and cost of gain were:

	Average daily gain.	Cost 100 lb. gain.
Lot 1. Corn and molasses, equal parts.....	.9 pound	\$10.75
Lot 2. Corn 2 parts, molasses 1 part.....	1.45 pounds	7.53
Lot 3. Corn alone	1.66 pounds	7.36

In this test molasses proved lower in value than corn. Molasses is poor in protein, and would likely have given better results if fed with a feed richer in protein than corn.

Sorghum Seed.—In a test at the Nebraska Experiment Station, one bushel of corn proved equal to nearly one and one-half bushels of sorghum seed for feeding hogs. Chemical analysis would indicate a lower feeding value for sorghum seed than for corn, but not such a wide difference as the Nebraska experiment shows. We would not expect such a wide difference in every case where these feeds are compared.

Cow-peas (Seed).—The Alabama Station fed cow-peas alone and in combination with corn against corn alone. The amount of meal for 100 pounds gain in weight in two tests was as follows:

1st Test.	Corn alone	487 pounds.
	Corn and cow-peas, equal parts	433 pounds.
	Cow-peas alone	481 pounds.
2nd Test.	Corn alone	478 pounds.
	Corn and cow-peas, equal parts	395 pounds.

At the South Carolina Station, corn fed alone required 602 pounds of meal for 100 pounds gain in weight, while cow-peas required 491 pounds.

From these tests we learn that cow-peas have a higher feeding value than corn, but they show to greatest advantage when combined with corn. As a supplementary feed with corn, cow-peas apparently have a high value.

Spanish Peanuts.—The Texas Experiment Station compared Spanish peanuts with corn, feeding the peanuts alone and in combination with corn. The results are summarized as follows: "Spanish peanuts fed alone yielded a larger gain than corn fed alone. The results indicated that an acre of peanuts of a yield of forty bushels would produce approximately

\$18.40 worth of pork at \$6.25 per 100 pounds. Peanuts and corn combined produced much more rapid gains than peanuts alone. The quality of pork produced by peanuts was much inferior to that produced by corn."

Peanuts contain a high percentage of protein, and this fact renders them suitable for feeding with corn, which is deficient in protein. Peanuts also contain a high percentage of oil, which probably accounts for their injurious effect upon the quality of the meat. It would seem, therefore, that peanuts are most suitable for young, growing hogs, but that they should not be fed to hogs during the finishing period.

Rough Red Rice.—The Texas Experiment Station (Bul-letin 135) fed rough red rice with cottonseed meal, and with alfalfa meal, as compared with corn chop fed in a similar manner. The conclusion drawn by the author is that ground rice is about equal to corn chop when fed with cottonseed meal, and better than corn chop when fed with alfalfa meal for pork production; and that ground rough red rice is an economical ration for fattening hogs.

Rice By-products.—Rice hulls are very woody, and are of very little use for any animals, but are especially objectionable for swine. Rice bran and rice polish have considerable feeding value, but, since any feed made up from rice by-products is apt to contain a considerable proportion of hull, feeders are inclined to look upon these feeds with suspicion. The South Carolina Experiment Station compared rice meal and skim-milk with corn meal and skim-milk for pigs, and obtained results slightly in favor of rice meal. The rice meal is stated to consist largely of rice flour, rice polish, and rice bran. At the Massachusetts Experiment Station, rice meal and milk proved practically equal to corn meal and milk for pigs.

Burns, Texas Bulletin 131, summarizes results of feeding rice bran as follows: "Rice bran was much cheaper than corn and yielded a larger gain. The pork produced by it was of an inferior quality to that produced by corn. The shrinkage from the dressed weight hot to the dressed weight chilled was much greater, and the per cent of dressed carcass much less. Rice bran should be used more extensively in pork production when corn is so much higher in price, and, for the best results, should be fed in connection with a feed rich in protein."

Weed Seeds.—Professor Henry conducted two trials at the Wisconsin Experiment Station with pigeon-grass seed, cooked and uncooked, for swine. The results are reported in "Feeds and Feeding."

Lot 1 was fed two-thirds cooked pigeon-grass meal and one-third corn meal uncooked.

Lot 2 was fed corn meal only, uncooked.

Lot 3 was fed one-third pigeon-grass meal and two-thirds corn meal, both uncooked.

Lot 1 made the largest gains and required the least feed for 100 pounds of gain, and lot 3 made the smallest gains and required the most feed for 100 pounds of gain.

Professor Henry says: "It is evident that pigeon-grass seed when cooked is a valuable feed for swine. . . . To be satisfactory for pig feeding the seed of this grass should be ground and cooked."

At the large elevators, weed seeds and small wheat accumulate in large quantities, and this product can be used to good advantage in feeding swine when judiciously mixed with other meal.

"Stock Feeds."—In Bulletin 151 of the Wisconsin Experiment Station, Prof. F. W. Woll gives a review of the work of experiment stations with so-called "stock feeds," or

“condimental stock feeds.” In summing up, Professor Woll says, in part: “The feeding experiments include twenty-three different trials, conducted at more than a dozen different experiment stations, with 992 animals in all; viz., with 78 steers, 81 dairy cows, 604 sheep, 112 pigs, and 117 hens. . . . In going over the evidence presented, we find that only two out of the twenty-three different trials showed the stock feed to possess any merit; the conclusions drawn from the results of the twenty-one trials is to the effect that nothing was gained by including these feeds in the ration fed; in fact, they were shown to be a positive detriment in so far that they rendered the rations more expensive and increased the cost of the product obtained, whether this be gain in live weight, milk, butter fat, wool, or eggs.”

Among the conclusions drawn from investigation work with “stock feeds” are the following:

“They are of no benefit to healthy animals when fed as directed, either as to increasing the digestibility of the feed eaten or rendering it more effective for the production of meat, milk, wool, etc.”

“They are of no benefit as a cure-all for diseases of the various classes of live stock; neither do they possess any particular merit in case of specific diseases, or for animals out of condition, off feed, etc., since only a small proportion of ingredients having medicinal value is found therein, the bulk of the feeds consisting of a filler which possesses no medicinal properties whatever.”

“Exorbitant prices are charged for these feeds.”

“By adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock feeds of any kind. If a farmer believes it is necessary to feed stock feeds at times, he can

purchase the ingredients at a drug store and make his own stock feeds at a fraction of the cost charged for them by the manufacturers."

The following formulas for stock feeds, suggested by two American experiment stations, are given in the bulletin:

"1. Ground gentian, 1 pound; ground ginger, $\frac{1}{4}$ pound; powdered salpeter, $\frac{1}{4}$ pound; powdered iron sulphate, $\frac{1}{4}$ pound. Mix, and give one tablespoonful in feed once daily for ten days, omit for three days, and feed as above for ten days more. Estimated cost, 20 cents a pound. Estimated tonic value, about four times that of most condimental feeds on the market."

"2. Fenugreek, 8 pounds; ginger, 8 pounds; powdered gentian, 8 pounds; powdered sulphur, 8 pounds; potassium nitrate, 8 pounds; resin, 8 pounds; cayenne pepper, 4 pounds; flax-seed meal, 44 pounds; powdered charcoal, 20 pounds; common salt, 20 pounds; wheat bran, 100 pounds."

This mixture is said to be "so near the average stock feed that neither the farmer nor his stock could tell the difference." Estimated cost, less than \$4.42 per hundred pounds.

"3. Powdered gentian, 1 pound; powdered ginger, 1 pound; fenugreek, 5 pounds; common salt, 10 pounds; bran, 50 pounds; oil meal, 50 pounds. Estimated cost \$1.50 per hundred pounds."

Soft Coal, Charcoal, and Tonic Mixture.—Bulletin 150 of the Maryland Experiment Station gives results of a single test with soft coal, charcoal, and tonic mixture, made up as follows: Wood charcoal, 1 pound; sulphur, 1 pound; common salt, 2 pounds; bread soda, 2 pounds; sodium hyposulphite, 2 pounds; sodium sulphate, 1 pound; black antimony, 1 pound. The ingredients of the tonic were pulverized and thoroughly mixed. The cost of the mixture was 4 cents per pound.

Four groups of pigs eleven weeks old were used in the test, and all groups were fed a meal mixture composed of corn meal, wheat middlings, wheat bran, and linseed meal.

Lots 1 and 2 were given free access to soft coal and charcoal, respectively, lot 3 was fed one ounce of the tonic to every 10 pounds of meal, and lot 4 was fed nothing but the meal ration.

The average daily gain per pig in the four lots was as follows: Soft coal, .695 pound; charcoal, .738 pound; tonic mixture, .958 pound; no corrective, .614 pound.

The cost of producing 100 pounds gain in weight was as follows:

	Lot 1. Soft coal.	Lot 2. Charcoal.	Lot 3. Tonic.	Lot 4. Nothing.
Meal	\$5.93	\$5.42	\$4.74	\$5.84
Corrective .....	.20	.14	.11	....
Total cost	\$6.13	\$5.56	\$4.85	\$5.84

It will be noticed that the lot receiving the tonic mixture made the most rapid and most economical gains, the lot receiving charcoal coming second. The hogs which were allowed access to soft coal made greater gains than those fed meal alone, but the gains were more expensive. It is stated that the hogs fed correctives had a decidedly better appetite than those which received none.

The experiment indicates that correctives or tonics may be used to advantage at times, but that it is easily possible to pay too much for them.

REVIEW.

1. What can you say of the value of Canada field peas for swine? In what forms are they fed?
2. In what ways is barley better than corn for certain lines of pig feeding?
3. Why is barley not used more?
4. Discuss the value of wheat for swine.
5. May frosted wheat be used with good results?

6. Which is found to be better, frozen wheat or barley?
7. Briefly mention the value for swine feed—of oats and of rye.
8. In what sections is kafir grown with profit as a hog feed?
9. With what success may swine feeders use buckwheat? Emmer? Millet seed?
10. Under what circumstances can beans be profitably fed to swine?
11. Discuss the special advantages of wheat middlings, of wheat bran, of low-grade flour.
12. What are the advantages and the disadvantages of hominy feed for hogs?
13. Is corn-and-cob meal good for swine? Should the feeder use it always? Why?
14. In what ways is gluten meal proved unfavorable?
15. Compare linseed meal with other substitutes for skim-milk for pigs.
16. Give the cautions regarding the use of cottonseed meal. How liberally may it be fed?
17. What is the effect on hogs following cattle that are fed cottonseed meal?
18. Can the by-products of oatmeal mills be used successfully for swine?
19. What shall the feeder decide about the use of brewers' grains? Distillers' grains? Sugar-beet pulp? Beet-sugar molasses?
20. What was the result of the trial with black-strap molasses?
21. How does sorghum seed compare with corn for feeding hogs?
22. What are the special claims for Spanish peanuts?
23. How does rough red rice compare with corn?
24. Can the rice by-products be used with profit?
25. How should the feeder use weed seeds?
26. What is the advice about the purchase and use of patent "stock feeds"? What do they contain?
27. Mention several good forms of feeding mineral matter to swine.

CHAPTER XXII.

PASTURE AND SOILING CROPS.

Alfalfa.—Bulletin 155 of the Kansas Experiment Station gives a summary of results from feeding alfalfa to hogs at that institution. The following is quoted directly from the bulletin:

“At this station some years ago, a gain of 800 pounds of pork was made from a ton of alfalfa hay, and a little less than that amount of gain was made from an acre of alfalfa pasture. In another test here, an acre of alfalfa produced \$20.20 worth of pork, while an acre of rape fed to a similar lot of hogs returned \$10.05 worth of pork.

“In a later experiment we found that 100 pounds of alfalfa hay saved 96 pounds of corn. Figuring on the basis of 5 pounds of corn producing one pound of pork, the 96 pounds of alfalfa would produce 19 pounds of pork. Estimating the average yield of alfalfa to be four tons per acre, on this basis it would mean a production of 1600 pounds of pork per acre with alfalfa fed in the form of hay in connection with corn. This experiment was conducted during the winter season.

“In an experiment during the summer, we found that 170 pounds of green alfalfa, cut and fed to hogs fresh in a dry yard, was equal to 100 pounds of corn, and in this experiment it took 6 pounds of corn to produce a pound of pork. Therefore, assuming 170 pounds of green alfalfa would produce $16\frac{2}{3}$ pounds of pork, a fraction over 10 pounds of green alfalfa would produce one pound of pork. Estimating that an acre of alfalfa will yield during the season 20,000

pounds of green hay, this experiment would show that such an acre of alfalfa, cut green and fed fresh, would produce something like 2000 pounds of pork. Of course, this is fed in connection with corn, and a statement that an acre of green alfalfa would produce 2000 pounds of pork would be very misleading. Figuring on the basis of these two experiments, alfalfa hay, yielding four tons per acre (8000 pounds), would produce 1600 pounds of pork, and its value at 4 cents per pound would be something like \$64.00 per acre; and green alfalfa producing ten tons per acre (20,000 pounds) would



FIG. 44.—Alfalfa is good both for soiling and for hay for swine.

produce 2000 pounds of pork, which, at 4 cents per pound, would be worth \$80.00 per acre."

Kansas and Wyoming Trials.—The Kansas results from feeding alfalfa are about the most favorable of which the writer is aware. Very fair results were obtained at the Wyoming Experiment Station, where alfalfa hay and wheat were fed against wheat alone. In this experiment it required 449 pounds of wheat for 100 pounds of gain where wheat was fed alone; and 319.3 pounds of wheat and 291.3 pounds of alfalfa for 100 pounds of gain where wheat and alfalfa hay were fed. On this basis, a ton of alfalfa hay would give

scarcely 200 pounds of pork, which is only one-quarter as much pork as was obtained at Kansas from a ton of alfalfa hay. It is well to remember, however, that alfalfa hay varies very much in quality. Well-cured, fine-stemmed, leafy hay would be best for hog feeding, and coarse-stemmed hay that had been damaged more or less by the weather might have very little value for this purpose. Such a discrepancy as that noted between the Kansas and Wyoming results might easily be accounted for on the basis of different qualities of hay, and in the meantime we may regard the Kansas results as representing the maximum returns from alfalfa. It is also worthy of note that in one Kansas experiment the amount of pork produced by a ton of alfalfa hay was only 235 pounds, an amount only slightly greater than that obtained at Wyoming, so that it would be safer to regard the 800 pounds of pork from a ton of alfalfa hay as a possibility, rather than as something which can be generally depended upon.

The Wyoming Station also tried feeding young pigs, weighing from 60 to 70 pounds, a ration of $\frac{1}{3}$ corn meal or wheat meal, and $\frac{2}{3}$ alfalfa hay, but the pigs lost weight, and one died. On the other hand, mature sows were successfully maintained on a ration of alfalfa hay and turnips without other feed, indicating that alfalfa hay is best suited to pigs that are fairly well grown.

Rape.—Rape is a crop which is highly recommended wherever it can be grown successfully. For hog pasture it is best sown in drills about 28 inches apart at the rate of three pounds of seed per acre. It may also be sown broadcast. In most localities, it is safer not to sow until after the first of June. If there is enough moisture in the soil to germinate the seed, it is generally ready for pasture in about six weeks.

Rape Compared with Alfalfa.—The Kansas Experiment

Station compared rape with alfalfa for pigs averaging 52 pounds at the commencement of the experiment. Ten pigs were used in each lot. Following are daily gains per head and pounds of grain consumed per 100 pounds of gain:

	Daily gain.	Grain consumed per 100 pounds gain.
Lot 1. No pasture	1.04 pounds	371 pounds
Lot 2. Rape pasture	1.09 pounds	301 pounds
Lot 3. Alfalfa pasture	1.10 pounds	200 pounds

An acre of rape was required for ten pigs, but half an acre of alfalfa was sufficient for the same number.

An acre of rape pasture produced 202 pounds of pork, and an acre of alfalfa pasture produced 408 pounds of pork.

"This experiment emphasizes the superior value of alfalfa, and likewise emphasizes the value of dwarf Essex rape, which can be seeded in the feed-lots that would otherwise go to waste or grow up to weeds, and be made to pay a handsome profit on the investment."

Rape for Pasture.—At the Wisconsin Experiment Station, Craig conducted two experiments with hogs on rape. In the first experiment, 10 hogs, about eight months old, were pastured on one-third of an acre of rape for 76 days, and fed corn and shorts in addition. Another lot was fed in a pen on corn and shorts only. In the second experiment, 19 hogs were pastured seven weeks on six-tenths of an acre of rape, as compared with a similar lot in pens on grain only.

In the first trial one-third of an acre of rape was equivalent to 1062 pounds of grain, and in the second trial six-tenths of an acre of rape was equivalent to 1330.2 pounds of grain. Therefore, in one case an acre of rape was equivalent to 3186 pounds of grain, and in the other to 2217 pounds of grain.

Later, Carlyle, of the same institution, repeated the work,

and states: "With pigs from four to ten months old, representing the various breeds of swine, an acre of rape, when properly grown, has a feeding value when combined with a ration of corn and shorts equivalent to 2346 pounds of a mixture of these grain feeds."

The Central Experimental Farm, Canada, reports feeding six pigs on three-sixteenths of an acre of rape pasture from August 14th until snow covered the ground. It is estimated that the rape saved 156 pounds of meal, or an acre of rape would save 832 pounds of meal. This is far short of the Wisconsin returns, but the pigs were young at the commencement of the trial, and it is the writer's experience that young pigs do not make as good use of pasture as older ones.

Rape vs. Clover.—The Wisconsin Experiment Station reports two trials with pigs on rape and clover. In the first trial there were twenty pigs in each group, and in the second trial twenty-one in each group. The pigs were from five to six months old at the commencement. The following table shows gains and feed consumed:

	First trial.		Second trial.	
	Rape.	Clover.	Rape.	Clover.
	lbs.	lbs.	lbs.	lbs.
Average daily gain per pig.....	.87	.78	1.27	1.22
Amount of grain for 100 lbs. gain..	391	439	332	340

It will be seen that the rape gave somewhat better gains with a smaller meal requirement per 100 pounds gain than the clover, though the difference was not great in the second trial.

Rape vs. Soy Beans.—The Ontario Agricultural College fed soy beans and rape to pigs in pens, the green fodder being

cut and carried to the pigs. The pigs were fed meal and skim-milk in addition.

An acre of rape furnished 22 tons of green fodder, and an acre of soy beans 15 tons of green fodder.

Soy beans had a higher feeding value per ton than rape, but when the difference in yield was taken into consideration, the two crops proved about equal in amount of pork produced per acre.

Rape has an advantage over soy beans in that it may be sown on a wider range of dates, and retains its green condition for a longer period.

Rape also suffers less from trampling than soy beans.

Soy Beans.—The test with soy beans and rape referred to above was conducted in a northern latitude where rape grows to perfection and soy beans do not. In the South, it is quite a different question, and the soy bean becomes a most valuable pasture crop. Bulletin 154 of the Alabama Station recommends soy bean pasture very highly. When corn is valued at 70 cents per bushel, and soy bean pasture at \$8.00 per acre, it costs \$7.61 to produce 100 pounds of pork on corn alone, but when hogs were fed corn on a soy bean pasture, the cost of 100 pounds of pork varied from \$2.59 to \$3.17.

One acre of soy bean pasture afforded grazing for 10 hogs, of an average weight of 45 pounds at the beginning of the test, for the following number of days:

When one-fourth of a full corn ration was fed.....	43 days.
When one-half of a full corn ration was fed.....	48 days.
When three-fourths of a full corn ration was fed.....	62 days.

The total value of pork made on each acre of soy bean pasture varied from \$25.84 to \$39.13, valuing pork at 7 cents per pound, and deducting value of corn consumed at 70 cents per bushel.

These results show the possibilities of soy bean pasture as a means of reducing cost of pork production in the South.

Clover and Timothy.—In the experiments at the Iowa

Experiment Station with supplementary feeds with corn, hogs were pastured upon both clover and timothy. Without going into details, it may be said that the experiments indicate that clover produced pork at the rate of 400 pounds per acre, and timothy at the rate of 278 pounds per acre. This is probably more than can be expected from these crops as a general rule.

Hairy Vetch or Sand Vetch.—This crop is very much relished by hogs, and if sown in the fall gives an early pasture of high nutritive value. Smooth vetch is sown in the spring, but it is rather late in the season before it is ready for pasture, and it does not give the amount of pasture which is desirable. The liability of hairy vetch to winter-kill in some districts when sown in the fall, and the high price of the seed, prevent the crop from becoming widely popular.

Velvet Bean.—This plant flourishes in certain parts of the South near the Gulf coast. The Florida Station (Bulletin 113) gives a rather adverse report on velvet beans for swine. Cull velvet beans and velvet beans in the pod were fed separately and in combination with corn and other feeds, but in no case could the results be called satisfactory. They also produced a poor quality of pork when fed in any considerable quantity. The velvet bean is a valuable cover crop and soil improver where it can be grown, and, incidentally, can be made to furnish pasture for hogs, especially when grown with field corn.

Various Forage Crops.—Bulletin 95 of the Missouri Experiment Station reports three years' work with several forage crops.

Shelled corn and corn meal were used to supplement the rape and the leguminous forage; and a ration of corn meal 6 parts and oil meal 1 part was used to supplement the sorghum, blue grass, and rye grain forages.

Blue Grass.—“An average of 12.6 head of hogs was pastured for an average of 155.3 days for the seasons of 1908–09–10, and produced on the average 285.2 pounds of pork

which could be accredited to each acre of forage eaten. With pork at 6 cents per pound there was returned per acre of blue grass forage an average of \$17.12. The average amount of grain per pound gain was 4.49 pounds. Profits from hogs on blue grass forage must be secured early in the season. The blue grass forage became dry and unfit for swine grazing purposes in August."

Alfalfa.—“Under ordinary conditions alfalfa will forage from 10 to 20 shoats per acre. A new seeding should be pastured very lightly the first season. No larger number than ten shoats per acre or one sow and her litter should be used. After the first season as high as 20 head per acre or two sows and their litters may be pastured on it throughout the season.” Only one test was conducted with alfalfa, and this on newly seeded ground. The test was started with 12 hogs per acre, which number was reduced to 10 at the end of eight weeks. The hogs averaged 58.5 pounds at the commencement of the test, and were turned on the alfalfa when it was six inches high. “The average amount of grain required to produce a pound gain was 3.07 pounds. The amount of pork which could be accredited to the alfalfa forage was 596.8 pounds per acre. With pork at 6 cents the return per acre was \$35.71.”

Red Clover.—Two tests were conducted with red clover, and it is stated that clover will pasture from 8 to 12 shoats per acre. It is recommended not to pasture clover until it is 10 inches high. The bulletin recommends feeding shoats about a pound of corn per head per day.

“A herd averaging 11 hogs was pastured for an average of 130 days for the seasons of 1908 and 1910, and produced an average of 572.2 pounds of pork that could be accredited to each acre of forage eaten. These experiments indicate that a value of 98 cents may be obtained for each bushel of corn fed to

hogs pasturing on clover, when pork is worth 6 cents, and when rent of land, taxes, labor, etc., are valued at \$10.00 per acre."

Rape, Oats, and Clover.—This mixture was sown at the rate of 5 to 7 pounds of rape, $\frac{1}{2}$ bushel of oats, and 6 to 10 pounds of clover per acre. The results are summarized as follows: "A herd averaging 10 hogs per acre was pastured on rape, oats, and clover forage for an average of 96 days for the seasons 1909 and 1910, and produced an average of 394 pounds of pork that could be accredited to each acre of forage eaten. A value of 89 cents may be obtained for every bushel of corn fed to hogs on rape, oats, and clover forage when pork is worth 6 cents per pound, and when rent, labor, taxes, etc., are valued at \$10.00 per acre."

Sorghum.—One test was conducted with sorghum forage. The sorghum was sown with the grain-drill at the rate of one bushel per acre. It is recommended to turn in the hogs when the sorghum is $1\frac{1}{2}$ to 2 feet high, and to pasture about 12 hogs per acre. From July 6th, when the hogs were first turned on the pasture, until September 21st, the hogs made good gains, showing a profit of from \$4.85 to \$10.00 per acre, and using from 2.73 to 4.24 pounds of grain per pound of gain. About the middle of September a second growth started, after which the hogs did not make profitable gains. The second growth is believed to have a poisonous effect upon hogs.

Cow-peas (Fig. 45) were sown broadcast at the rate of $1\frac{1}{2}$ bushels per acre, and the hogs were turned in when the berries were just out of the dough stage. "A herd averaging 12 hogs per acre was pastured on cow-pea forage for an average of 35.7 days during the seasons of 1908, 1909, and 1910. There were produced on the average 224.9 pounds of pork that

could be accredited to each aere of cow-pea forage." The cow-pea forage was supplemented with corn meal to the extent of $\frac{1}{2}$ to $\frac{3}{4}$ of a full ration.

Soy Beans.—Two tests were conducted with soy-bean forage. The first test, in 1909, was unsatisfactory, owing to



FIG. 45.—Cow-peas grown in hot weather in eight or ten weeks. Good for hog pasture.

a poor stand of soy beans. In 1910 the results were satisfactory. Medium early yellow soy beans were sown June 15th at the rate of $1\frac{1}{2}$ bushels per aere. The hogs were turned into the crop when the pods were well formed. The crop was pastured at the rate of 12 hogs per aere, and corn meal to the extent of three-fourths of a full ration was fed as a sup-

plement. The pasture lasted from September 13th to October 25th, and the amount of pork per acre accredited to the forage was 183.1 pounds.

Hogging Off Rye.—The authors state that when rye is intended for "hogging off" purposes, it should be allowed to become thoroughly ripe, so that the heads crinkle down and droop near the ground. In three tests a supplementary ration of corn meal 6 parts and oil meal 1 part was fed at the rate of 1 pound per head per day. In two tests 16 hogs were pastured per acre, and in one test 8 hogs per acre. The amount of pork accredited to an acre of rye in the three tests was 215 pounds, 257 pounds, and 260 pounds respectively. With pork at 6 cents per pound, the returns are accounted about equal to the returns when the crop is sold as grain, but the fertility is retained under the pasturing system.

General Conclusions.—Of the general conclusions given in the bulletin, the following are of special importance:

1. "The number of hogs which may be kept on each acre of forage will depend upon the abundance of forage, but in general not more than 10 to 12 head should be used."
2. "The greatest returns have been obtained when grain was fed in addition to the forage at the rate of 2 to 3 per cent of the weight of the hogs per day. The amount fed per head per day should be increased as the hog increases in size."
3. "A very good plan in feeding 80 to 100 pound hogs on forage would be to feed, per head per day during May, 1.75 pounds of grain; during June, 2 pounds grain; during July, 3 pounds grain, and during August, 4 to 5 pounds grain."
4. "Gains made on forage are made at 20 to 30 per cent less cost than gains produced with grain and dry lot feeding. With pork at 6 cents, the average value of a bushel of corn fed to hogs in dry lot was 66 cents; and the average value of

a bushel of corn fed to hogs on forage was 80 cents, after a \$10.00 charge (per acre) had been paid for rent, taxes, etc."

Fall Rye.—Rye does not make so valuable a pasture as many other crops, and its main feature is its early growth. For supplying pasture very early in the spring, a small plot of rye can often be used to good advantage. (Also see under "Pork Production in the South," Chapter XXVII.)

Sorghum.—Owing to its large yield and sureness of crop, sorghum is quite popular in the South as a feed for swine. At the Alabama Station (Bulletin 143), sorghum was used as a pasture and soiling crop for hogs weighing 73 pounds each at the commencement of the test. The following statements are quoted from the bulletin:

A ration of corn and sorghum alone is a very poor feed for either fattening hogs or for producing growth, neither feed furnishing enough protein or ash for hogs which are not completely matured. The sorghum might have made a better showing if the pigs used had been matured animals before the fattening period began.

Under the conditions in which sorghum was fed in these experiments, it was found to be almost worthless as a supplement to either corn, or to a mixed ration of corn and cottonseed meal.

Sorghum has probably one valuable place as a hog feed—to help carry the brood sows through the summer months economically when the pastures become short.

The sorghum was not fed until the juice began to sweeten; or until some of the heads began to turn black. The bulletin states that some farmers report success in pasturing hogs on sorghum when the plants are about one foot in height.

The Arkansas Station reports favorably upon the use of sorghum for pigs, and recommends red clover or alfalfa for early pasture, followed by sorghum fed to pigs in pens, and the sorghum followed by peanut pasture. The pigs should be finished for market on a grain ration.

Cow-peas.—The cow-pea flourishes in the South, where it gives exceptionally good results as a hog pasture. (Fig. 45.) It is frequently sown among corn with the last cultivation, and

pastured after the corn is harvested. The Mississippi Experiment Station (Bulletin 100) reports producing from 350 to 483 pounds of pork from an acre of cow-peas. The peas were allowed to become nearly ripe before the hogs were turned in. (Also see Missouri results reported in this chapter.)

Soy Beans vs. Cow-peas.—Bulletin 82 of the Tennessee Station makes the following comparisons:

The soy bean may fail to come through a crust which would offer but little resistance to cow-peas.

The germination of the cow-pea seed is surer than that of the soy bean seed. The cow-pea is, therefore, better than the soy bean for broadcasting, especially on land that is heavy and liable to bake.

The cow-pea is much better suited than the soy bean for planting with either corn or sorghum.

On the other hand, the soy bean is more valuable than the cow-pea as an early grazing crop, and the seeds decay more slowly than those of the cow-pea when left on the ground, which is an advantage when the crop is to be pastured off by hogs.

It will be seen, therefore, that much depends upon the conditions under which the crop is grown.

Mixtures.—Various mixtures have been used as pasture crops for swine. The writer has used oats and peas, also a mixture of oats, peas, and vetches. These crops do not stand pasturing well, and are better suited for soiling purposes.

The Michigan Experiment Station speaks well of a mixture of corn, peas, oats, rape, and red clover. There is a good deal of waste in pasturing this crop. If, however, the first crop could be cut for soiling purposes, the second growth would furnish a good deal of pasture. (See also Missouri tests reported in this chapter.)

Jerusalem Artichokes.—The Central Experimental Farm, Canada, reports good results from this crop. One-sixteenth of

an acre was planted on May 19th with 70 pounds of tubers. The tubers were planted about four inches deep, in rows 24 inches apart, and in hills about 20 inches apart in the rows. Six pigs, averaging a little over 100 pounds each, were turned into the plot on October 3 and allowed to harvest the crop, which lasted them three weeks. They were fed a light meal ration while eating the tubers. The six pigs gained 197 pounds in three weeks, and consumed only 189 pounds of meal. This is a most extraordinary result, but it must be remembered that the experiment lasted a very short time. The experiment indicates possibilities for this crop. Pigs eat artichokes greedily.

Peanuts (Pasture).—Bulletin 143 of the Alabama Station gives results of three years' work with peanuts as a pasture crop. Unfortunately, the peanuts produced a normal crop only one year out of the three, due to the fact that labor could not be procured to work the crops after they were put in.

In the test with a normal crop of peanuts, it required 560 pounds of corn fed alone to produce 100 pounds of pork, but with hogs fed corn on peanut pasture, it required 177 pounds corn and 0.12 acre peanuts to produce 100 pounds of pork.

The average of three years shows the amount of feed for 100 pounds gain in weight to be as follows:

Corn alone	611 lbs. corn.
Corn and peanut pasture	148 lbs. corn, 0.45 acre peanuts.

The writers of the bulletin state: "As a whole, peanut pasture was found to be more useful than any other pasture tried. Pork was made at a good profit when peanut pasture was used in conjunction with corn."

Of course this does not mean that other pasture crops do not occupy an important place because peanuts are available for only a limited time.

Attention is called again to the injurious influence of peanuts upon the quality of pork, and the fact that the hogs should have, at least, several weeks of grain feeding before going to market.

The chufa is more or less a weed in the South, but it produces small tubers which hogs eat readily. The Alabama Station (Bulletin 122) fed hogs corn and cow-pea meal on a chufa pasture. The average of two tests shows 307 pounds of pork which can be credited to each acre of chufas after making allowance for the meal fed. Chufas did not prove as satisfactory as peanuts and soy beans for hog pasture (Ala. Bul. 143). Like other succulent feeds, the chufa is not a substitute for grain, but may often be used to advantage to supplement a grain ration.

Acorns.—In parts of the South, acorns assume considerable importance in feeding hogs. Hogs usually are allowed to run in the woods and gather the fallen nuts, which, being a waste product, help to cheapen production. The Tuskegee Station in Alabama reports feeding 400 pigs successfully on acorns and kitchen slop. The pigs were fed about five pounds of acorns each, per day. Acorns make a very poor quality of pork and pigs should be given several weeks of grain feeding before they are slaughtered, to overcome the bad effect of the acorns.

Pasture vs. Soiling.—Some experiments at the Ontario Agricultural College indicate that more rapid gains with a smaller consumption of feed per pound of gain can be secured by soiling pigs than by pasturing. This is especially true of young pigs, and the writer's experience leads him to believe that pigs should weigh at least 100 pounds before being turned on pasture, to get best results. There is considerable extra labor in cutting green crops and carrying them to the pigs under the soiling system, which brings the two systems fairly close together from the stand-point of economy.

Amount of Grain on Pasture.—Growing or fattening pigs cannot be produced satisfactorily on pasture alone, but a grain ration is necessary. The Montana Experiment Station found that hogs fed a full grain ration on pasture gained, on an average, 1.39 pounds per hog per day, and required 412

pounds of grain for 100 pounds of gain. Hogs fed a half ration of grain, gained .98 pound per hog per day, and required 291 pounds of grain for 100 pounds of gain. Thus, it will be seen that the hogs fed a full ration on pasture made more rapid gains, but consumed much more grain for every 100 pounds of gain.

The Ontario Agricultural College fed two lots of pigs five weeks on clover and ten weeks on rape. One lot received a full meal ration and the other a two-thirds meal ration. As in the Montana experiments, the hogs fed a full meal ration made more rapid gains than the others, but they consumed 421 pounds of meal for 100 pounds of gain, as compared with 353 pounds meal for 100 pounds gain in the lot fed the two-thirds ration.

It seems to be clearly demonstrated that it is a mistake to feed hogs all the meal they will eat when upon pasture, unless it becomes necessary to do so near the end of the feeding period in order to fit them for market. (See also Missouri recommendations quoted in this chapter.)

Methods of Feeding Alfalfa.—Bulletin 123 of the Nebraska Experiment Station reports a series of winter tests with varying proportions of corn and alfalfa. The tests covered three years, and they appear to have been carefully conducted. The rations tested were as follows:

- Corn alone.
- Corn and alfalfa hay in a rack.
- 9 parts corn and 1 part chopped alfalfa.
- 9 parts corn and 1 part alfalfa meal.
- 3 parts corn and 1 part chopped alfalfa.
- 3 parts corn and 1 part alfalfa meal.
- 1 part corn and 1 part chopped alfalfa.
- 1 part corn and 1 part alfalfa meal.

Summary of Results.—(1) The gains made by the rations containing one-half alfalfa were much slower and more ex-

pensive than those obtained from any of the other rations. The tests during two winters showed that a fattening ration should contain less than half alfalfa, but a ration of half alfalfa and half corn was found quite satisfactory for wintering brood sows.

(2) When half the ration consisted of alfalfa, alfalfa meal gave faster gains with less grain than chopped alfalfa, but the difference was not enough to pay for the extra cost of the alfalfa meal.

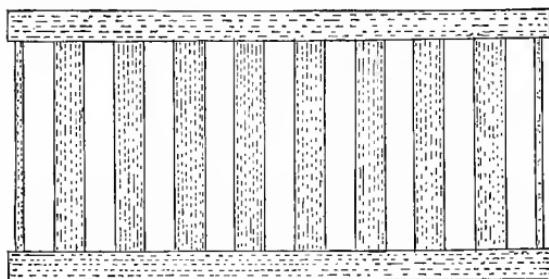


FIG. 46A.—Side view of alfalfa rack for swine.

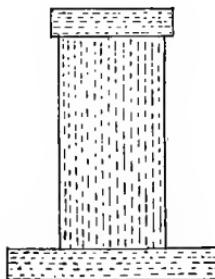


FIG. 46B.—End view of alfalfa rack.

The rack is made of 1" x 4" stuff. It is 3 feet high, 6 feet long, and 16 inches wide. The top is open, the ends solid, and the four-inch slats have four-inch spaces between them. The trough along each side is 4 inches deep, and extends 7 inches beyond the bottom of the rack. (Col. Bul. 146.)

(3) The average of four tests with 160 pigs showed that rations containing one-fourth alfalfa produced slower gains than a ration of corn alone, or of 9 parts of corn and 1 part of alfalfa. It would seem that a ration containing one-fourth alfalfa is not as satisfactory for fattening hogs as a ration of corn alone, or a ration containing a larger proportion of corn and a smaller proportion of alfalfa.

(4) Alfalfa meal proved more satisfactory than chopped alfalfa when the ration consisted of one part of alfalfa to three parts of corn.

(5) In three tests with 90 pigs, a ration containing 9 parts of corn to 1 part of alfalfa proved more profitable than corn alone.

(6) When the alfalfa comprised only one-tenth of the ration, chopped alfalfa and alfalfa meal gave almost the same gains, but the chopped alfalfa proved more profitable owing to its lower cost.

(7) In three tests with 90 hogs, the feeding of corn with alfalfa hay in a rack gave very similar returns to feeding 9 parts of corn mixed with 1 part of chopped alfalfa, with the difference in favor of rack feeding.

(8) The results of 5 years' indicate that for fattening hogs the way to feed alfalfa most satisfactorily is to feed it without grinding or chopping.

(9) In these tests 50 pounds of hay were worth more in the ration than a bushel of corn.

(10) The rations used in these tests are ranked in order of merit as follows:

- 1st. Corn and alfalfa hay in a rack.
- 2d. 9 parts corn and 1 part chopped alfalfa.
- 3d. 9 parts corn and 1 part alfalfa meal.
- 4th. Corn alone.
- 5th. 3 parts corn and 1 part alfalfa meal.
- 6th. 3 parts corn and 1 part chopped alfalfa.
- 7th. 1 part corn and 1 part chopped alfalfa.
- 8th. 1 part corn and 1 part alfalfa meal.

(11) It is recommended to feed the finest and brightest hay possible. Hogs will not eat the coarse stems.

REVIEW.

1. How many pounds of pork were produced from a ton of alfalfa hay? How does it compare with corn?
2. In the Kansas trials how much pork was produced per acre of alfalfa?
3. Mention three or four ways of feeding alfalfa.

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4. Give the value of rape as green feed for pigs.
5. How does rape compare with clover? With alfalfa? With soy beans?
6. Tell of the values as pasture of clover, of timothy, of vetch, of blue grass.
7. What is the value as a pasture mixture of rape, oats, and clover?
8. Tell of the relative values of first and second growth sorghum.
9. How may soy beans and cow-peas be used as forage for hogs? Will it pay?
10. Tell of the results of "hogging off" rye.
11. Give four conclusions in the trials with various forage crops.
12. Tell of the methods and results in using Jerusalem artichokes.
13. Compare pasturing with soiling methods for swine.
14. Tell of the needs for grains when hogs are on pasture.
15. Give the most important points in the results of the Nebraska trials with different forms of alfalfa.

CHAPTER XXIII.

ROOTS, POTATOES, PUMPKINS, APPLES, AND DAIRY BY-PRODUCTS.

Roots.—In Henry's "Feeds and Feeding" there is an excellent summary of Danish experiments with roots for swine. The meal equivalent of roots was found to vary in a marked degree in different trials, and 100 pounds of barley were found to be equivalent to 600 to 800 pounds of mangels and 400 to 800 pounds of stock beets. In the United States and Canada, wide variations in the meal equivalent of roots have also occurred in various tests. The following table gives an idea of the range of values found at several stations:

Meal Equivalent of Roots.

Central Experiment Farm	100 pounds meal =	786 pounds roots
Ohio Experiment Station	100 pounds meal =	642.5 pounds roots
Montana Experiment Station	100 pounds meal =	529 pounds roots
Utah Experiment Station	100 pounds meal =	455 pounds roots
Ontario Agricultural College	100 pounds meal =	441.5 pounds roots
<hr/>		
Average	100 pounds meal =	570.8 pounds roots

The variations in these trials is similar to the variations in the Danish experiments. Ontario obtained a remarkably high meal equivalent for roots, and it is worthy of note that in the Ontario trials the roots were pulped and mixed with an equal weight of meal, the hogs being fed all they would eat of the mixture.

In the writer's experience hogs fed roots are thriftier looking and possess better appetites than hogs fed meal alone, and it is no doubt due to their influence upon the general health of the animal that roots are able to make such a favorable showing. The degree to which the general thrift of the animals

is injured by exclusive meal feeding will be reflected in the relative feeding value shown by roots and grain, and this fact renders extreme variations quite possible.

Generally speaking, it may be said that sugar beets possess the highest feeding value among ordinary roots, and are most readily eaten by swine. Mangels, Swede turnips, and carrots may be counted practically equal in value, but hogs eat mangels with greater relish than they eat turnips.

Potatoes.—At the Wisconsin Experiment Station, 441 pounds of potatoes, cooked and fed to swine, proved equal to 100 pounds of corn meal. In "Feeds and Feeding," Henry summarizes Danish experiments, where 400 pounds of potatoes proved equal to 100 pounds of mixed meal. In connection with these investigations, Professor Henry says: "In general, we may say that a bushel of corn is worth four and one-half bushels of potatoes for fattening purposes when cooked and fed with corn meal. Potatoes may have a higher value than the rating here given, in furnishing variety in ration to growing animals."

Potatoes must be cooked for swine, and this item of expense cancels some of the advantage which they possess over roots as a feed for swine.

The sweet potato contains more starch and less protein than ordinary potatoes. In the South, it is used quite commonly for hog feeding. The Florida Station (Bulletin 90) reports a four weeks' test with hogs which were nearly full grown. They were fed shorts and sweet potatoes in the proportion of one pound of shorts to between five and six pounds of sweet potatoes. The gains were large, and if the gain in weight is valued at five cents per pound, sweet potatoes would show a value of \$10.70 per ton. At the same station, young pigs lost weight on sweet potatoes alone, and hogs weighing a little over 100 pounds each at the commencement of the test made an average daily gain per head of slightly over half a pound. In the last mentioned test, the sweet potatoes showed a value of \$3.00 per ton when the

gain in weight is valued at five cents per pound. In another test, sweet potatoes were fed with rape as compared with corn and rape. Pigs fed sweet potatoes and rape made an average daily gain per pig of 0.4 pound, and those on corn and rape, 0.9 pound.

Florida Bulletin 113 reports an average daily gain per head of 0.65 pound in a 30 days' trial with hogs fed equal parts of corn and sweet potatoes. Corn was valued at \$1.75 and sweet potatoes at \$1.00 per hundred pounds. Under this valuation, the cost of 100 pounds gain in weight was \$6.85.

The South Carolina Station found that 500 pounds of sweet potatoes fed alone were equal to 100 pounds of corn, and the Alabama Station obtained 100 pounds gain in weight for every 313 pounds of corn fed to hogs pastured on sweet potatoes. Like other bulky, succulent feeds, sweet potatoes give best results when fed with a liberal meal ration—one fairly rich in protein.

Cassava.—This plant grows in Florida and along the Gulf Coast. It grows fleshy roots like the sweet potato. The roots contain about 30 per cent starch, but only about 1.1 per cent protein.

The Florida Station (Bulletin 90) gives results of tests of cassava with swine. In a short test (4 weeks) with nearly full-grown pigs, cassava was fed with about one-third of its weight of shorts. The hogs made satisfactory gains on the average, and a ton of cassava showed a value of \$11.86, when the gain produced was valued at five cents per pound. Commenting on the test, the author of the bulletin makes the following statements: "The pigs fed on cassava gained rapidly at first, but towards the end of the four weeks the gain was very slow. . . . Cassava in the raw state does not seem to be palatable even to the hog."

In another test, cassava alone, and equal parts of cassava and sweet potatoes were fed to two groups of young pigs. In both cases the pigs lost weight. Older pigs showed a very small gain on cassava alone, but it was not a profitable feed used in this way.

Like roots and potatoes, it would seem that cassava should be accompanied with a liberal meal ration when fed to hogs.

Pumpkins and Squashes.—Pumpkins belong to the same class of feeds as roots, giving bulk and succulence to the ration and thus promoting thrift. J. H. Grisdale, Central Experimental Farm, has a high opinion of pumpkins for swine. He says: "We cook them and mix meal with them, and I don't think there is anything that will surpass them as a cheap fattening ration." He also states that the pigs like the seeds best, and that no injury comes from feeding the seeds. Excellent results were obtained at the New Hampshire Experiment Station from feeding raw pumpkins with meal and skim-milk.

The Oregon Experiment Station found that a 200-pound hog consuming 26 pounds of cooked pumpkin and a small amount of shorts gained 1.2 pounds per day. Other investigators have found that 273 pounds of grain and 376 pounds of raw pumpkin produced 100 pounds of pork. Some experiments show that cooking pumpkins does not add to their value.

The squash may be counted as equal to the pumpkin in feeding value.

Apples.—Apples do not appear to possess a high feeding value, but may often be used to good advantage to give variety and succulence to a ration. They are perhaps most suitable for mature breeding stock, but a hog should never be expected to subsist upon apples as the main part of its ration.

Skim-Milk.—The results of nineteen trials with eighty-eight pigs at the Wisconsin Experiment Station are well summarized by Henry in "Feeds and Feeding." It is a well-known fact that when a small proportion of skim-milk is fed with meal, the milk shows a higher meal equivalent than when a large proportion is fed; that is to say, it requires a smaller amount of skim-milk to be equivalent to a given amount of meal when a small proportion of milk to meal is used. Henry summarizes the Wisconsin results as follows:

Meal Equivalents of Skim-Milk.

Proportion of milk to meal.	Pounds of milk equivalent to 100 pounds meal.
1 lb. corn meal, 1 to 3 lbs. milk.....	327 lbs. milk = 100 lbs. meal.
1 lb. corn meal, 3 to 5 lbs. milk.....	446 lbs. milk = 100 lbs. meal.
1 lb. corn meal, 5 to 7 lbs. milk.....	574 lbs. milk = 100 lbs. meal.
1 lb. corn meal, 7 to 9 lbs. milk.....	552 lbs. milk = 100 lbs. meal.
Average of 19 trials.....	475 lbs. milk = 100 lbs. meal.

The Ontario Agricultural College reports a trial in which 355.6 pounds of skim-milk proved equal to 100 pounds of meal. The proportion of milk to meal was about 2.5 to 1, and the result is similar to the Wisconsin result with a similar proportion of milk to meal.

The Minnesota Experiment Station reports six trials in which the proportion of milk to meal varied, the highest proportion being about 5 pounds of milk to one of meal. The average of these trials gives 467 pounds of milk equivalent to 100 pounds of meal, which is very close to the Wisconsin average.

Utah experiments show 431 pounds of skim-milk equal to 100 pounds of grain, and Tennessee experiments 476 pounds of skim-milk equal to 100 pounds of grain. The Tennessee results are practically identical with the Wisconsin average, and the Utah results are reasonably close.

These experiments show that, where skim-milk can be obtained conveniently and in suitable quantity, it has a very considerable value in hog feeding. When meal is worth \$20.00 per ton, skim-milk is easily worth 20 cents per hundred pounds, unless an exceptional amount of labor is involved in procuring it. For young pigs just after weaning, however, its value is very much higher than for older hogs.

Sweet vs. Sour Skim-Milk.—Several experiments with sweet and sour skim-milk indicate that there is little or no difference in the feeding value of the two products,—in fact,

the sour milk has, if anything, had the advantage. For very young pigs sweet milk is preferable.

Whey.—At the Ontario Agricultural College, the writer conducted seven trials with a view to ascertaining the value of whey for pig feeding. The average of these seven trials gives 744.5 pounds of whey equivalent to 100 pounds of meal.

Two trials at the Wisconsin Experiment Station give an average of 800 pounds of whey equivalent to 100 pounds of meal.

These trials probably show the maximum value of whey for pig feeding. Under ordinary methods of feeding, it would hardly be safe to expect quite as good returns for whey. Where labor is involved in procuring the whey, due allowance must be made in estimating the value of this product.

Sweet vs. Sour Whey.—Five trials made by the writer failed to show any appreciable difference between the feeding value of sweet and sour whey.

Separated vs. Ordinary Whey.—In an experiment conducted by the writer, ordinary whey proved to be worth twenty-five per cent more than separated whey. The separated whey had been run through the cream separator to remove the fat for making whey butter.

Buttermilk.—Experiments at the Ontario Agricultural College and elsewhere show that buttermilk is practically equal to skim-milk for feeding pigs.

Substitutes for Skim-Milk.—For young pigs just after weaning, it is difficult to find anything that will take the place of skim-milk. When skim-milk is not available, there is danger of the pigs becoming stunted at this period of their life, especially pigs that are weaned young. The Ontario Agricultural College conducted two trials with Swift's digester tankage and blood meal as substitutes for skim-milk. These two feeds proved nearly equal in value, and, since the tankage costs much less per ton, it was regarded as the more satisfactory.

In the first trial the tankage constituted about one-fourteenth of the total ration, and in the second trial one-tenth of the total ration.

About two pounds of milk to one pound of meal were fed in each trial.

The average of the two trials shows that to produce 100 pounds of gain it required:

375 pounds meal and 34 pounds tankage.

390 pounds meal and 727 pounds skim-milk.

The pigs getting tankage ate their feed quite as eagerly as those getting skim-milk, and continued thrifty throughout the experiment.

Tankage, therefore, proved a very satisfactory substitute, so far as gains in weight were concerned, but, when skim-milk can be obtained at 15 cents per hundredweight, it is cheaper than tankage at prevailing prices.

In other experiments by the writer, the results of which have not been published, other substances, such as linseed meal, "black-strap" molasses, and tea from alfalfa hay, have been tried, but none of these approached tankage in efficiency as a substitute for skim-milk for young pigs.

The Michigan Experiment Station also compared tankage with skim-milk for young pigs. The pigs on skim-milk made slightly larger gains, but, when skim-milk was valued at 20 cents per 100 pounds and tankage at \$1.62½ per 100 pounds, the tankage-fed pigs made cheaper gains than the skim-milk pigs.

Garbage.—Large hotels, boarding houses, and institutions have much kitchen refuse, often used in hog feeding. Such material possesses considerable feeding value, but there are serious dangers connected with its use. Ordinary garbage is likely to contain broken glass or crockery, washing powders, lye, poisonous medicines, and other substances which may prove fatal to hogs. In addition, ptomaines may develop in fermenting garbage, and the hog seems to be very susceptible to ptomaine poisoning.

Bulletin No. 141 of the Cornell Station deals with "Powdered Soap as a Cause of Death Among Swill-fed Hogs." In connection with the many fatalities resulting from feeding swill, the following statement occurs in the bulletin: "In view of this danger, it seems better to abandon altogether the habit of giving dishwater to hogs. Although the feeding of garbage is generally condemned, the scraps of vegetables and table refuse could, perhaps, if properly collected, be used with safety. But certainly pure water is a much more wholesome drink, even for swine, than dirty dishwater. When the subject of swill-feeding as a business is studied, and the conditions as they exist are understood, the wonder is, not that some of the hogs die, but rather that any of them live." The bulletin also points out the dangers connected with feeding decaying garbage apart from the dishwater, and the danger of hog cholera and swine plague germs being carried in the garbage.

The man who would feed garbage should make arrangements to have all dishwater, broken dishes, lye, etc., kept separate from the table and kitchen scraps. Only the table and kitchen scraps, of course, should be used, and, before using, this material should be sorted, and finally cooked if one wishes to keep on the safe side.

REVIEW.

1. Give the average equivalent of roots for 100 pounds meal. What kind of roots are best?
2. Give the meal equivalent for potatoes. How are they to be fed?
3. Tell of the value of pumpkins for swine. How may they be fed?
4. Tell of the suitability and value of apples for swine.
5. How does the proportion of skim-milk fed affect its meal equivalent? Give the average.
6. How do sweet and sour skim-milk compare as feed for pigs?
7. What is the meal equivalent of whey? Is there danger in letting it sour?
8. What is separated whey? How does it compare with ordinary whey?
9. How does buttermilk compare with skim-milk for pigs?
10. Mention some of the best substitutes for skim-milk for pigs.

CHAPTER XXIV.

PREPARATION OF FEED.

Cooking and Steaming.—Years ago there was a popular belief that cooking or steaming feed increased its digestibility, and hence its feeding value. The work of experiment stations and private investigators has thoroughly exploded this idea, and indicates that digestibility may be decreased rather than increased by cooking in the case of many feeds. There are some feeds which are rendered more palatable by cooking, such as potatoes and beans, but in the case of feeds which are eaten readily without cooking, it may be taken as settled that cooking or steaming is poor economy. Instead of being a commendable practice, cooking is something which should be avoided as far as circumstances will permit, and employed only when feeds are not acceptable in the raw state. Where economy is no object, one may secure larger gains in weight by cooking portions of the feed to make the ration more palatable, thus stimulating the appetite, but such gains usually come at comparatively high cost.

Grinding.—The question of grinding was discussed under corn, and it was shown that, so far as corn is concerned, the gain from grinding is comparatively small. Numerous experiments have been made with other grains to determine the effect of grinding, it being generally supposed that grinding would be more effective in the case of small grains than it would be with corn. It is out of the question to review experimental work in detail in regard to this point, but it may be said that grinding small grains, such as peas, barley, oats, and rye, has almost invariably proved beneficial. Sometimes the advantage of the ground grain has been very slight, and sometimes very marked, but the general evidence indicates that it is advisable, when practicable, to grind such grains. When the cost of grinding is excessively high, the practice may not be advisable, but, under

ordinary circumstances, it is the safe course. According to a compilation of experiment station results, by G. M. Rommel (Bulletin 47, U. S. Dept. of Agr.), the average saving effected by grinding small grains is 12.26 per cent, which is double the saving effected by grinding corn in the Wisconsin experiments.

Wet vs. Dry Feed.—Considerable experimental work has been done with wet and dry feed, and results are very contradictory. On an average, the two methods of feeding show practically equal results. The writer's experience is that when hogs can be fed dry meal in such a manner that they cannot waste it, they make as good use of it as when it is wet. There is more tendency to waste feed when fed dry, especially when many feed at the same trough. Troughs arranged so as to prevent crowding will tend to lessen waste. In cold pens, dry meal feeding has some advantages, a good ration is to mix dry meal with an equal weight of pulped roots. Under ordinary conditions, it is difficult to see much advantage from dry feeding.

Soaking.—Soaking feed is another practice which seems to give variable results according to experimental data. There seems little doubt, however, that, in the case of dry hard grain fed whole, soaking is to be commended. As to meal, freshly mixed feed will likely give as good results as soaked feed.

Fermenting.—The practice of fermenting feed for swine was formerly much more common than it is at present. In the case of cottonseed meal, it will be remembered that the Texas Station recommends mixing the cottonseed meal with other meal and allowing the whole mass to sour. The New Hampshire Station obtained better results from fermented bran than from unfermented. With feeds well adapted to pig feeding, it is not likely that fermentation would be of any benefit.

METHODS OF FEEDING.

“Hog Motor Grinder” vs. “Hopper.”—The Maryland Experiment Station (Bulletin 150) reports tests with the “hog motor grinder,” a contrivance by which hogs grind their own

grains as they require it. (Fig. 47.) The grinder was compared with a self-feed hopper. In the first test whole corn was used in the hopper, and in the second ground corn. The pigs were from four to five months old when the experiment began.

In the first test hopper-fed pigs made an average daily gain per pig of 1.85 pounds, and grinder-fed pigs 1.65 pounds.

The feed consumed per 100 pounds gain was as follows:

Hopper pigs.—Corn, 256 pounds; middlings, 68 pounds; milk, 339 pounds.

Grinder pigs.—Corn, 224 pounds; middlings, 76 pounds; milk, 385 pounds.

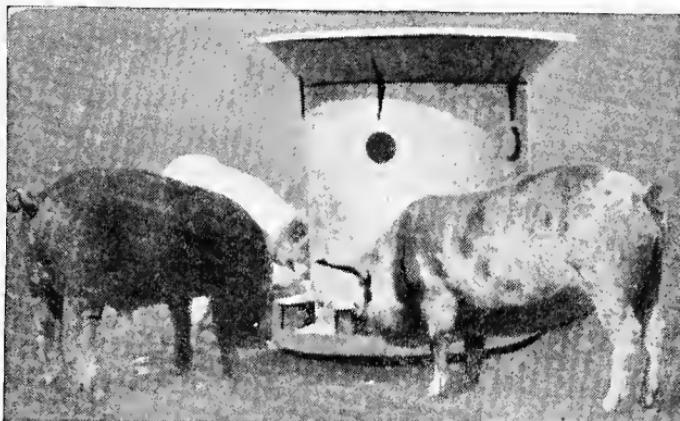


FIG. 47.—Hog motor grinder and feeder. With this machine hogs grind their own feed.

In the second test hopper-fed pigs averaged a daily gain per pig of 2.11 pounds, and the grinder-fed pigs, 1.86 pounds.

The feed consumed per 100 pounds gain in second test was:

Hopper pigs.—Corn, 287 pounds; middlings, 71 pounds.

Grinder pigs.—Corn, 273 pounds; middlings, 80 pounds.

The author of the bulletin states: "The motor grinder and feeder gave good results in two tests. However, when used in comparison with hopper feeding of both shelled corn and corn meal, the margin of profit was in favor of the hopper-fed pigs."

Hopper Feeding vs. Trough Feeding.—Bulletin 150 also reports two tests in which the self-feed hopper (Fig. 48) was compared with trough feeding. In the first test were 10 five-months-old pigs, and in the second, 10 three and one-half months.

In the first test all the pigs were fed a mixture of ground corn, wheat middlings, and bran; and in the second test, hominy chop and middlings. In each test dry meal was fed in the hoppers, and wet meal in the troughs. The results were:



FIG. 48.—A type of self-feeding hopper in use on some large farms.

First Test: Hopper fed.—Average daily gain per pig, .71 pound.

Meal consumed per 100 pounds gain, 520 pounds.

Trough fed.—Average daily gain per pig, .73 pound.

Meal consumed per 100 pounds gain, 478 pounds.

Second Test: Hopper fed.—Average daily gain per pig, 1.26 pounds.

Meal consumed per 100 pounds gain, 387 pounds.

Trough fed.—Average daily gain per pig, 1.36 pounds.

Meal consumed per 100 pounds gain, 348 pounds.

Notice that in both tests trough-fed pigs gained the more rapidly and cheaply, though the labor is less with hoppers.

REVIEW.

1. What was the old belief as to the value of cooking feed for swine? What do the trials show?
2. What is shown regarding the benefit of grinding small grains and corn for swine? Under what circumstances does it pay?
3. Give advantages and disadvantages of wetting or soaking feeds?
4. Tell of the method of feeding by use of a hog motor grinder.
5. Compare it with the hopper method.
6. How does hopper feeding compare with trough feeding?

PART V
FEEDING AND MANAGEMENT

CHAPTER XXV.

THE BOAR.

Use.—The age at which a young boar may be first used depends largely upon his development. Some boars may be used to a few sows when not more than seven months old, without apparent injury. As a rule, it is safer not to use a boar before he is eight months old, and to use him as sparingly as possible until he is a year old. No hard-and-fast rule can be laid down, and the owner must use his judgment in the matter. Excessive use when young is likely to shorten the period of a boar's usefulness, and, since a boar will usually produce the best pigs after he reaches maturity, the importance of saving him while he is young will be readily appreciated.

Some good breeders allow only one service a day, with intervals of one or two days a week without being used, in the case of valuable boars. This is a matter which can be regulated better in large herds, where several stock boars are kept, than it can where only one boar is kept and where outside sows are admitted. The owner of a boar under the last-named conditions will require to exercise all his ingenuity to prevent his boar from being used too freely during certain seasons of the year.

In no case should more than one service to a sow be permitted, and the boar should not be allowed to run at large with sows to which he is to be bred. Excessive use is likely to result in small, weak litters, and the aim should be to save the boar as much as possible. It is not good to use a boar immediately after he has been fed.

Exercise.—Probably nothing is more essential to the health and vigor of an animal than exercise. In summer it is usually a comparatively simple matter to provide exercise in a paddock or pasture lot, but in winter it is rather more difficult to furnish this. A roomy pen should be provided, with a sheltered outside yard.

When practicable, it is well to feed the boar out-doors at some distance from his sleeping quarters, thus compelling him to take exercise in walking back and forth between his pen and the feeding place. Icy ground is the greatest drawback to this method, but this can be overcome by littering the walk with some strawy horse manure. Sometimes the boar can be fed in a well-littered barnyard, which makes a very good arrangement when practicable.

When several boars are kept, it is difficult to provide separate runs for each boar, and it simplifies matters if they are taught to run together. The tusks should be removed and a cool day should be selected for turning them together for the first time. It takes a very short time, as a rule, to settle the question of supremacy, and when once settled no further disputes arise. The writer has had considerable experience with this method, and has never known bad results to follow. The two mentioned conditions are necessary,—namely, the tusks must be broken off and a cool day selected for the tournament which decides. After this first struggle has taken place, the boars will live together quite as peaceably as sows.

Removing Tusks.—Armed with long, sharp tusks, the boar is capable of inflicting serious injury upon man or beast, should he take the notion, but, deprived of his tusks, he becomes

comparatively harmless. It is the part of wisdom, therefore, to remove these tusks before any damage is done, because we never know what the quietest boar may do under provocation. Several methods may be employed, and the following one will answer very well. The boar is first made fast to a post by means of a rope noosed about his upper jaw back of the upper



FIG. 49.—Yearling Berkshire boar, a Canadian prize winner.

tusks. Then one man takes a crowbar and another a sharp cold chisel and a hammer. The sharp edge of the crowbar is placed against the tusk near its base, and held firmly in position, and the edge of the cold chisel is placed on the opposite side of the tusk directly across from, and even with, the edge of the crowbar. A sharp blow with the hammer on the cold chisel does the job.

Feeding.—It requires good judgment to keep a boar in the best possible condition. (Fig. 49.) Extremes are to be avoided. The over-fat boar does not make a satisfactory sire, as a rule, and a half-starved boar cannot transmit vigor and constitution to his progeny to the same degree that he would if properly managed. To get the best results, the boar should be in fair flesh. A reasonable amount of fat on his bones will do him no harm if he gets sufficient exercise.

An exclusive meal ration will not give good results, especially if the ration is made up of corn. It is true that corn can be fed to a boar without injuring him, but it must be fed in the right way. Corn is fattening, but its exclusive use is debilitating, and the feeder must combine something with it to get good results. Equal parts ground corn, ground oats, and wheat middlings make a good meal ration. Equal parts ground oats and middlings make a first-class meal ration when corn is not used. It gives sufficient bulk, and is nutritious without being heating or too fattening. Ground oats, middlings, or bran may be used singly to dilute corn; in fact, a very great variety of grains may be fed, so long as the feeder uses judgment.

Supplemental Feeds.—But a boar needs something besides grain and meal to be in his best condition. Skim-milk and buttermilk are excellent, and will give good results with corn, even if nothing else is used. In winter, roots of any kind are much relished. They have a cooling, laxative effect, preventing constipation and keeping the animal thrifty and vigorous.

If roots are not available, alfalfa hay of fine quality or even fine red clover hay may be used to give bulk to the ration. Some feed the alfalfa hay dry in racks, and others prefer to cut it and soak it with the meal ration, or

scald it with boiling water before mixing with the meal. As a substitute for roots, the soaked or steeped alfalfa would be preferable to the dry hay. Alfalfa or clover hay may be fed along with roots, and will be found to give good results if the feeder takes care to supply a reasonable amount of concentrated feed to make the ration sufficiently nourishing.

Summer management is usually simpler than winter. A pasture lot provided with shade is one of the best places to

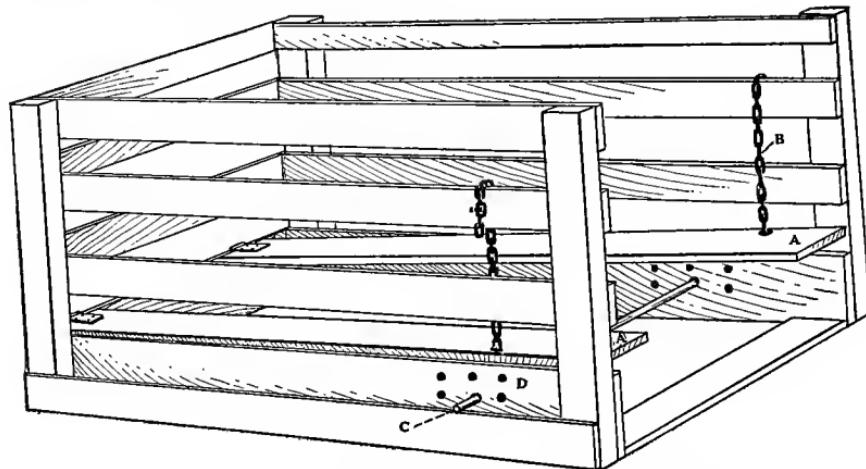


FIG. 50.—Breeding crate. A, movable board hinged at left-hand end and held by chain B, both sides alike; D, six holes for the iron rod C to assume various positions.

keep a boar. The grass or clover, or whatever the pasture may consist of, will furnish the bulky, succulent feed necessary for health, and gathering part of his food from pasture compels the boar to take exercise. If it is not possible to provide the pasture, he should be liberally supplied with green feed in his pen.

The quantity of meal to feed a boar will vary with circum-

stances. During the season when he is used most he will require liberal treatment, but at no time should he be fed more than he will eat up clean before leaving the trough. During comparatively idle seasons, a very light meal ration will be sufficient, and if on good pasture he will require but little feed in addition. It is entirely a matter of judgment, and the feeder must at all times be governed by the condition of the boar.

It is never wise to make sudden changes in the ration,—that is, to change suddenly from a light ration to a heavy one, or from a heavy ration to a light one. Changes should be made gradually, and the feeder, who will know just about when the heaviest season commences, should start in plenty of time to prepare the boar for it.

Breeding Crate.—When it is necessary to breed heavy boars to rather small sows, a breeding crate can often be used to advantage. There are numerous types of breeding crates, but the one we show illustration of on page 223 may be easily made and will in most cases answer the purpose very well. (Fig. 50.)

The dimensions of the crate are: length 5' 6", width 2', and height 3' 6". The uprights at the corners are made of 2" x 4" scantling, and the sides may be made of 4" strips of inch lumber, with a 10" board at the bottom on each side. The supports for the feet of the boar (A, A) are hinged at the front end of the crate, and can be raised or lowered by means of the chains (B). On the outside of the crate are hooks for holding the chains. C is an iron rod which slips through holes (D) bored in the bottom side-boards of the crate. The rod should come just above the hocks of the sow, and there should be enough holes to admit of adjusting the rod to the size of the

sow. If it is desired to use a small boar on a large sow, the crate may also be made to answer the purpose by simply placing a cleated sloping platform at the rear of the crate.

REVIEW.

1. Give three or more points of advice regarding the use of a boar.
2. How can the boar be compelled to take regular exercise?
3. How can two or more boars be kept peaceably together?
4. Why remove the boar's tusks? Tell how.
5. Give suggestions as to keeping the boar in best condition of flesh.
6. Mention the special value for him of such feeds as roots, skim-milk, alfalfa, and pasture.
7. Tell of the need of varying his meal ration.

CHAPTER XXVI.

THE SOW.

Age of Breeding.—The age at which a young sow is first bred will depend upon her development, but it is very seldom that it is advisable to breed her before she is eight months old. Many good breeders prefer not to breed sows before they are ten, or even twelve months old, and if they are intended for show purposes it is scarcely advisable to breed them earlier. One of the great objections to breeding sows very early is the fact that the very young sow is seldom able to raise a fair-sized litter of pigs, and if she raises only a few pigs in her first litter her mammary glands do not develop properly, and she rarely makes as good a nurse with subsequent litters as the sow which raises a good-sized first litter. Another objection to early breeding is the fact that the very young sow has not the strength to stand the strain of nursing a litter of pigs, and her vitality is sapped to such a degree that she never develops as she should. As a result, she will not retain her usefulness for so long a period, nor is she so likely to give strong, vigorous litters as though she had possessed more maturity before being bred.

Breeding Mature Sows.—Many sows will accept service a few days after farrowing, but it is hardly necessary to say that to breed a sow at this time is bad practice. No sow can do justice to herself and two litters of pigs at the same time, and the man who attempts to gain time by following such a practice will surely lose by it in the end.

Usually the sow may be bred again a few days after her pigs are weaned, if not too much pulled down in condition by

nursing. If she has raised a large litter and is very much emaciated, the chances are that she will produce a small litter the next time if she is bred immediately after the pigs are weaned. In such cases she should be given three weeks or a month of liberal feeding to enable her to regain something of her lost strength and vitality before she is bred.

Though the sow need not be fat, she should be in good heart and thriving at the time she is bred. Many a man has been puzzled to know why his sow, which had raised a large litter, should drop down to four or five pigs the next time. The reason is not difficult to find, because a sow must be strong and full of vitality at the time of service in order to produce a large, vigorous litter.

Period of Gestation.—The period of gestation in sows is usually placed at 112 days. Often, young sows will farrow a few days sooner than the stated time, and old sows will frequently go a few days over it. It is not a good sign when a sow goes much over the sixteen weeks, as the litters are often lacking in vitality when carried much over time. If a sow has been properly handled, she will seldom go more than a few days over sixteen weeks, though there are exceptions to all rules.

Best Time for Farrowing.—Where winters are at all severe, it requires exceptional skill and equipment to make a success of winter litters. Most farmers will find it safer to have their sows farrow in April and October. It is generally possible to give April pigs a little outdoor exercise at an early stage of their growth, which will be found a great help in keeping them healthy and thrifty. The October pigs will also be able to get outdoor exercise for a time, which will enable them to get a good start, and make them better able to endure the closer confinement necessary during winter.

One or Two Litters.—The man who is breeding for show

purposes, and who wishes to have his pigs with the sow as long as possible, as well as get his sows into high condition between litters, will find it necessary to breed his sows only once a year; but the general practice of farmers is to require their sows to do more than this. There is no good reason why a sow should not produce two litters a year when properly handled, provided that the sow is not to be fitted for the show ring.

Exercise.—Though exercise is important in the case of the boar, it is doubly important with sows during the period of gestation. Without considerable exercise during this time, sows cannot be made to give satisfactory results. In summer, pasture should be provided in which there is plenty of shade. A good pasture affords ideal conditions for sows, the green feed and the exercise keeping the sows in the best possible condition.

Winter Exercise and Quarters.—The greatest difficulty will be encountered in giving the sows sufficient exercise during the winter. Where only a few sows are kept, it is often possible to give them the run of a barn-yard, where they will take exercise rooting in the manure, or working in scattered straw or chaff to find what little grain it may contain. If a dry, well-bedded sleeping place is provided, which is free from draughts, the conditions are about as good as can be obtained.

When it is impossible to use the barnyard, a roomy shed with earth floor, and a sleeping place arranged in one corner, can be made to answer the purpose very well. By littering the shed with cut straw or chaff and sprinkling a very little whole grain in the chaff every day, the attendant can induce the sows to take considerable exercise. Another method is to use portable pens set in outside lots. The pens should be placed facing the south, and fifty yards or more from the feeding

place. If kept well bedded, and banked about the bottom with strawy horse manure, they make comfortable sleeping quarters. The sows are forced to take exercise in walking backwards and forwards between the pen and the feeding place.

It is better to keep not more than five or six sows in a pen of this kind, and care should be taken to provide plenty of trough room. The troughs should be placed on dry ground or on a platform, and it is preferable to have them in a place that is sheltered from the wind.

Feeding and Management during Gestation.—During the period of gestation the sow should be kept in good, strong condition, but not overloaded with fat. Extremes in condition are to be avoided. The very fat sow is apt to be clumsy with her pigs, and sometimes her pigs are few in number or lacking in vitality. On the other hand, the very thin sow will either not do justice to her pigs, or will become a mere wreck herself during the time she is nursing her litter, and the chances are that both these things will happen. A sow may be kept in fairly high condition and still produce satisfactory litters, provided she takes plenty of exercise. (Fig. 51.)

Her Ration.—In districts where corn is plentiful, there is a temptation to feed sows almost exclusively upon corn. Such a method of feeding cannot give the best results, because corn does not furnish enough bone- and muscle-forming constituents to properly develop the unborn pigs. It is also rather too fattening and heating to feed in large quantities to a sow at this stage. It is true that corn may be fed, but, as in the case of the boar, it must be fed with judgment. The ration recommended for the boar—namely, equal parts ground corn, ground oats, and wheat middlings—will answer very nicely for the sow. The proportion of corn should not be over one-third of

the meal ration, and wheat middlings or bran may be used to dilute the corn meal without oats. In cold weather, if sows have a good deal of out-door exercise, they may be fed more corn with safety than when they have to be kept pretty closely confined.

A meal ration which is preferred by the writer to all others is equal parts ground oats and middlings, leaving out corn

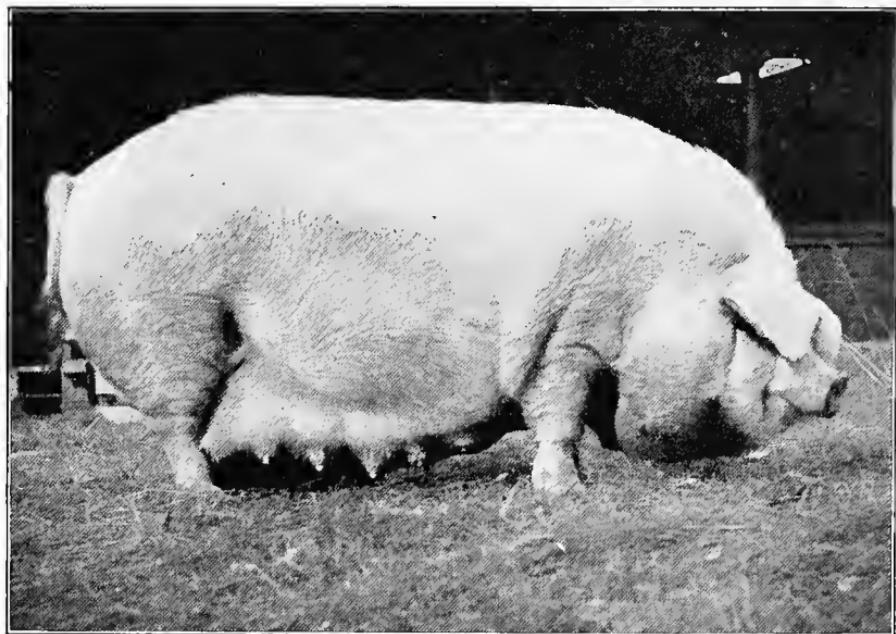


FIG. 51.—Three-year-old Chester white sow, winner of numerous prizes.

altogether. It is possible, however, to use a wide variety of feeds, so long as the feeder realizes the importance of furnishing considerable bulk and of restricting the proportion of heating or highly fattening feeds.

As in the case of the boar, the sow requires something besides meal, and the furnishing of some such feeds as roots, or alfalfa or red clover hay, is even more important than in

feeding the boar. Skim-milk is also excellent, but is not always available for sows.

In summer, a pasture field will furnish the bulky part of the ration, and, if sows are in good condition to start with and are given a good pasture, they will get along very well without other feed for two or three months. They should be given a little meal for several weeks before farrowing, to accustom them to its use, and render the change less violent when they are taken into the pens. With regard to the quantity of meal, the feeder must be guided entirely by the condition of the sows.

Meal may be fed either wet or dry. When roots are fed, a good plan is to mix the dry meal with pulped roots, though the feeder has wide latitude in regard to the methods he may see fit to follow.

In cold weather, when sows are fed out-doors, very little water should be used in mixing their feed. It will be found better to furnish them with water separately, should they require it. If they are fed roots, they will take very little water in cold weather. It should be seen to, however, that they have water when they need it, and in hot weather an abundant supply of fresh water is very important.

A record should be kept of the date of service of each sow, so that the date of farrowing will be known in advance, and due precaution taken. A week or two before farrowing, the sow should be placed in the farrowing pen, so as to become accustomed to her surroundings and changed conditions before the pigs are born.

Constipation is the bane of the swine breeder, and if the sow becomes constipated before she farrows, the chances are that she will lose her pigs, and possibly her own life. Constipation, therefore, is one of the main things to be guarded against at this time. When it once occurs, very little can be done to overcome it and save the pigs, so that it is almost

altogether a matter of prevention. If a sow is taken directly from a pasture field, shut up in a pen, and fed upon an exclusive meal ration, trouble is almost sure to occur. Radical changes in feeding are to be avoided, and the ration should be kept practically the same after taking the sow into the pen as it was before. If anything, the feed should be made rather more sloppy, and green feed or roots should be supplied the same as they were before the sow was taken in. A small amount of linseed meal (oil meal) or ground flaxseed added to the ration is also helpful in preventing constipation. The wisdom of feeding meal to sows while on pasture for a time before they farrow can be readily appreciated, as it prevents a violent change in their ration. The sow should also be given a chance and encouraged to take exercise.

Farrowing.—The farrowing pen should be dry, well ventilated, and free from draughts. It is a good plan to provide the pen with a guard rail made of two by eight inch planks fastened with their edges against the sides of the pen a little above the bed. These prevent the sow from lying against the partition, and lessen the danger of injury to the little pigs, which often find the space under the guard a very convenient refuge. (Fig. 52.)

There is a difference of opinion as to the amount of bedding which should be used, some maintaining that the sow should be liberally supplied with bedding, and others that the bedding should be limited. The writer's experience is that active sows in comparatively light condition can generally be trusted with a liberal amount of bedding, but sows which are in high condition, or which are at all clumsy, had better be given only a moderate amount of cut straw.

Sows should not be allowed to farrow in a large piggery where many other pigs are kept, unless it is warm weather and windows and doors can be left open. The air of a piggery

where many pigs are kept seems to be poisonous to little pigs, when the weather is cold and the doors and windows have to be closed, in spite of ordinarily good methods of ventilation.

The writer has had good results from sows farrowing in portable single pens placed in a sheltered yard, even in zero weather. Tarred paper was put on the studding, and the pen tightly boarded outside and inside. A ceiling of slats was put in the pen, and the space above the ceiling stuffed with straw.

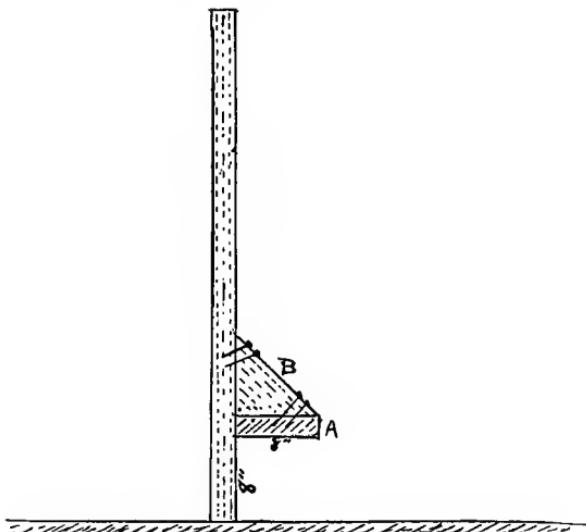


FIG. 52.—Method of fastening guard rail to wall or partition. A, guard rail, 2" x 8"; B, three-cornered pieces of two-inch plank spiked, at intervals, to guard rail and wall.

A window in the side, a small ventilator running from the ceiling out through the roof, and a lighted lantern hung in the pen on the coldest days when the pigs were very small, completed the equipment. The air in this pen always felt dry and comfortable, and the pigs all kept healthy and thrifty. If the ventilating shaft runs up from near the floor, it will be better.

It pays to treat sows kindly and to have them quiet. If they are on good terms with the attendant and regard him as

a friend, there is much less danger of trouble from nervous, excited sows when the critical time of farrowing arrives.

Feeding and Management after Farrowing.—After farrowing, the sow should not be disturbed, and if she lies quietly for ten or twelve hours, or even more, so much the better. When she wants anything, she will come to the trough for it. At first she should have little more than a drink. A very thin slop of middlings and water will answer very well. If the weather is cold, tepid water should be used. During the first three days, great care must be exercised not to over feed, and the ration should be kept very light. After this, the feed may be gradually increased, taking a week or ten days to reach full feed. A good mother with a large litter requires very liberal feeding, but if the litter is small, it may be necessary to reduce the feed.

Many different rations are used for nursing sows. Equal parts of finely ground oats and wheat middlings, allowed to soak between feeds, makes a most excellent ration. If sweet skim-milk can be added to the mixture, it makes an almost ideal ration. Corn may be used as recommended for sows before farrowing, and in larger quantities if skim-milk is available. A certain amount of roots and green feed are always in order, but the sow should not be expected to subsist upon such feeds at this time. A limited amount of bulky, succulent feed helps to keep the sow healthy.

The sow's udder may become hard and inflamed. If so, it is a good plan to bathe thoroughly with hot water and apply equal parts of lard and turpentine.

When the pigs are weaned, the feed should be cut down to check the secretion of milk. Dry oats make a safe feed for the sow for a few days after the pigs are weaned. If the udder gets very full, it is a good plan to turn the sow in with the pigs once a day for a few days.

Sows which Eat their Pigs.—Occasionally a sow will be found which will eat her pigs. It is claimed by some that the tendency to eat their young is sometimes caused by allowing sows to eat the afterbirth. As a precautionary measure, the afterbirth should be promptly removed from the pen. There is little doubt that the trouble is generally caused by a fevered condition in the sow, often induced by injudicious feeding before farrowing, or even after farrowing. A remedy that has been suggested is to feed the sow salt pork, but the danger is that once the sow has eaten her pigs she acquires the habit and is likely to do it again. Unless she is a very valuable sow, it is safer not to give her a second opportunity, but to turn her into the feed lot and fatten her for the butcher.

REVIEW.

1. What is the advice as to age for the first breeding of sows?
2. What is the effect of breeding again too soon after farrowing?
3. What should her condition be when bred?
4. Tell of the usual period of gestation and the probable causes of variation.
5. When are the best times for farrowing?
6. Give the reasons for one litter a year; for two litters.
7. Tell of the importance of exercise for brood sows during gestation.
How given in summer?
 8. Give methods of furnishing exercise for brood sows in winter.
 9. Describe the feeding of sows during gestation: water supply in winter and summer; pasture; roots; meal ration.
10. What is the value of a breeding record?
11. Tell of the bad effects of constipation for brood sows. How prevented?
12. Tell how to place a guard rail in a farrowing pen and tell of its purpose.
13. Tell of the amount of bedding desirable at farrowing time.
14. Tell of the need of pure air in the farrowing quarters. How may it be provided without draughts?
15. What are the main points to be observed in feeding the sow after farrowing?
16. Give directions for treatment of inflamed udder.
17. What cautions regarding feed of a sow when the pigs are weaned?
18. Give directions to help prevent sows from eating their pigs.

CHAPTER XXVII.

THE YOUNG PIGS.

Feeding and Management before Weaning.—When the pigs are born, the attendant should be on hand to see that everything goes well. If the pigs are strong and the sow lies quiet, it is better not to interfere. Sows that have been properly fed and given sufficient exercise seldom have difficulty in farrowing.

If the pigs seem somewhat weak, or if the sow is very restless, it is safer to place the pigs in a well-bedded box or basket to keep them out of the way until all are born. If the pen is chilly, a bottle of hot water placed in the bottom of the basket and covered with a blanket, with another blanket over the top of the basket, will help keep up the vitality of the pigs.

The pigs should be placed to the teat to suck as soon as possible. The weaker the pigs, or the colder the pen, the more important an early drink of the mother's milk becomes. If parturition is not unduly protracted, and if the pigs are strong, lively, and comfortable, they may wait for their first drink until all are born, but in such matters the attendant must use his judgment.

In cases of difficult parturition, a pig that is apparently lifeless can often be revived by opening its mouth and blowing into it. To be successful, this operation must be performed as soon as it is born. A chilled pig can sometimes be revived by immersing up to the neck in water heated to a temperature of about 98 degrees. When removed from the water, it should be rubbed dry, and induced to suck if possible.

As soon as the sow appears to have settled down quietly,

it is best to put the little pigs with her and leave them together. It is well not to interfere except when it is absolutely necessary.

Learning to Eat.—By the time the pigs are about three weeks old they will have learned to eat. If at all possible, it is a good plan to give them access to another pen in which is kept a small trough. Here they can be fed a little skim-milk with a very little middlings stirred into it. The quantity of middlings can be increased gradually as the pigs grow older. If they can be taught to nibble at sugar-beets or mangels during this time, so much the better. A small amount of soaked whole corn, or almost any other grain, scattered on the floor of the pen, will cause them to take exercise while hunting for it. If it is not possible to provide an extra pen, the sow may be shut out of the pen while the pigs are being fed. Many people simply allow the young pigs to eat with the sow, and many good pigs are raised in this way, but better results will be obtained if the pigs can be fed separately.

Exercise is very important for young pigs, and every possible means of securing it must be adopted. If they are kept in a small pen with the mother, some of the best of them will likely become too fat, and will probably sicken and die. Outdoor exercise is especially beneficial, but the pigs should be protected from cold winds or from a very hot sun. If the sow is turned out with her pigs, it is not well to give a very large range at first. She is likely to travel too far and unduly tire them.

Boar pigs not intended for breeding purposes should be castrated before weaning, to get the best results, though there is not much danger from castrating at a later date, provided care is exercised in connection with the operation. Clean hands, a clean knife, and the use of a disinfectant upon the wound will obviate practically all danger.

Pigs ruptured in the scrotum may be easily castrated as follows: Have an assistant hold the pig up by the hind legs. In making the incision, cut only through the skin of the scrotum,

being careful not to cut the membrane or sac which envelops the testicle. Then draw out the testicle enclosed in its membrane, and, at the same time, work the intestine back into the body of the pig. With the pig held as described, the intestine will go back to its place with little or no assistance. Having drawn out the testicle far enough, tie a strong white string firmly around the cord of the testicle (including the membrane) and then cut away the testicle (enclosed in its membrane) just outside of where the string is tied. Leave the ends of the string three or four inches long, so that they hang outside the wound. If the string does not come away in a couple of weeks, it may be pulled out.

If the rupture is only on one side, the remaining testicle may be removed in the ordinary way. The scrotum should be washed with disinfectant before any incision is made. The hands of the operator and the knife should also be washed with disinfectant, and the string should be soaked in disinfectant before it is used. The incision in the scrotum should extend well downwards to facilitate drainage from the wound. These simple precautions assure success.

The writer has employed this method successfully, and when the wound heals no person could tell that the pig had been ruptured.

Feeding and Management after Weaning.—There is considerable difference of opinion as to the best age at which to wean pigs. Some advocate leaving the pigs with the sow for ten or twelve weeks,—in fact, the sow is allowed practically to wean her own pigs. For producing show pigs this method may answer very well, but it means only one litter a year; at any rate, it does not admit of two litters a year. The average farmer will find it more profitable to wean his pigs early enough to permit two litters a year to be raised. If the young pigs have been taught to eat as described, and skim-milk is available, they may be weaned successfully when six weeks old. It is true that many pigs are weaned before they are six weeks old. It is seldom advisable to do so if they appear to be thriving

with the sow. If skim-milk is not available, it is generally advisable to defer weaning for two weeks more, and special pains should be taken to have the pigs well accustomed to their new feed and eating heartily before they are weaned.

Skim-milk and middlings make about the best feed for young pigs after weaning. If the middlings are fine and floury, which is not very likely to occur under present-day methods of milling, they will sometimes cause indigestion, which may show itself either in the form of diarrhoea or constipation. Diluting the middlings with a little bran or finely



Courtesy Illinois Experimental Station.

FIG. 53.—Group of Yorkshire bacon pigs.

ground oats will help prevent the trouble. Soaking or scalding the middlings will also tend to prevent digestive troubles. Scalding the middlings is especially useful when no skim-milk is to be had, as it makes the pigs like the feed better. To scald the middlings, it is best to pour boiling water on them, cover the vessel, and allow to stand several hours, or from one time of feeding until the next. When the pigs are first weaned, it is better to feed four times a day, giving only a small quantity of feed each time, and taking care to keep the trough clean. When well started, they may be changed to three feeds a day.

Other Feeds.—It is not well to be in a hurry to commence feeding corn, but if skim-milk is fed, corn feeding may commence earlier than when no skim-milk is available. Generally

speaking, when pigs are about three months old a little corn or other grain may be introduced into their ration. Two parts of middlings and one part of corn meal or ground barley, mixed with skim-milk to form a slop, make an excellent ration for growing pigs. As the pigs grow older the proportion of grain to middlings may be increased, but at no time should they be fed exclusively or almost exclusively upon corn, because corn is a poor bone- and muscle-former. The importance of feeding supplementary feeds with corn has been pretty fully discussed under the work of experiment stations. The need of such feeds is most important during the early life. A few roots will be found most helpful in keeping young pigs healthy during the winter, and green feed of almost any kind will answer the purpose during the summer. The feeder has a wide range of feeds to choose from, and if he understands something of their nature, has no difficulty in compounding a satisfactory ration.

The aim should be to develop bone and muscle during the early stages of growth, and, while the pigs should be thrifty and sleek in the hair, they should not be fed in such a way as to overload them with fat. (Fig. 53.) This is especially true of pigs which are intended for breeding purposes, and which should be carried right through to breeding age upon feeds which stimulate growth and general vigor rather than fat. A reasonable amount of fat is not objectionable, but the development of the frame, the muscular system, and the vital organs must not be neglected, if a satisfactory breeding animal is to be produced. Variety in feeds and plenty of exercise are very essential features in raising an animal that will possess all-round development.

Cost of Raising Pigs.—The Ontario Agricultural College obtained some interesting figures relative to the cost of raising young pigs until six weeks old, at which age they are commonly weaned.

Feeds were valued as follows: Meal of all kinds, including

bran and middlings, \$20.00 per ton; roots, \$2.00 per ton; skim-milk, 15 cents per 100 pounds.

It is assumed that the sow raises two litters a year, and that she nurses each litter six weeks. This would leave about nine and one-quarter months during the year that the sow would not be nursing pigs, and the cost of maintaining the sow during the time she is dry is estimated at 75 cents per month, it being assumed that the sow is fed as economically as possible during this time. The maintenance during the nine and one-quarter months at 75 cents per month amounts to \$6.94, or, in round numbers, \$7.00. Half of this amount, or \$3.50, is charged against each litter, in addition to the cost of feed consumed by the sow and pigs before the pigs are weaned. Risk, interest on investment, labor, and manure are left out of the calculation. Twelve litters of pigs were used, which were weaned at six weeks old in each case.

The following table gives particulars of each litter:

Sow and litter.	No. of pigs in litter.	How bred.	Cost of feeding sow and litter for six weeks.
No. 1.	4	Pure Yorkshire.....	\$3.20
" 2.	9	Berkshire sire, Tamworth dam.....	3.08
" 3.	6	Pure Yorkshire.....	3.87
" 4.	5	Yorkshire sire, Tamworth dam.....	3.70
" 5.	8	Yorkshire sire, Tamworth dam.....	3.04
" 6.	3	Yorkshire sire, Berkshire dam.....	5.85
" 7.	9	Berkshire sire, Yorkshire dam.....	4.31
" 8.	8	Pure Yorkshire.....	4.33
" 9.	8	Pure Tamworth.....	3.88
" 10.	8	Yorkshire sire, Tamworth dam.....	3.94
" 11.	6	Tamworth sire, Berkshire dam.....	3.33
" 12.	4	Tamworth sire, Berkshire dam.....	2.37
Average. .	6½		3.74

Total and Average Costs.—To arrive at the total cost of the pigs at six weeks old, the service fee and half the cost of maintaining the sow when dry are charged against the average cost of maintaining the sow and litter for six weeks, making the total cost as follows:

Service fee	\$1.00
Half cost of maintaining dry sow ($\frac{1}{2}$ of \$7.00)	3.50
Average cost of feed for sow and litter.....	3.74
Total	\$8.24

Average number of pigs in litter, $6\frac{1}{2}$.
 Average cost per pig six weeks old, \$1.27.

Variations in Cost.—If the cost of maintaining the dry sow were placed at \$1.00 per month, it would bring the cost of the young pigs to \$1.44 each at six weeks old. It is probably a safe statement, therefore, that young pigs can be raised to the age of six weeks at \$1.50 each, making some allowance for items not considered in the experiment described.

J. H. Grisdale, Central Experimental Farm, Canada, estimates that a breeding sow can be maintained during a whole year at from \$12.00 to \$15.00, under careful management, and produce two litters during the year. This approximates, very closely, the Ontario results, which, omitting service fee, make the cost of maintaining a sow half a year, and one litter of pigs for six weeks, \$7.24.

Since the above calculations were made, there has been a very material increase in the cost of feeds, but if we add 50 per cent to the cost of maintenance, all round, the cost of a pig six weeks old is about \$1.85, which is a very moderate cost.

REVIEW.

1. Give a plan of keeping new-born pigs warm in very cold weather.
2. Tell of the importance of the first milk soon after farrowing.
3. Tell of the management of apparently lifeless pigs when first born.
4. Give plans for teaching sucklings to eat.
5. How may young pigs be induced to exercise?
6. When is the best time to wean pigs? Give reasons for variation.
7. Give suggestions regarding best feeds after weaning. Why avoid giving corn only?
8. What is the cost given for pigs six weeks old? How is it calculated?
9. What variation in these figures would be necessary for the present prices of feed?

CHAPTER XXVIII.

FATTENING.

MANY of the problems connected with the fattening of hogs have already been discussed under experiment station work. Corn may be used much more freely for fattening hogs than for those intended for breeding, but experiments show conclusively that corn has its limitations, even for fattening, and that it is greatly improved by having some feed richer in protein combined with it. The importance of using some sort of supplementary feed with almost any meal ration in order to give bulk and variety has also been demonstrated, and the important place which pasture may play in the fattening of hogs has been quite fully dealt with. There are a few general facts of more or less importance remaining to be given under this heading.

Winter Feeding.—Generally speaking, winter feeding is more expensive than summer feeding. Part of the extra feed required in winter is probably due to the fact that more feed is required to keep up the heat of the body during cold weather. There is little doubt, however, that much of the advantage of summer feeding is due to more sanitary surroundings,—that is, more fresh air and out-door exercise, coupled with more succulent feed, which seems to aid digestion. The man who feeds hogs in winter, therefore, should aim to approach summer conditions as nearly as possible. He cannot get summer temperature, it is true, but he can provide a fair amount of fresh air, and feeds that will keep the digestive organs in good condition. It is just here that the man who grows a few roots

for winter feeding has a great advantage over the man who does not. Skim-milk, buttermilk, and alfalfa hay may also be made to perform a useful part in giving variety and aiding the digestive organs to perform their functions properly.

Quantity of Feed.—The test of the skill of the feeder is his ability to keep just slightly within the appetite of the animals under his charge. He must watch the animals closely and see that they clean up with apparent relish all that he gives them. Feed left in the trough is a sign that something is wrong with the methods employed, and to have to cut back in the quantity of feed means a loss of time. The quantity should be so gauged that there is a gradual increase as fattening advances, and radical changes, either in quantity or kind, should be avoided. To be successful, the feeder must learn the lesson that all changes should be made gradually, and that undue haste in fattening may mean serious delay in the process, together with a waste of feed.

Regularity and Comfort.—Regularity in time of feeding is necessary to regularity in the appetite of the animal. The animal which is fed at the same hours every day will take more feed with less danger of surfeiting than the one fed at any time to suit the convenience of the feeder.

Dry, comfortable quarters, and sanitary conditions generally in pen or feed lot, are important factors in securing satisfactory gains, and in avoiding disastrous loss through disease.

Cost Increases with Age.—Prof. Henry, in "Feeds and Feeding," gives a very instructive table, compiled from results from numerous experiment stations, showing the feed consumed per 100 pounds gain by hogs of different weights. Following is an abbreviation of the table as given in Prof. Henry's book:

Weight of animals in pounds	Total number of animals fed.	Average feed eaten per day	Feed eaten daily per 100 lbs. live weight.	Average gain per day.	Feed for 100 pounds gain.
15 to 50.....	174	2.23	5.95	.76	293
50 to 100.....	417	3.35	4.32	.83	400
100 to 150.....	495	4.79	3.75	1.10	437
150 to 200.....	489	5.91	3.43	1.24	482
200 to 250.....	300	6.57	2.91	1.33	498
250 to 300.....	223	7.40	2.74	1.46	511
300 to 350.....	105	7.50	2.35	1.40	535

The table shows that the heavier hogs made more rapid gains and consumed less feed per 100 pounds of their live weight, but there was a steady increase in the amount of feed required for 100 pounds gain as fattening advanced. (See Fig. 54.)

A similar result was obtained at the Ontario Agricultural College with 36 pure-bred pigs of different breeds, as shown by the following table:

Live weight of hogs.	Meal required for 100 pounds increase in weight.
54 to 82 pounds.....	310 pounds
82 to 115 pounds.....	375 pounds
115 to 148 pounds.....	438 pounds
148 to 170 pounds.....	455 pounds

These figures, together with others that might be given, show very clearly that the cost of production steadily increases as the hogs become older.

Correctives.—Swine appear to have a craving for what might be called “unnatural” substances. This is especially true of hogs which are kept in confinement, which will eat greedily such substances as charcoal, ashes, mortar, soft coal, and rotten wood. It is probable that some of these substances

are not good for hogs, but there is no doubt that charcoal and wood ashes have a beneficial effect. Charcoal made from corn-cobs answers very well. It is a good practice to supply hogs with charcoal, especially during the winter months, but, if the hogs have not had any charcoal for a considerable time and are then given a liberal supply, there is danger that they may

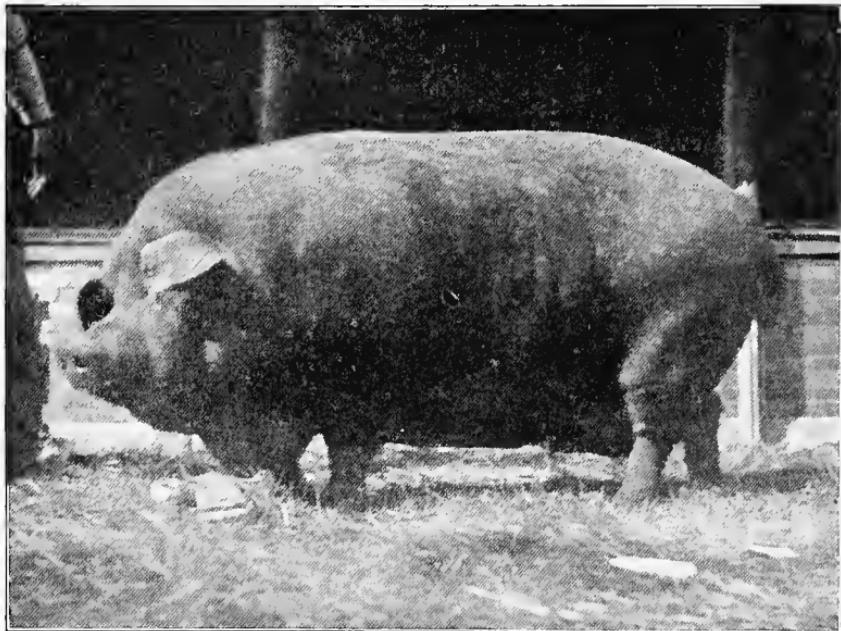


FIG. 54.—Yearling Duroc-Jersey sow, a frequent prize-winner.

take too much for their own good. The same caution must be observed in regard to salt.

If charcoal is not available, a very good mixture, to keep constantly before hogs in small troughs made for the purpose, can be made up of one part salt, one part sulphur, and about ten parts wood ashes.

Sods make a very fair substitute for charcoal. A wagon-

load or two of sods placed conveniently near the piggery so that the feeder can throw one or two into each pen occasionally will be found very beneficial during the winter.

Hogs that are out-doors during the summer and have access to earth and vegetable matter have little need of other correctives.

Money Returns for Feed Consumed by Hogs.—Some interesting figures have been published by the Ontario Agricultural College relating to the value it is possible to obtain for feed consumed by hogs, when the hogs are sold at varying prices per pound live weight. The investigation includes hogs fed by the College, as well as a large number fed by farmers throughout the province. The following summary shows the scope of the investigation:

Number of hogs	297
Weight when marketed	56,718 pounds
Average weight per hog	190.9 pounds
Total meal consumed, which included barley, peas, oats, corn, middlings, and bran	165,911 pounds
Total skim-milk consumed	112,500 pounds
Total roots consumed	64,600 pounds
Miscellaneous feeds, such as pasture, green feeds, etc., valued by experimenters at	\$77.00

The pigs are valued at \$1.50 each at weaning time. This amount, together with the value of the skim-milk at 20 cents per cwt., roots at 10 cents per bushel, and the miscellaneous feeds valued at \$77.00, is first deducted from the gross proceeds derived from the assumed sale of the hogs at each of the different prices per pound, and the remainder represents the cash received for the meal consumed by the hogs. The following table shows the prices obtained for feed, under each valuation of the hogs when sold:

Prices Realized for Feeds Consumed by 297 Hogs.

Assumed selling prices of hogs, live weight.	Meal, including mixed grain, middlings, and bran.	Milk.	Roots.
	per ton	per cwt.	per bu.
If sold at 4½ cents per lb.....	\$20.45	\$.20	\$.10
If sold at 5 cents per lb.....	\$23.87	\$.20	\$.10
If sold at 5½ cents per lb.....	\$27.29	\$.20	\$.10
If sold at 6 cents per lb.....	\$30.71	\$.20	\$.10
If sold at 6½ cents per lb	\$34.13	\$.20	\$.10

Figures such as the above, obtained from a large number of hogs fed under varying conditions, carry considerable weight. They show that the hog is able to give a good account of the feed he consumes, provided he is handled with intelligence. Of course, the figures in the table are averages. Some tests showed larger returns and some did not show as large, but it is worthy of note that two tests which showed exceptionally good results were omitted from the computation in order to make the results as conservative as possible.

PORK PRODUCTION IN THE SOUTH.

Advantages of the South.—Many people think that the South is not adapted to swine raising, and that the "corn belt" has something approaching a monopoly of the business. It has been demonstrated very clearly, however, that corn alone is not an ideal hog feed. (See Chapter XX). The hog requires variety in his feed, and pasture crops play an important part in cheap pork production. The South produces a wonderful variety of feeds, and possesses a climate which permits of pasturing practically the whole year, so that it is difficult to see why the South should not excel along the line of swine husbandry.

Pasture Crops for the South.—The Mississippi Station has issued a circular on "Growing Hogs in Mississippi" which gives very full directions regarding pasture crops for that state. Owing to the fact that the recommendations may be modified and

adapted to almost any part of the South, they are given here practically in full. They give a very clear idea of the great variety of crops which may be employed to furnish pasture and cheapen production. The recommendations follow:

" We find that the following crops are applicable in Mississippi and that they are such that our labor can grow without much effort. It must be understood that better crops and better results will follow planting on well prepared, well fertilized, well drained, and thoroughly cultivated soils. It is best to have good soil for all crops, and it is a waste of time, energy, and money to attempt to grow some of the crops on poor soil. On the other hand, fairly good results will be shown on poor lands if the proper selection of seed is made and the soil is prepared properly. An application of stable manure will always pay, and provisions should be made to save and use the same, whenever possible.

" One and one-half bushels oats and one-half bushel vetch per acre, planted in September, will furnish grazing from December to the first of April. Supplemental feed, 1 per cent corn or 5 per cent sweet potatoes.

" One bushel barley and 10 pounds red clover per acre, planted in September, will furnish grazing from December to July. Supplemental feed, same as above.

" Eight pounds Dwarf Essex rape and 10 pounds red clover per acre, planted in September, will furnish grazing from December to July, and the same planted in February will provide grazing from May to July. Supplemental feed, same as above.

" Alfalfa, 20 pounds per acre, planted in September or October, or in March or April, will furnish grazing from March to September. The pastures should not be over stocked. Supplemental feed, 1 per cent corn and shorts.

" One-half bushel cow-peas per acre, drilled, planted in May, June, and July, will furnish grazing from August to November. Supplemental feed, 1 per cent corn, or 5 per cent sweet potatoes.

"Three-fourth bushel soy beans per acre, drilled, planted in May, will furnish grazing from July to October. Supplemental feed, 5 per cent sweet potatoes, 1 per cent corn and shorts.

"Two bushels peanuts per acre, planted in April, May, or June, will furnish grazing from August to November. Soy beans may be drilled between rows of peanuts when laid by, and the hogs allowed to harvest both. Supplemental feeds, 5 per cent sweet potatoes, 1 per cent corn.

"Eight thousand sweet potato plants per acre, planted in April or May, will furnish grazing from September to November. Wheat, rye, rape or clover can follow. Supplemental feeds, peanut, soy bean, alfalfa, or pea hay.

"One-half bushel chufas per acre, planted in April, May, or June, will furnish grazing from August to November. Supplemental feeds, 1 per cent corn, 5 per cent sweet potatoes.

"Corn and cow-peas, $\frac{1}{4}$ bushel of the former planted in March or April, and $1\frac{1}{2}$ bushels of the latter planted when the corn is laid by, will be ready to graze or "hog down" during the fall. Supplemental feeds, 5 per cent beets, 5 per cent rutabagas.

"One to one and one-half bushels wheat or rye per acre, sown in September with 10 pounds red clover, will furnish grazing from December to May. The wheat or rye should be mowed off in March to give air to the clover. Well fertilized soil will be required for a good yield of these grazing crops. Supplemental feeds, 1 per cent corn, 5 per cent sweet potatoes.

"Bermuda and Vetch: In this state, two periods of the year are especially severe on grazing crops for hogs. One is in August, when the weather is hot and dry and the pastures fail, and the other in January and February, when it is very wet and the hogs cut the soft ground. These conditions can be overcome by planting cow-peas in May, which can be pastured in August, and by sodding Bermuda grass with a good sprinkle of vetch for the winter pasture. Our native Bermuda grass is easily grown by planting tufts in moist ground 2 feet apart, when it soon covers

the entire surface. Sow $\frac{1}{2}$ bushel of vetch per acre broadcast with this. If Bermuda grass seed is sown, use $\frac{5}{6}$ pound seed per acre. Supplemental feed, 1 per cent corn, 5 per cent sweet potatoes. (The Bermuda grass makes a permanent pasture after the first spring.)

“Wheat of a smooth variety and vetch, $\frac{1}{2}$ bushel of each per acre, planted in the fall, make an excellent winter pasture until the wet season sets in, and furnish grazing until the grain is nearly ripe. (Rye may be used instead of wheat, and it would probably be better to sow 1 to $1\frac{1}{2}$ bushels of wheat or rye per acre with $\frac{1}{2}$ bushel of vetch.) Supplemental feeds, 1 per cent corn, 5 per cent sweet potatoes.

“Sorghum, $\frac{1}{2}$ bushel in rows, sown in drills, can be planted as a catch crop from the first of April to August, and either used as a grazing crop, or cut and used as a green food. This crop is generally ready for grazing or feeding in $2\frac{1}{2}$ months. Supplemental feeds, 1 per cent corn, 5 per cent sweet potatoes or grazing.

“Jerusalem artichokes (ground artichokes), 3 bushels per acre, planted like Irish potatoes early in the spring, will furnish fall grazing, although hogs are not so fond of them as of sweet potatoes.

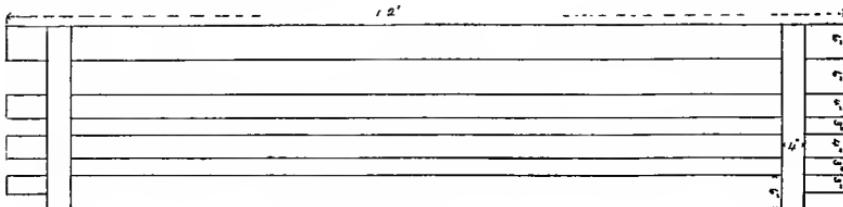
“Stock beets for winter and spring feeding, planted in early fall, will furnish grazing or soiling in four months. Plant 8 pounds to the acre in ridges and thin to a stand of about 10 to 12 inches. Supplemental feeds, 1 per cent corn.

“Rutabagas and turnips are sown in corn fields, when laying by, as a catch crop, and furnish good grazing in the fall. They can also be sown in the spring or summer as a main crop and pulled for pigs, especially when pastures are low.”

The circular also states that Lespedeza (Japan clover) may be sown in April on finely pulverized soil at the rate of 8 to 10 pounds of seed per acre, which will give pasture from September to November. The seed should not be covered with a harrow.

It is stated also that white clover, at the rate of 6 pounds per acre, may be sown with Bermuda grass instead of vetch, to form a permanent pasture.

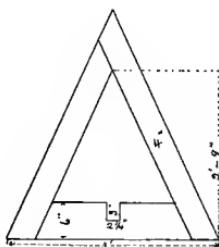
Also, velvet beans at the rate of $\frac{1}{2}$ bushel per acre may be planted among corn when the corn is laid by, instead of cow-peas as previously described.



Elevation of Panel



Top view of Panel



Elevation of Support

FIG. 55.—Panel and support of portable hurdle fence, designed by Dr. E. M. Ranck, of the Mississippi Agricultural College. It is very simple to make and easy to erect. Note the notch in the bottom piece of the support. This notch is $2\frac{1}{4}$ inches wide and 3 inches deep. The ends of the bottom boards of adjoining panels fit into the notch side by side, and the top boards fit snugly into the apex of the triangular opening.

Points to be Considered.—The following are given as important points in raising crops for hogs:

“ All crops that produce feed underground, such as sweet potatoes, peanuts, chufas, artichokes, and root crops, grow best on sandy loam or in very mellow soils.

“ The legumes, such as peas, soy beans, and clover, should

be rotated over poor clay and worn-out soils with some stable manure, as they will add fertilizer and produce fairly good grazing crops.

"Permanent sod pastures are necessary for grazing during the very wet or very dry seasons of the year.

"It requires very rich, well manured, and thoroughly prepared soils to grow profitably the grain crops, such as barley,



Photograph from Dr. F. M. Ranck, Mississippi Agricultural College.

FIG. 56.—Duroc-Jersey pigs digging Johnson grass roots on a corn headland. This is an illustration of how hogs can turn waste material into value. Another type of portable fence is shown in the picture, but it is not so simple as the one designed by Dr. Ranck, Fig. 55.

wheat, rye, etc., although oats sometimes grow fairly well on poor soils.

"Whenever possible and practical, the crops should be harvested by the hogs themselves. It is cheaper, and the exercise is beneficial." (Figs. 55, 56, 57.)

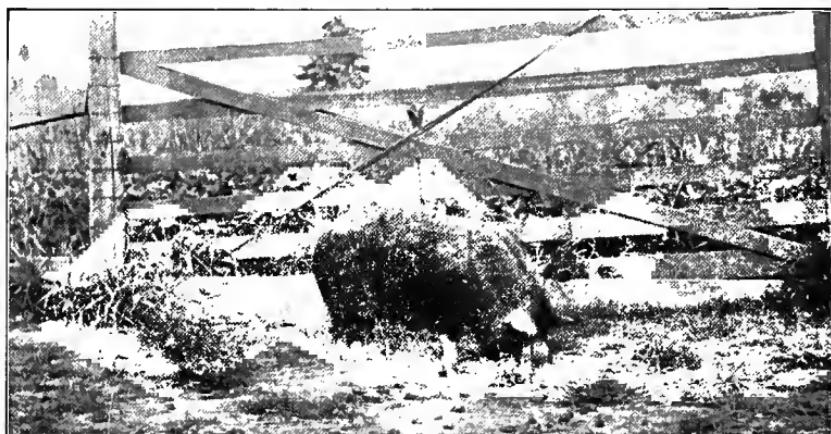
For hogs fed in pens without grazing crops during the finishing period of fattening, the writer of the circular recommends

a ration of 8 parts corn chops to 1 part cottonseed meal. (Fig. 58.)

When tankage was used in place of cottonseed meal, better results were obtained, but the ration was more expensive.

A ration composed of equal parts corn chops and shorts is also commended.

If one were disposed to criticize the recommendations made in the circular, it would be in connection with the amounts of meal recommended in the supplemental feeds on pasture. One



Photograph from Dr. E. M. Ranck, Mississippi Agricultural College.

FIG. 57.—A patch of field peas can be seen through the bars of the gate. One can get an idea of the amount of pasture by comparing the height of the peas with that of the mature sow shown in the foreground. The sow appears to be in ideal breeding condition.

per cent of meal, that is to say one pound of meal for each 100 pounds live weight of the hogs, looks like a rather light meal allowance for growing or fattening hogs. The reader is especially referred to the discussion under "Amount of Grain on Pasture" in Chapter XXII.

Results in Alabama.—Bulletin 143 of the Alabama Station gives results of three years' experimental work with swine. The following points are taken from the summary of results.

When corn was used alone as a ration for fattening hogs,

both the daily gains and the financial outcome were unsatisfactory.

On the whole, peanut pasture was found to be more useful than any other pasture tried. Pork was made at a good profit when peanut pasture was used in conjunction with corn.

Mature sorghum pasture has very little to recommend it as a feed for fattening swine. Both the gains and the financial outcome were unsatisfactory.



Photograph from Dr. E. M. Rauck, Mississippi Agricultural College.

FIG. 58.—Piggery at the Mississippi Experiment Station. Details of plan may be obtained by writing the Director of the Station.

When sorghum was cut and carried to the hogs, the results were better than when the hogs were made to graze the crop.

Soy bean pasture ranked second to peanut pasture as a supplement to corn.

Chufa pasture was not found to be as good as either peanut or soy bean pasture.

When hogs have been grazing a green crop, it usually pays to enclose and feed them in a dry lot for a short period after the crop is exhausted.

The same bulletin gives the following table:

*A Succession of Green Crops for Hog Grazing.**For Fall Planting.*

Crop.	Time to plant.			Amount seed per acre.	Number days from planting time to grazing time.
Alfalfa	Sept.	1 to Oct.	15	15 to 25 pounds..... (15 to 20 pounds cleaned)	90 to 120
Burr Clover ..	Sept.	1 to Oct.	1	seed 36 pounds in burr	90 to 120
Oats.....	Sept.	1 to Nov.	1	1½ to 3 bushels..... (4 to 6 pounds drilled)	90 to 120
Rape.....	Sept.	20 to Oct.	15	5 to 10 pounds broad- cast	60 to 75
Rye.....	Sept.	1 to Nov.	1	1½ to 2 bushels.....	90 to 120
Vetch.....	Sept.	1 to Oct.	15	1 bushel.....	90 to 120

For Spring and Summer Planting.

Alfalfa.....	Feb.	25 to April	1	15 to 25 pounds.....	75 to 90
Chufas.....	March	15 to June	1	3 to 4 pecks..... (½ bushel drilled)	120 to 150
Cow-peas	May	1 to July	10	1½ bushels broadcast	75 to 90
Japan Clover	March	1 to March	15	24 pounds.....	60 to 75
Oats.....	Feb.	1 to March	20	1½ to 3 bushels.....	75 to 90
Peanuts.....	May	1 to June	30	1 to 2 bushels, unhulled (4 to 6 pounds drilled)	90 to 120
Rape.....	March	1 to March	31	9 to 10 pounds broad- cast	60 to 75
Sorghum.....	April	1 to June	30	1½ to 2 bushels.....	60 to 90
Soy Beans ...	April	1 to June	30	1½ bushels, broadcast..	90 to 120

Pasture the Entire Year.—The following is quoted from Bulletin 113 of the Florida Station:

“ The following is a list of useful forage crops in Florida. The crops in this list will give pasture through the entire year.

Dwarf Essex Rape, can be pastured from December to March.

Japanese Cane, can be pastured from November to March.

Rye, Oats, Barley, can be pastured from November to April.

Sorghum, can be pastured from May to November.

Chufas, can be pastured from August to December.

Sweet Potatoes, can be pastured from October to December.

Cow-peas and Soy Beans, can be pastured from July to November.

Peanuts, can be pastured from September to December.

"For permanent pasture, it is doubtful whether we can get anything better than Bermuda and Johnson grass."

Pasture Supplemented with Grain.—Professor Good, in Bulletin 175 of the Kentucky Station, gives results of carefully conducted experiments with several forage crops for swine. Following is a summary of the principal points brought out in the experiments:

To obtain best results young green rye, barley, wheat, and oats should be grazed by hogs when the plants are between 6 inches and 15 inches in height.

There is no time that grain can be so profitably fed to a hog as when he is young and running on pasture. Some experiments showed as high as 18 pounds gain in weight for each bushel of grain fed.

It is a mistake to run young pigs on forage crops without a grain ration. Breeding sows, when not nursing pigs, can be maintained on pasture alone, but young pigs are apt to become stunted.

During the spring, summer, and early fall months, from one-half to three-fourths of a full feed of grain was fed to hogs running on pasture. During the late fall, winter, and early spring, when the pastures were short, nearly a full ration of grain was fed.

Corn meal should be supplemented with soy beans, tankage, middlings, or with some other nitrogenous supplement, when fed to pigs running on young rye or barley during the winter months.

Pigs averaging 66 pounds per head, receiving corn meal alone, but allowed the run of a clover pasture until it was killed by frost, and then turned on a pasture of young rye, averaged 215 pounds in 124 days, making a gain of 14.65 pounds of pork for every bushel of corn meal fed.

Eighteen pigs, averaging 51 pounds per head, averaged 222 pounds at the end of 166 days, from receiving a ration of a mixture of corn meal 9 parts, and soy bean meal, 1 part, and

allowed a succession of forage crops, namely, 1 acre rye pasture, 2 acres oat pasture, and 1 acre succotash pasture. The gain was 16.47 pounds for every bushel of grain consumed. The succotash, planted June 22nd, was composed of 2 bushels of oats, 1 pound of rape, 30 pounds of cow-peas, 30 pounds of soy beans, and 2 pecks of corn.

An important advantage in favor of pasturing hogs is the fact that practically none of the manure is wasted.

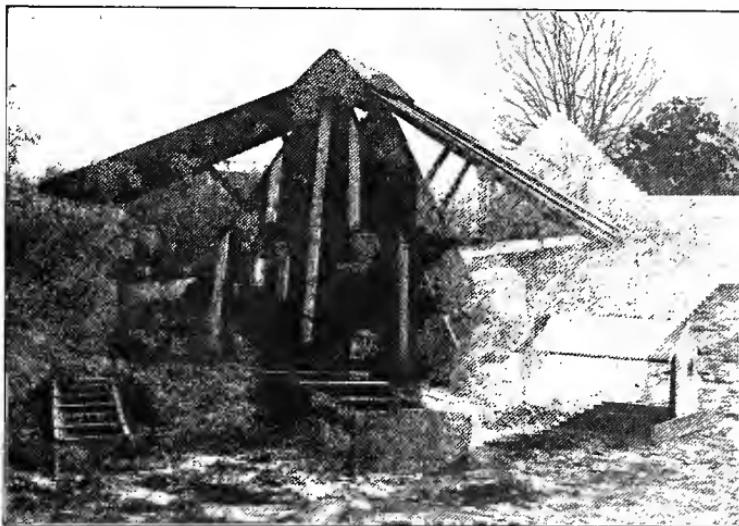
Pasture for Breeding Stock.—It will not be found satisfactory to allow breeding sows with their litters to run in large pastures with other stock. This method is not fair to either the sow or her litter, because this is a critical time, and a little extra attention to the young pigs may make all the difference between growthy, profitable hogs, and unprofitable scrubs.

Dr. Tait Butler, in a bulletin published by the North Carolina Department of Agriculture, describes the pasture lots for breeding sows and their litters at the Iredell Test Farm of the Department of Agriculture. The portable farrowing pens are set in a grove so that they are sheltered from the extreme heat of the sun, each pen being set in a lot 100 feet square in the grove. Running out from each grove lot is a lot 100 feet wide by 450 feet long. These large lots are divided lengthwise, giving each sow and her litter two lots, each 50 feet wide by 450 feet long. One of these lots is in permanent pasture, preferably alfalfa, and the other is planted with some other pasture crop, so that the sow and her litter can be grazed alternately on the two lots. The long, narrow lot is convenient to cultivate. No doubt it is not practicable for every swine breeder to follow the plan described above, but the principle is sound, and may suggest to the thoughtful man ways and means of improving the conditions for his breeding stock at a very critical period of their existence.

Shade and Water.—Ample provision for shade and an abundant supply of pure drinking water are of great importance in keeping hogs healthy and thrifty. To compel hogs to drink from

filthy wallows, or other impure sources, is to court disaster from disease.

Scope of Suggestions.—As this is not a treatise upon Southern agriculture, it is out of the question to discuss suitable soils, methods of cultivation, etc., for the various crops mentioned. All that has been attempted is to show the possibilities of the South along the line of cheap pork production, and to urge farmers to



Photograph from Dr. E. M. Ranck, Mississippi Agricultural College.

FIG. 59.—Hog colony house recommended by the Mississippi Agricultural College. It is a modification of the A-shaped pen, the sides being hinged at the top. In summer the sides are lifted up as shown in the picture, in which position it affords shade during the whole day and allows a free circulation of air. In winter the sides are let down, when the pen is as comfortable as the ordinary A-shaped pen.

utilize the advantages existing in their location, whether the number of hogs they raise be few or many. Experiment Stations are for the guidance of the farmer, and the wide-awake farmer will look to his State Experiment Station for advice regarding the culture of crops with which he is not familiar.

The reader is referred to the chapters dealing with results of experiments in swine feeding for further reference to many of the feeds mentioned.

SCRUBS NOT ECONOMICAL.

The legitimate place of the hog, or any other meat-producing animal, is to turn cheap feeds into valuable meat, and the more feed a hog can turn into pork during its short lifetime, the more valuable it is to its owner. Professor Burns of the Texas Experiment Station fed six scrubs and six grade Poland-Chinas on the same kind of ration. So far as amount of feed for 100 pounds gain in weight was concerned, there was practically no difference, but that is only one side of the question. While the scrubs were making 850 pounds gain in weight, the grades made 1130 pounds. It required no more labor to feed the grades than the scrubs, it cost no more for a pound of pork in the grades than in the scrubs, yet the grades manufactured 280 pounds more pork than the scrubs. From the standpoint of labor alone the grades were the more profitable, but this is not all. When sent to market, the packer paid \$6.00 per hundred weight for the scrubs, and \$6.65 for the grades, and as a result the grades showed a profit of \$1.48 per hog more than the scrubs. The scrub has outlived his usefulness, and there is clearly no place for him in present day agriculture.

Scrub Methods.—The scrub, unlike the poet, can be *made* as well as *born*. Methods of feeding and management which produce a pig weighing from 100 to 150 pounds at 10 months old, when it ought to weigh at least 300 pounds, may properly be described as scrub methods. We may have the best of blood in our herd, but fail to secure any advantage from it through our carelessness or indifference. To effectively eradicate the scrub requires intelligent methods of both breeding and feeding, and the scrub pig will disappear when scrub methods are abandoned. The principles underlying the successful handling of hogs have been pretty fully discussed in the preceding pages of this and other chapters of the book.

REVIEW.

1. Why is it more expensive to fatten hogs in winter?
2. How can this expense be reduced?
3. Give cautions regarding quantity and change of feed.
4. Tell of the importance of regularity in feeding and comfortable quarters for fattening.
5. What is the effect of age on the cost of fattening?
6. What are "correctives"?
7. How are they supplied to swine?
8. From the results given in this chapter, do hogs pay well for their feed?
9. Give advantages of the South for swine husbandry.
10. Outline a pasture succession for hogs in your section.

CHAPTER XXIX.

SUGGESTIONS TO BEGINNERS.

Starting in Business.—One of the most common mistakes for a beginner to make is to be too ambitious, and to make his start on too large a scale. As a result, he is liable to meet with some rather serious losses and to become discouraged. Perhaps the safest way to start is to buy one or two young sows safely in pig to a good boar. It costs more money to start this way than to buy newly weaned pigs, but this disadvantage is more than compensated by the fact that a person is able to make a much more intelligent selection by buying a more fully developed animal than he could make if he bought his sow very young. In addition to this advantage, he has a shorter time to wait for returns. He is also saved the necessity of immediately buying a boar, if there is not a good one in the near neighborhood, and need not tie up capital in a boar until he has had some money returns from his venture, provided, of course, that he cares to sell some of his young pigs at an early age. (See "Selection of the Sow," pp. 37 and 38.)

Breed to Select.—As to the breed to select, each man must be his own judge. Nearly any of our well-known breeds will give good results if intelligently handled. Generally speaking, however, it is safer for a beginner to select a breed which is popular in his own neighborhood. By doing so, he has a better chance to make new selections for his herd, and will find it easier to sell breeding stock in his own neighborhood in the face of competition, than to do missionary work for a new breed, which, after all his efforts, may fail to win popularity in his district. This paragraph applies only to the man who wishes

to sell pure-bred pigs for breeding purposes. If he is merely raising market pigs, the drover or butcher is the only man to please. Whatever breed is selected, it should be retained. No man need expect to make a success of breeding any class of animals if he keeps changing from one breed to another.

Buying a Boar.—Sooner or later the beginner will want to own a boar of his own, but if there is a really good boar in his neighborhood to which he can breed his sows, he had better postpone the purchase until he has gained considerable experience. He will find that there are many things about selecting a boar which cannot be learned from books, and that wisdom will come from experience. Boars can be bought for the least money when they are very small, but this method has too many of the elements of a game of chance to be commendable. When buying a young boar, it will be found safer to buy one from eight to twelve months old than a pig two or three months old. The reason for this recommendation is plain, it being impossible to foretell just how the very young pig is going to develop. Highly-fitted show boars had better be avoided. As pointed out in another place, pedigree is important, but the boar should, to some extent at least, demonstrate the excellence of the blood behind him. It is more satisfactory to select by personal inspection than to buy through correspondence. A visit to the herd which produced the boar enables one to judge the general quality of the hogs produced in the herd, and one can pick up information regarding the sire and dam that could not otherwise be obtained. It is easy to pay too much, and it is possible to be too economical. It is not so much a question of how few dollars we invest as it is one of how much real merit we can get for every dollar invested.

If the boar is shipped some distance and arrives excited and tired, he should be fed very lightly at first and not used for several weeks after his arrival.

Cheap Buildings.—The beginner should not go in for expensive buildings. A few cheap shacks will answer his purpose very well for a few years, and before building he should take a look around among other breeders and see what kind of buildings they find most satisfactory (Fig. 77). What will suit one part of the country may not suit another, so that it is important to study what is giving satisfaction in his own neighborhood. For cold climates, the method of making the ceiling of the pen of poles or boards placed a few inches apart and covered with a layer of straw is worth investigating. Of course, the straw should be renewed every year.

Cheapening Production.—The beginner is urged to read Chapter I, the place of the hog on the farm. Having hogs on hand at the time they are most needed for consuming substances which would otherwise go to waste is one of the secrets of handling hogs profitably. At certain seasons there may be more dairy by-products to consume than at others, and on nearly every farm there are stubble fields to glean and fallen fruit to dispose of, or other perishable products which may go to waste if hogs are not on hand at the right time. Any farmer who keeps hogs should make a study of this phase of the question, or he will not derive the full benefit from his hogs as economical revenue producers.

The possibility of utilizing pasture crops should also be studied, and the experimental work with pastures described in another chapter will repay careful reading. Even though special pasture crops may not be sown, it is generally possible to lighten feed bills by utilizing second-growth clover, or newly-seeded clover fields, if one will take the trouble to ring his pigs. The feeder must always be on the alert to take advantage of every opportunity to utilize the cheap feeds and thus increase his profits.

Promptness in Registering.—If pure-bred swine are

handled, the breeder should make himself acquainted with the rules of registration for the breed. The secretary of the breed association will furnish full information and blank forms free of charge, so there is no excuse for ignorance in regard to this matter. When an animal is sold, promptness in forwarding the certificate of registration and transfer will be appreciated by the purchaser.

Keeping Records.—The breeder of pure-bred stock should keep an accurate record of his breeding operations. As time goes on, these records become more and more valuable. They enable him to avoid mistakes, and may save him from financial loss in case of a dispute. Before mailing the registration certificate of an animal which has been sold, it is a good plan to copy from the certificate into a book kept for the purpose the name and registration number of the animal, date of birth, name and number of sire, name and number of dam, date of sale, and name and address of purchaser. It takes only a few minutes to enter this information in a book ruled for the purpose, and the information accumulated in a book of this kind will be found invaluable as time goes on.

Another very important book is one which gives particulars regarding the produce of each sow. Below is given an illustration of the method of ruling this book.

When grade pigs are kept, a record of date of service and date of farrowing for each sow is all that is necessary, but when a man is handling pure-breds he cannot be too careful in keeping records. A page such as is illustrated here will hold the names of quite a number of sows, so that there is very little trouble in keeping a record of this kind. This record, along with the one which gives particulars as to hogs sold for breeding purposes, will enable one to account for every pig each sow produces, which is the only business-like method of handling stock.

Identification.—The column headed "Ear mark" requires explanation. When several breeding sows are kept, and the young pigs are all running together after weaning, there is a danger that the identity of certain pigs may be lost. To prevent any such occurrence, it is important that each litter should have a mark of identification. After the pigs are five or six months old, metal ear labels can be used to good advantage to identify individuals, and it is a good plan to insert ear labels in every pig at the time it is recorded; but metal labels are not satisfactory for very small pigs. A plan followed by the writer is to use the ear punch, which is employed when inserting tags, and with it nip a small piece out of the edge of the ear of each little pig before it is weaned, giving each pig in the litter the same mark. The location of the mark indicates the number, and the following plan of numbering will be found satisfactory with either pigs or lambs.

Location of mark.	Number indicated.	
	Left ear.	Right ear.
Lower side, next to head.....	1	10
Lower side, midway between head and tip of ear.....	2	20
Tip.....	3	30
Upper side, midway between head and tip of ear.....	4	40
Upper side, next to head.....	5	50

For example (Fig. 60) all the pigs in the first litter would have a nip taken out of the lower edge of the left ear next to the head, which represents No. 1. No. 2 is indicated by taking a nip out of the lower edge of the left ear half way between the base and the tip; and the pigs in the third litter have a nip taken out of the tip of the left ear, and so forth. Between 5 and 10 two nicks are necessary. Thus, $6 = 5 + 1$. $7 = 5 + 2$. $8 = 5 + 3$. $9 = 5 + 4$. For No. 10, we go to the lower side of the right ear next to the head. Larger numbers call for various combinations, for example: $11 = 10 + 1$. $12 = 10 + 2$. $17 = 10 + 5 + 2$, etc. The nick should not be made deep, or it will disfigure the ear; just a little deeper than the thickness

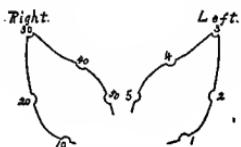


FIG. 60

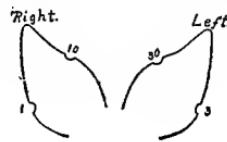


FIG. 61

FIG. 60.—One method of numbering pigs by means of ear marks. If all the pigs in a litter are given the same mark, the large numbers will be unnecessary, except in very large herds.

FIG. 61.—Another method of ear-marking pigs, which some may prefer to the one first mentioned.

of the skin is sufficient. If the piece is cut out cleanly, the mark will stay as long as the ear lasts.

Another method of numbering is as follows: A cut on the lower or outer side of the right ear indicates "one," and a corresponding cut on the left ear indicates "three." Also, a cut on the upper or inner side of the right ear indicates "ten," and a corresponding cut on the left ear indicates "thirty." Thus No. 2 would be indicated by two cuts on outer side of right ear. No. 4 would be $3 + 1$. No. 6 would call for two cuts on outer side of left ear. No. $7 = 6 + 1$. No. $43 = 30 + 10 + 3$. Two cuts on inner side of left ear would indicate 60, and three cuts would be 90. Thus it will be seen that a great many numbers may be indicated by using different combinations of cuts. (Fig. 61.)

On the front page of the record book, a sketch should be made similar to the ones shown here, indicating the location and value of different cuts. This will make a convenient reference and will help to avoid mistakes.

In case a breeder prefers to insert ear labels at the time of weaning, the system of marking described above will be unnecessary, and in the column headed "Ear mark" he would enter the numbers of all the labels used for the litter.

Instead of ear labels, tattoo markers may be used for white pigs.

Gestation Table.—On page 269 is a gestation table for sows, which will be found convenient for reference. In the table the period of gestation is placed at 112 days, but a great many sows will go a few days past the time stated. Everything should be in readiness, however, before the 112 days are up.

Business Methods.—The importance of supplying registration certificates promptly to customers, and of keeping an accurate record of breeding operations and of animals sold, has already been mentioned; but, in addition to these records, the breeder should have some method of book-keeping which will show the financial standing of the business. The system need not be complicated, but the books should at least show all sales, and all purchases, whether of feed or stock, and should contain an inventory showing the value of the stock on hand at the beginning of each year. It is worth while, also, to use neatly and attractively printed letter-heads and envelopes in answering correspondence. They help to secure business. Above all, the breeder must remember that a satisfied customer is an effective advertisement, and that it is poor business to take advantage of a customer in any way.

Gestation Table for Sows.

Norse.—In Least Years the date when due to farrow will fall one day earlier than the table shows, in all cases where February is included in the count.

REVIEW.

1. Give two plans to follow when starting in the swine business.
2. What is the proper breed for him to select? Why?
3. Before buying a boar, why visit the herd from which he comes?
4. Give several ways in cheapening production.
5. Give the points to be recorded in keeping a swine-breeder's record.
6. Describe the systems used for identifying pure-bred swine.
7. Tell of the use of a gestation table.
8. Why keep accounts? What items should be entered?
9. Give other points of good business methods.

PART VI
MARKETING AND CURING

CHAPTER XXX.

MARKETS AND SWINE PRODUCTS.

THE hog market of the United States is extremely complicated, local conditions and demands rendering it difficult to present the subject in anything like a clear and concise form. The subject is one of such great importance, however, that an attempt should be made to explain some of its principal features.

Grades of Hogs.—In the smaller packing-houses east of Chicago, the hogs are not so finely graded nor so systematically cut into standard cuts as they are in the great markets of Chicago, St. Louis, Kansas City, St. Joseph, and Omaha. The method of grading live hogs in the large markets does not materially differ, and the Chicago market may be regarded as typical of the American hog and provision trade. If we read Chicago market reports, we find the following classification of live hogs:

- Choice to prime heavy. (Fig. 62.)
- Medium to good heavy.
- Butcher weights.
- Good to prime mixed.
- Rough heavy packing.
- Poor to prime pigs.
- Straight to heavy packing.
- Selected bacons.
- Stags.
- Boars.

“*Prime*” refers to the degree of finish and maturity evinced by the hog. To grade as prime, a hog must be highly finished

and give evidence of being fitted to a high degree of perfection. (Fig. 62.) In other words, prime hogs are those which fully come up to the highest standard of the class to which they belong. Choice hogs are scarcely equal to prime hogs, and good hogs stand a little lower still, than the choice.

"*Medium*" sometimes refers to weight alone, and some-



FIG. 62.—"Prime heavy hogs," weight 350 to 500 pounds, the extreme of the fat or lard type. At one time these hogs were much more numerous on American markets than they are to-day. (Photo, from Illinois Experiment Station.)

times includes quality as well. Many market terms are purely local in significance, and hence are difficult to define.

"*Common*" represents a still lower grade, and "*poor*" and "*rough*" the least desirable grades.

"*Heavy*" hogs may range in weight from 350 to 500 pounds. They are not so numerous as they were some years ago, but they still constitute quite an important feature of the

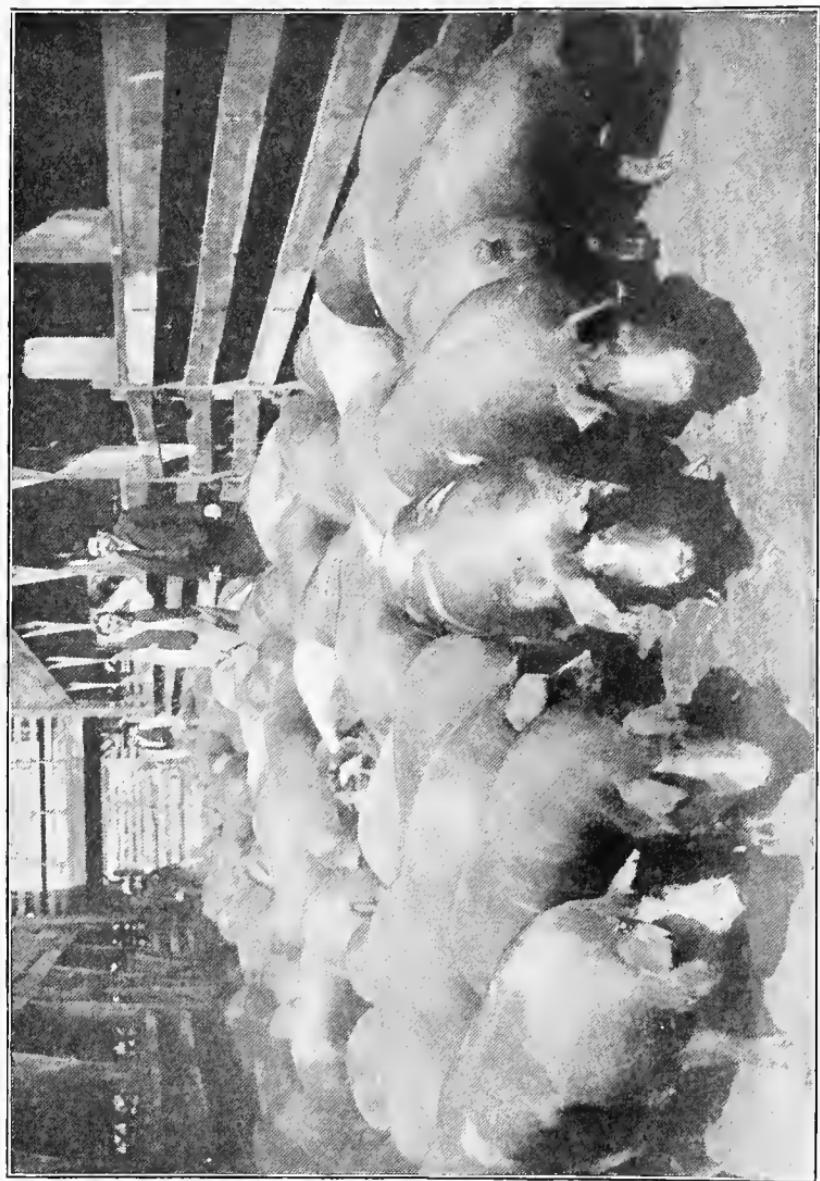
market. Though the general trend of the market is towards lighter weights, it not infrequently happens that *prime heavy* hogs command a premium over other sorts, especially when the lard market is strong. "Clear backs" and "clear bellies," which are entirely composed of fat, come from this class of hogs, though it is difficult to establish any definite relation between the live hog and its product, owing to the fact that the



FIG. 63.—"Prime medium butchers," weight 220 to 280 pounds, very smooth and highly finished. "Light butchers" are of the same general type but lighter, 180 to 220 pounds. Butcher hogs are commonly used for the fresh meat trade. Prime butcher hogs represent the highest quality of fat hog. (Photo, from Illinois Experiment Station.)

packer must shape his course largely to suit market demands, and these vary from time to time.

"*Butcher*" hogs (Figs. 63 and 64) may vary in weight from 180 to 350 pounds. This class may be subdivided as follows: Heavy butchers, 280 to 350 pounds; medium butchers, 220 to 280 pounds; light butchers, 180 to 220 pounds. The heavy butchers are also graded into "prime" and "good," and the medium and light butchers each into "prime," "good," and "common." The Chicago market report referred to has lumped all the butcher hogs together. Butcher hogs are prin-



|||||

cially barrows, and are commonly used for the fresh meat trade, though they may be variously used, according to the peculiarities of the market.

“*Packing*” hogs are not equal in quality to “butcher” hogs. Old brood sows that have been well fattened find their way into this class, as well as all hogs that have not the requisite quality and finish for the “butcher” or “prime heavy” classes, but have sufficient weight and finish to qualify for the purpose for which packing hogs are used. The meat from packing hogs is cured and *packed* in barrels or boxes, hence the name of the class, as well as the name of the industry. Packing hogs are usually graded as “heavy,” “medium,” and “mixed.” Heavy packing hogs weigh from 300 to 500 pounds, and medium packing from 250 to 300 pounds. “*Mixed packing*” is a term applied to hogs which are marketed without grading, and the class may contain representatives of almost all classes, packing hogs, of course, predominating. Generally they sell at a slight discount as compared with properly classified and graded hogs, and frequently they are bought by speculators in the stock yards, who buy large numbers, divide them up into their proper classes and grades, and resell them. “*Rough*” packing hogs are coarse, and lacking in condition.

“*Pigs*” are light hogs, weighing from 60 to 125 pounds. They are young, as their weights indicate, and their meat is unsuitable for curing. They supply a demand for cheap fresh meat.

“*Bacon hogs*” as quoted in Chicago, are not suitable for making Wiltshire sides. They are merely selected light hogs, weighing from 155 to 195 pounds. (Fig. 65.) They are of the same breeds that produce the lard type, but they are young, from six to eight months, and have not been fattened to the highest degree. They are used principally for supplying the

home demand for comparatively lean meat. A hog suitable for making Wiltshire sides is usually classed as an "English bacon hog," since the Wiltshire side is especially adapted to the English trade. The St. Paul market is about the only American market which gives prominence to the English bacon hog.

"*Stags*" are males which have been castrated too late in life



Fig. 65.—"Choice bacon," as classified by Chicago packers. These hogs are not suitable for "Wiltshire sides," but are simply light hogs of the fat or lard type. They help to supply a growing demand for leaner meat. (Photo, from Illinois Experiment Station.)

to grade as barrows. The smoothest of them may go into the packing class, the roughest with the boars, and various uses are found for intermediate sorts. They are docked 80 pounds in selling, so that the quoted market price is higher than the seller actually receives.

The meat from boars is used largely for sausages, and also helps to supply the demand for cheap meat.

Tendency toward Lighter Hogs.—Generally speaking, it

may be said that the tendency of the American market during the past ten years has been towards a lighter and leaner hog. The most desirable weight for butcher and packing hogs is 250 pounds, though, as previously stated, there are times when heavy hogs command a premium. It is also worthy of note that "butcher" hogs represent the best market hogs of the fat or lard type.

Hog Products.—The market for live hogs is somewhat complicated, but the market for hog products is very much more complicated than the former. The speculative provision market quotes only "pork," "ribs," and "lard." These are the only pork products traded in on the Board of Trade in the way of options. To a certain extent they govern the prices of other pork products.

"*Pork*" refers to standard mess pork, which is made from the sides of well-fattened hogs. The hams and shoulders are removed, and the sides cut into strips about six inches wide. These pieces are packed in barrels with salt and brine, the number of pieces to a barrel varying from seven to sixteen. Barrel pork is quoted on the market on the basis of 200 pounds net to the barrel.

There are other classes of barrel pork, such as prime mess pork, in which the shoulder is included with the side, extra prime pork, and extra shoulder pork, taken from the shoulders alone, and numerous other kinds which it would be scarcely profitable to describe, because each packer has his own methods of cutting pork, outside of certain standard products.

"*Ribs*," or short rib sides, are cut from the sides, leaving out hams and shoulders, in the same way as standard mess pork. These are dry salted and packed in boxes containing 500 to 525 pounds net, or shipped loose in the car, salted.

Lard is usually divided into two grades,—namely, "choice

lard" and "prime steam lard." The Chicago Board of Trade regulations state: "Choice lard to be made from leaf and trimmings only, either steam or kettle-rendered, the manner of rendering to be branded on the tierce." The same regulations state: "Standard prime steam lard should be solely the product of the trimmings and other fat parts of hogs." This permits the intestinal fat or fat from any other parts to be used in the manufacture of prime steam lard, whereas choice lard is made from the leaf and trimmings only. Market quotations are based upon choice lard.

Mess pork and short ribs are no longer popular cuts, and

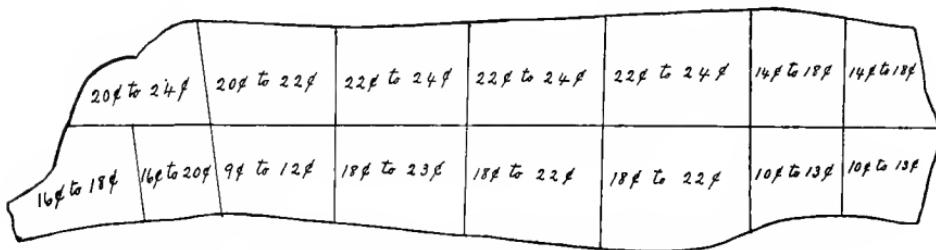
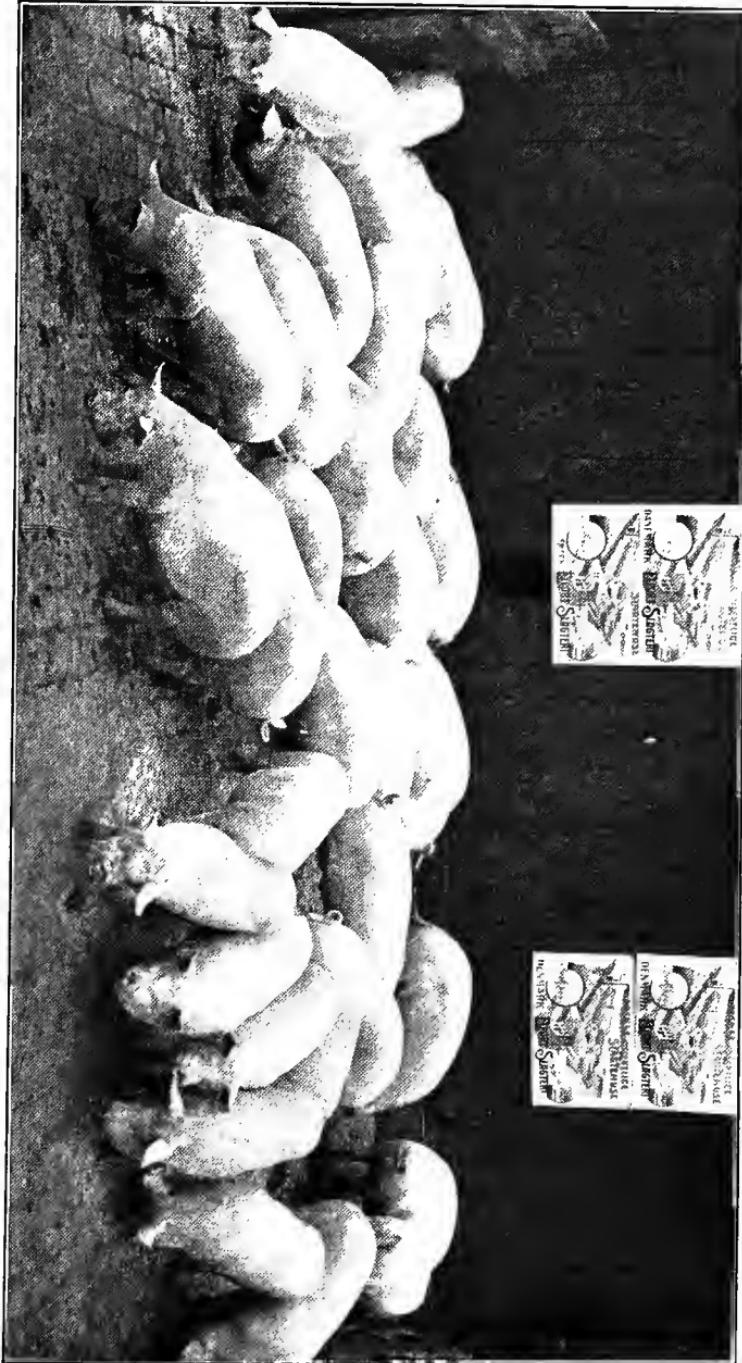


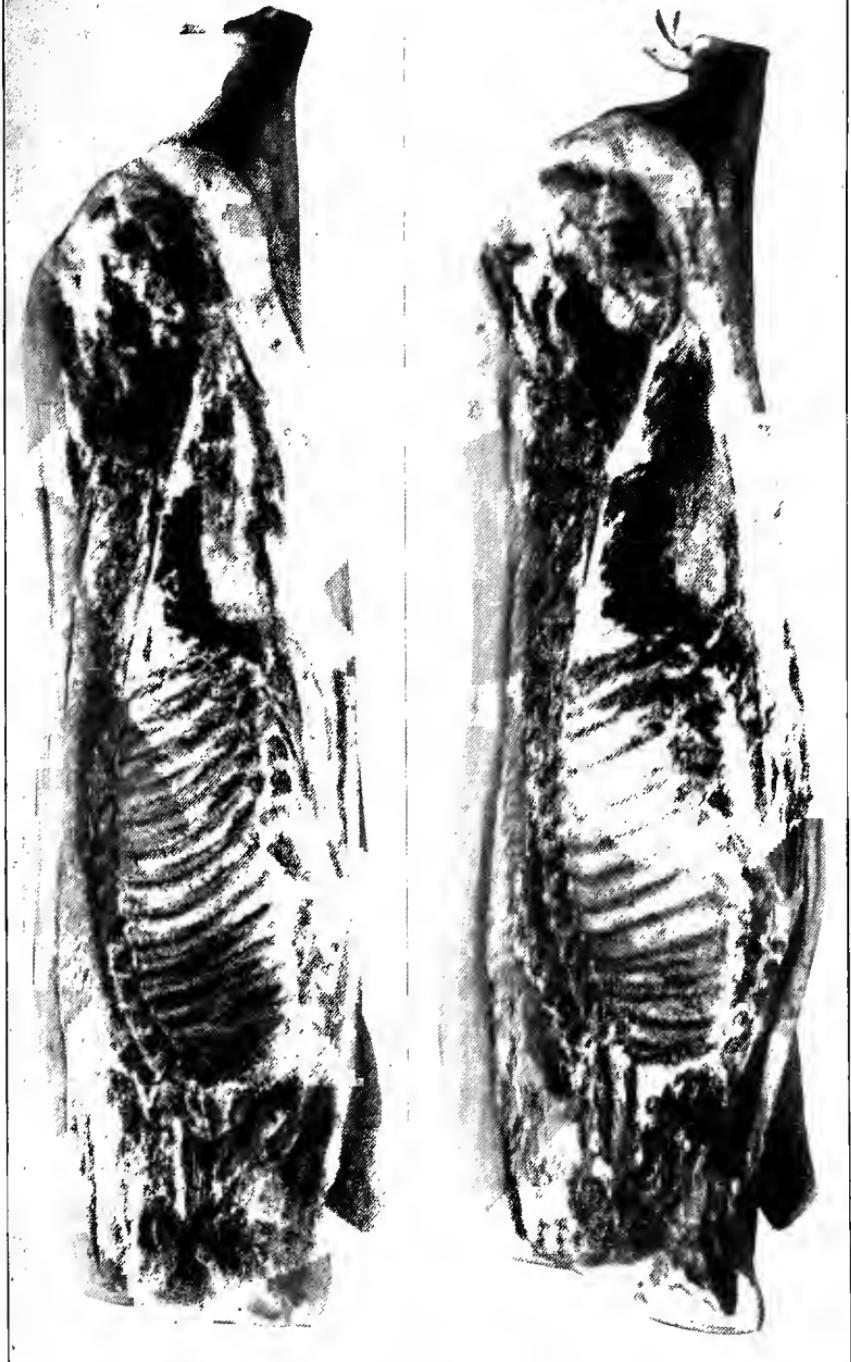
FIG. 66.—Diagram of Wiltshire side, showing retail dealer's method of cutting, and approximate range of values in Great Britain

are only made at a time when there is a surplus of hogs above the number required for the fresh meat trade, or when, owing to speculative conditions, the market price of these products is relatively higher than the price of fresh pork cuts.

The "Wiltshire side" (Figs. 66 and 68) constitutes the main export product of Canada and Denmark, but has never attained any great importance in the United States. It is especially designed to meet the requirements of a certain class of English consumers. A Wiltshire side consists of the whole side of the hog, less the head and feet. The blade bone of the shoulder, the neck bone, and the aitch bone are removed, the top of the ribs sawed off, and the side trimmed as smoothly

FIG. 67.—Group of selected Danish bacon hogs suitable for making choice Wiltshire sides. They are the product from crossing large Yorkshire boars upon the common sows of Denmark. Note the remarkable uniformity shown by the group.





A No. 1 Wiltshire Side.

A Fat Side.

FIG. 68.—Note superior length of side, greater uniformity of thickness of layer of fat along the back, lighter shoulder, lighter neck, and less cheap meat generally in the No. 1 side than in the fat side.

as possible. The sides are mild cured, and shipped to England in the green state, where they are smoked before they reach the consumer. The type and weight of hogs suitable for this purpose have already been described.

One of the greatest drawbacks to the trade in Wiltshire sides is the fact that the meat has to be mild cured, and, therefore, must be consumed within a very short time, or it will go "off flavor." The result is that it is impossible to hold over Wiltshire sides when there happens to be an extra amount thrown upon the market at one time, and prices often suffer severely through this cause.

Ham and Bacon.—Generally speaking, it may be said that the consumption of ham and bacon is steadily on the increase, and large quantities of these products are taken by Great Britain, Mexico, Cuba, Porto Rico, and the Philippines. Norway, Sweden, and Italy take very heavy, fat meats. The bulk of other standard cuts and products outside of those already mentioned are taken for home consumption.

Leading Features.—This discussion of markets is anything but exhaustive. To attempt a description of all the many classes of products placed upon the market by different packers would probably only tend to confuse the reader, and all that has been attempted is to present, as briefly as possible, some of the leading features of the trade.

REVIEW.

1. Why should feeders study and keep in touch with the swine markets?
2. Name ten grades of market hogs in order.
3. Explain the market meanings of "prime," "medium," "common," "poor," and "rough."
4. Give the range in weight of "heavy" hogs.
5. Why do prime heavy hogs often command a premium over other sorts?

6. Give the range in weight for "butcher" hogs.
7. How are these often subdivided?
8. What is the quality of "packing" hogs?
9. Of what is this class made up?
10. What is the meaning of "mixed packing"?
11. Would it be better for the farmer to sort them?
12. What is the market meaning of the term "pigs"?
13. What is the Chicago market meaning of "bacon" hogs?
14. How much are stags docked in weight? How may this custom fool the seller?
15. How is the meat from stags and boars used?
16. What is the market tendency toward weight of hogs?
17. Name the three hog products mentioned in market reports.
18. What does the term "pork" include?
19. What are the different methods of packing it?
20. What are "ribs"? How packed?
21. Name the two grades of lard and tell of the make-up of each grade.
22. Under what circumstances are mess pork and short ribs packed for shipment?
23. In what countries are "Wiltshire sides" chiefly packed? Where shipped?
24. Of what does a Wiltshire side consist? How prepared?
25. Explain the chief drawback to the trade in this class of bacon.
26. What countries use large amounts of ham and bacon? What countries the fat meats?

CHAPTER XXXI.

CURING PORK.

FARMER'S BULLETIN 183 of the U. S. Department of Agriculture, by Professor Andrew Boss, gives much useful information regarding the curing of meats, and has been liberally drawn upon in the preparation of material for this chapter.

Cooling.—“Meat must be properly and thoroughly cooled to insure good keeping qualities when cured. If salted before the animal heat is out, the shrinkage of the muscles causes the retention of injurious gases, giving an offensive odor to the meat. Neither should meat be frozen when salted, as the action of the frost will prevent the proper penetration of the salt, and uneven curing will result. While the temperature cannot well be controlled on the farm, it is possible to slaughter when the weather is favorable to cooling the carcass before the surface freezes. The most desirable temperature for cooling meat is 34 to 40 degrees Fahrenheit. It is important, also, that meat be cured as soon as cooled, and while still fresh. Ordinarily, twenty-four to thirty-six hours after slaughtering will allow sufficient time for cooling.”

Vessels for Curing.—“A clean, hard-wood barrel is a suitable vessel in which to cure meat. A barrel made for the purpose is best, but where it cannot be had, a molasses or syrup barrel will answer. The important point is to have it clean and tight enough to prevent leakage. A large stone jar is the best vessel that can be had. A barrel or a jar that has once held meat may be used again and again unless meat has spoiled in it. If used repeatedly, it will be necessary to scald it out thoroughly each time before packing with fresh meat.”

Brine Curing and Dry Curing.—“Brine-cured meats are best for farm use, for the reason that a suitable place for dry curing is not usually obtainable. It is also less trouble to pack the meat in a barrel and pour on a brine than to go over it three or four times to rub in the salt. The brining method also gives better protection from insects and vermin. Trouble is sometimes experienced in keeping brine, but if pure water is used and directions followed in making the brine (see next paragraph), there should be no difficulty in keeping it for a reasonable length of time. During warm weather, brine should be closely watched. If it becomes ‘ropy,’ like syrup, it should be boiled or a new brine made. A cool, moist cellar is the best place for brine curing. Dry curing may be done successfully in a cellar also, though even more moisture is needed to effect a thorough cure. The cellar should be dark and tight enough to prevent flies and vermin from damaging the meat.”

Plain Salt Pork.—“Rub each piece of meat with fine, common salt and pack closely in a barrel. Let stand over night. The next day weigh out 10 pounds of salt and 2 ounces of saltpetre to each 100 pounds of meat and dissolve in 4 gallons of boiling water. When cold, pour this brine over the meat, cover, and weight down to keep it under the brine. Meat will pack best if cut into pieces about six inches square. The pork should be kept in the brine until used.”

To keep the meat under the brine use a loose-fitting wooden cover, and weight with a heavy stone or several vitrified bricks. The cover should be made of some hard wood, oak preferred. Such woods as pine or cedar will taint the brine.

Sugar-cured Hams and Bacon.—“When the meat is cooled, rub each piece with salt and allow it to drain overnight. Then pack it in a barrel with the hams and shoulders in the bottom, using the strips of bacon to fill in between or to

put on the top. Weigh out for each 100 pounds of meat 8 pounds of salt, 2 pounds of brown sugar, and 2 ounces of saltpetre. Dissolve all in four gallons of water, and cover the meat with the brine. For summer use it will be safer to boil the brine before using. In that case it should be thoroughly cooled before it is used. For winter curing it is not necessary to boil the brine. Bacon strips should remain in this brine four to six weeks; hams, six to eight weeks. This is a standard recipe and has given the best of satisfaction. Hams and bacon cured in the spring will keep right through the summer after they are smoked."

The length of time the meat is kept in the brine depends upon the size of the pieces. A large ham takes more time to cure than a small one.

Dry-cured Pork.—"For each 100 pounds of meat weigh out 5 pounds of salt, 2 pounds of granulated sugar, and 2 ounces of saltpetre, and mix them thoroughly. Rub the meat once every three days with a third of the mixture. While the meat is curing it is best to have it packed in a barrel or a tight box. For the sake of convenience, it is advisable to have two barrels, and to transfer the meat from one to the other each time it is rubbed. After the last rubbing the meat should lie in the barrel for a week or ten days, when it will be cured and ready to smoke. To cure nicely it is desirable to have a cool and rather moist place in which to keep it. This recipe should not be used where the meat must be kept in a warm and dry place, as the preservatives will not penetrate evenly and uniformly."

Smoking.—"The smoke-house should be eight or ten feet high to give the best results, and of a size suited to the amount of meat likely to be smoked. One 6 by 8 feet will be large enough for ordinary farm use. Ample ventilation should be

provided, to carry off the warm air in order to prevent overheating the meat. Small openings under the eaves or a chimney in the roof will be sufficient, if arranged so as to be easily controlled. A fire-pot outside of the house with a flue through which the smoke may be conducted to the meat chamber gives the best conditions for smoking. When this cannot well be arranged, a fire may be built on the floor of the house and the meat shielded by a sheet of metal. Where the meat can be hung six or seven feet above the fire, this precaution need not be taken. The construction should be such as to allow the smoke to pass up freely over the meat and out of the house, though rapid circulation is at the expense of fuel."

"Brick or stone houses are best, though the first cost is greater than if they are built of lumber. Large dry-goods boxes, and even barrels, may be made to serve as smoke-houses where only small amounts of meat are to be smoked, but a permanent place is much more satisfactory."

"The best fuel for smoking meats is green hickory or maple wood smothered with sawdust of the same material. Hard wood of any kind is preferable to soft wood. Corn-cobs are the best substitute for hard wood, and may be used if desired."

"Meat that is to be smoked should be removed from the brine two or three days before being put in the smoke-house. Washing the meat in tepid water and scrubbing clean with a brush is a good practice. The pieces should then be hung up to drain for a day or two. When drained, they may be hung in the smoke-house. All should be suspended below the ventilators, and should hang so that no two pieces come in contact."

"A slow fire may then be started, warming up the meat gradually. During the winter months in cold climates it is best

to keep the fire going continually until the smoking is complete, holding the temperature at about the same point. During the spring months and in the summer, a light fire may be started every second or third day for a couple of weeks, the meat being allowed to hang in the smoke-house until sufficiently colored. When the fire is kept going steadily twenty-four to thirty-six hours will be required to finish one lot of meat. Smoke will not penetrate frozen meat. As soon as smoked sufficiently the meat should be cooled by opening the ventilators or doors. When hard and firm it may be packed away."

Liquid Smoke.—Those who wish to obtain the flavor of smoke without going to the trouble of smoking the meat in the ordinary way, or who have not the necessary equipment for smoking, may obtain practically the same result by the use of liquid smoke, or smoke compound. This liquid may be applied by means of a brush. It should be painted on the surface of the meat very lightly, and, as each application dries, a fresh coat should be painted on for two or three applications.

Smoke Flavoring Powder.—This powder is used for giving a smoky flavor to sausages, one ounce of powder being used to ten pounds of sausage meat. The skins of the sausages may be colored by means of "smoke dye." There is nothing injurious in these smoke products.

Keeping Smoked Meats.—“A dry, cool cellar or an attic with free circulation will be a satisfactory place for smoked meats at all seasons, if it is kept dark and flies are excluded.”

“If to be held only a short time, hams and bacon will need only to be hung out separately without covering. For longer keeping it will be necessary to wrap them first in paper, and then in burlaps, canvas, or muslin, and bury them in a grain bin (or in wood ashes) or other suitable place, the object being to gain a uniform temperature and to keep away insects. For absolute safe-keeping for an indefinite period of time, it is

essential that the meat be thoroughly cured. After it is smoked and has become dry on the surface, it should be wrapped in parchment paper or old newspapers. Then inclose in heavy muslin or canvas, and cover with yellow wash or ordinary lime whitewash, glue being added to the whitewash. Hang each piece out so that it does not come in contact with other pieces. Do not stack in piles."

Trying Out Lard.—“Only the best of fat should be used for choice lard. Leaf fat is the best. The back strip of the side also makes nice lard, as do the ham, shoulder, and neck trimmings. Gut fat should never be mixed with the leaf and back fat. It makes a strong-smelling lard and should be kept separate. All scraps of lean meat should be cut out of the fat before trying out, as they are very likely to stick to the kettle and get scorched, giving an unpleasant flavor to the lard. When preparing the fat for trying, cut it into pieces from 1 to $1\frac{1}{2}$ inches square. They should be nearly equal in size, so that they will try out in about the same time. Fill a clean kettle about three-fourths full and put in a quart of water, or, if convenient, a quart of hot lard. One or the other is necessary to prevent the fat from burning before the heat is sufficient to bring out the grease. Keep the kettle over a moderate fire until the cracklings are brown and light enough to float. Frequent stirring is necessary to prevent burning. When done remove from the stove and allow to cool slightly, and then strain through a muslin cloth into a suitable jar or crock. Stirring while the lard is cooling tends to whiten it and make it smoother. A quarter of a pound of saleratus (baking soda) added to each 100 pounds of fat has a like effect.”

REVIEW.

1. Give directions for cooling fresh meats before curing.
2. What are suitable vessels for meat curing? How prepared for use?
3. Compare brine curing with dry curing for farm use.

4. Tell of the dangers associated with its use.
5. Give directions for treatment of plain salt pork.
6. Tell of the treatment of cooled meat to produce sugar-cured hams and bacon.
7. Give the treatment for producing dry-cured pork.
8. Describe the essentials of a good smoke-house.
9. Tell how to carry on the smoking process.
10. How should smoked meats be kept?
11. What fats are best for lard?
12. Tell how it is tried out.

PART VII

BUILDINGS, SANITATION, AND DISEASES

CHAPTER XXXII.

BUILDINGS.

THE QUESTION of buildings for swine is such a complicated one that it seems almost a hopeless task to attempt a discussion of the subject. Almost every piggery that is built possesses certain features peculiar to itself and rendered necessary by the circumstances which it is intended to meet. All that can be attempted is to discuss the most desirable features of a piggery, for the general guidance of those who wish to build, but every man will have to adapt his building to his own peculiar requirements.

The most important qualities of a piggery are dryness, ventilation, light, freedom from draughts, reasonable warmth, and convenience.

Dryness.—Dryness is closely associated with ventilation, but is also influenced by the material of which the building is constructed. Good results cannot be obtained in a damp pen, and dripping walls are a pretty sure indication of impending disaster. Stone and cement walls are very cold in winter and chill the air of the pen, causing it to deposit its moisture upon their surface. In a short time the wall becomes quite wet, and trouble is stored up for the pigs. A hollow cement or hollow tile wall is much less objectionable than a solid one, but there is little doubt that wooden walls constructed in such a way as to form a complete dead-air space inside are the best.

The floors and foundation may be constructed of cement concrete, and the foundation may rise about two feet above the surface of the floor. This will preserve the wood of which the

walls are constructed and is not likely to prove at all injurious to the pigs.

A very good wall can be made by setting two-by-four scantlings on end, and first boarding inside and out with rough lumber. This rough lumber should then be covered with tarred paper, and then the walls should be tightly boarded up with matched lumber. If preferred, the outside of the pen may be clapboarded. Smooth, matched lumber is best for the inside of the pen. Patent building paper may be used outside.

If it is thought desirable to have a loft over the pen, the ceiling can be made of poles, placed a few inches apart, and well covered with straw. The straw absorbs moisture and helps to keep the pen dry. Where this is done, the straw should be renewed at least every year, otherwise it becomes a harbor for dust and disease germs.

Ventilation.—Thorough ventilation is a great help in preserving dryness, but it is a difficult thing to secure in a piggery without unduly lowering the temperature. It is an aid to ventilation to provide a large air space; in other words, to have a high ceiling. The tendency at present is to do away with the common loft over the piggery, and to have the space above the pigs extend to the roof. This gives more air space and makes ventilation a simpler problem, but it necessitates lining the under side of the rafters with matched lumber in order to prevent the pen from becoming too cold.

Shaft Ventilators.—The admission of fresh air can be provided for by constructing shafts in the walls at intervals of fifteen or twenty feet. These shafts should not be more than about four by six inches in size, and should open outside near the ground, and inside at the ceiling. Provision should be made for closing, or partial closing, of these intakes when cold air is admitted too rapidly. The outlets may consist of

shafts about eight inches square, starting near the floor and extending through the roof, and equipped on the top with a device for preventing the wind from blowing down the shafts. (Fig. 69.)

Chimney and Pipe.—If a feed cooker is used, it could be utilized to great advantage in assisting ventilation. If the

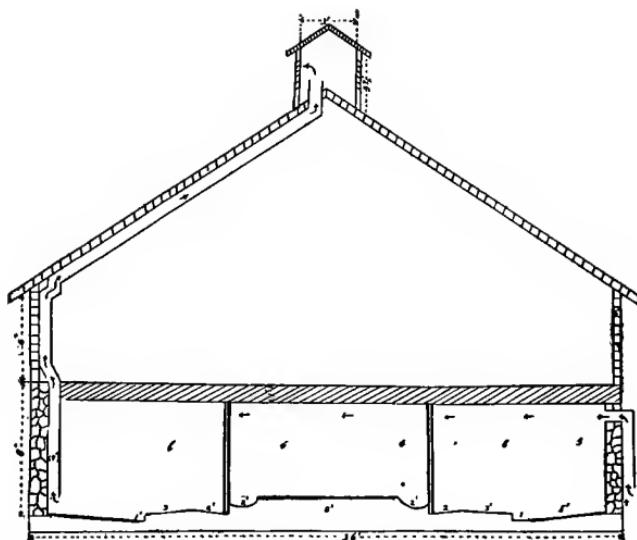


FIG. 69.—The King system of ventilation as shown for a dairy barn or hog-house. The air outlet should start near the floor and extend through the roof. The inlet for air into the room is near the ceiling, but should start outside well above the ground. In cold weather, windows are for light, not for ventilation, when the King system is in use.

building is not a very long one, the chimney may be constructed at the opposite end of the building from the feed cooker, and the pipe from the feed cooker run the whole length of the building before it enters the chimney. In a long building the chimney may be placed about the centre, so as not to have too great length of stove-pipe. The heat from the stove-pipe has a wonderful influence in aiding the circulation of air in the pen, as well as modifying the temperature and helping to

keep the air dry. An extra opening made in the chimney shaft near the floor will serve to draw out much foul air.

In fact, where winter litters are raised in large pens, some helpful device like this is absolutely necessary.

Light.—Light, especially sunlight, has a wonderful influence in promoting health. So far as possible, the windows should be on the south side of the building, because the south side gets the most sun and is least exposed to cold winds.

Draughts.—While ventilation is necessary, draughts are extremely injurious, and their prevention should be kept in view when building.

Warmth.—Warmth is a good thing, but it should not be secured at the expense of ventilation. A somewhat cold pen, well ventilated but free from draughts, is preferable to a warm pen where the air is damp and foul, and the pigs will suffer less discomfort in the former than in the latter. Very young pigs require warmer quarters than older ones, and when a sow farrows in winter, special pains should be taken to secure warmth and freedom from draughts. If she is in a large piggery, it is often a help to lay poles across the tops of the partitions over the bed and then cover these poles with straw.

PLANS OF PIGGERIES.

The first plan which is given here (Fig. 70) is taken from a piggery on the farm of Mr. J. E. Brethour, Burford, Ontario. Its construction is comparatively cheap, and it possesses many desirable features. It is capable of many modifications, and a careful study of the plan will be helpful to those who intend to build. Of course, the building can be made any length desired.

Size.—The building is 36 by 100 feet, outside measurement. A cement wall, 8 inches thick, rises three feet above the floor.

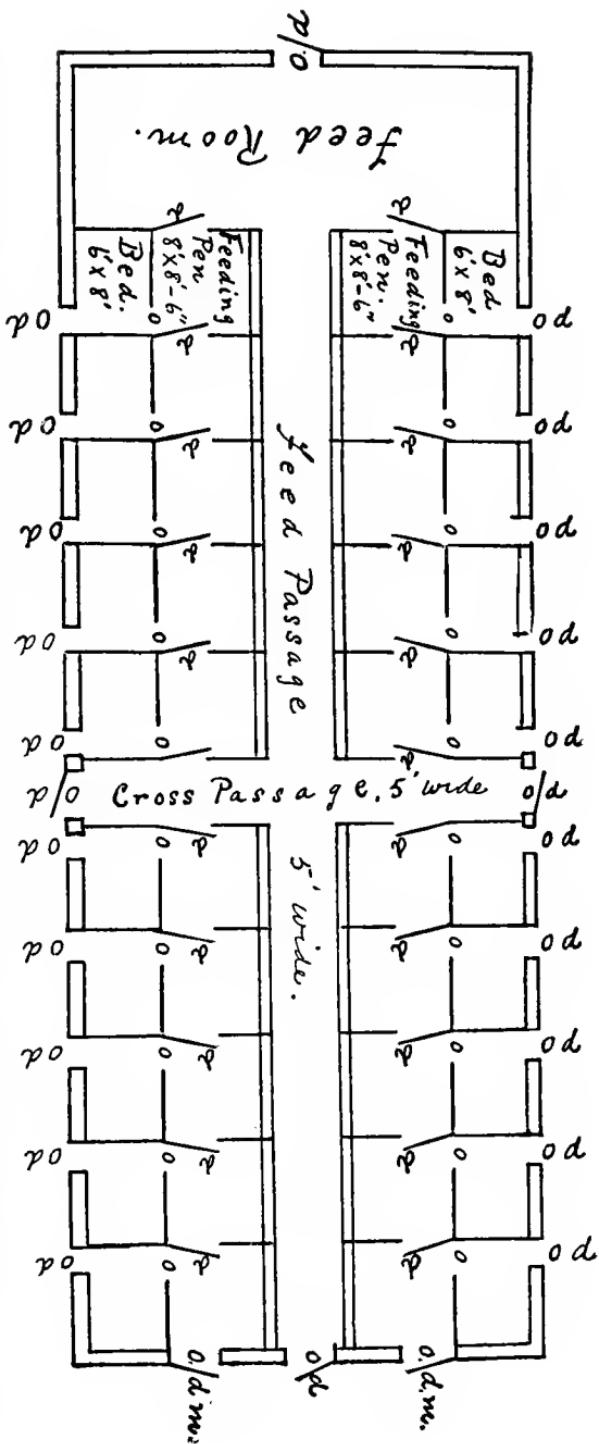


FIG. 70.—Plan of pigsty. o_9 , openings $2\frac{1}{2}$ feet wide between bed and feeding pen; d_d , doors 4 feet wide in partitions, which swing back and close openings at o_9 ; o_{d_m} , doors leading outside; o_{d_m} , doors for taking out manure, or taking in bedding. Pens are uniform size throughout. Dimensions of pens include partitions.

On top of this wall the frame is built. The walls are built of two-by-four inch studding, boarded on the outside with cheap lumber, covered with building paper, and tightly clapboarded over the paper. On the inside the walls are lined with matched lumber so as to form a dead air space inside the wall. The lining also extends over the lower side of the rafters, giving a dead air space to the roof as well as the walls.

Cross Section.—From the cross section (Fig. 71) it will be seen that the total height of the wall on the north side is 11 feet, and of that on the south side is 8 feet. The roof has the same pitch on both sides, so that there is a drop of three feet from one section of the roof to the other at the centre of the building. In this space windows are inserted, to throw light and a certain amount of sunshine into the row of pens along the north side of the building. These windows are hinged at the bottom and can be opened at any angle, according to the requirements of ventilation. A ratchet device, similar to that used for opening the ventilators in greenhouses, would be very convenient for this purpose.

Drainage.—The floor is cement. Cement is so durable and so easily cleaned that it seems to be about the only satisfactory floor. The part *A B* (see Fig. 71) is six inches higher than *C D*. There is a fall of one and one-half inches from *A* towards *B*, and a fall of three inches from *D* towards *C*. Thus all the drainage is towards *C*, the lowest point, and the bed, being on top of *A B*, is always dry. There should be a fall from one end of the building to the other along the line at *C*, so that the drainage would be towards one end of the building, and a suitable outlet could be provided.

Partitions.—There is a partition three and a half feet high between the bed and the feeding pen, and the opening from the bed to the feeding pen is two and a half feet wide. The par-

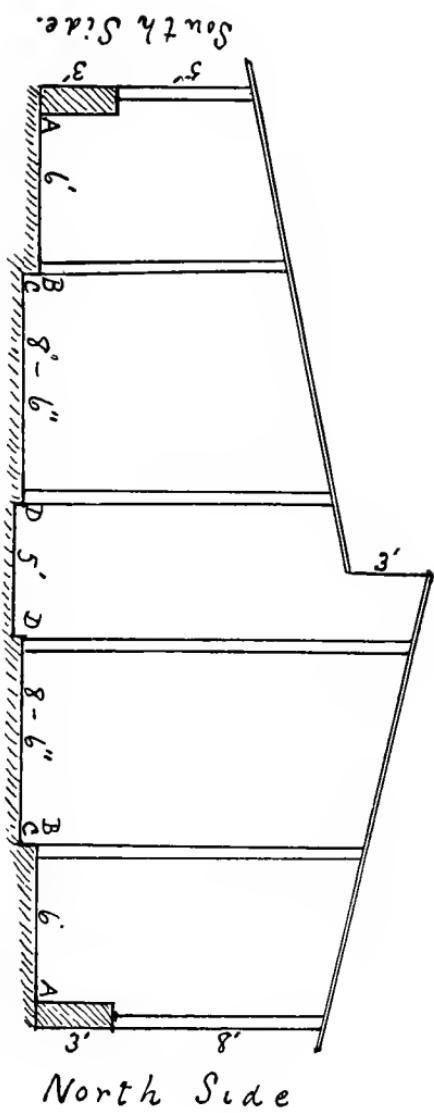


FIG. 71.—Cross-section of pigery, showing contour of floor, shape of roof, and supports for same.

tition shelters from draughts and also economizes bedding by holding the straw in place. The other partitions are four feet high. The partition next to the feeding passage is made of woven wire fencing of No. 9 coil steel wires, two inches apart at the bottom, and grading to about three inches apart near the top. The wire partition is set in about two and a half inches from the side of the trough next to the feed passage, thus allowing room to pour feed into the troughs.

The troughs are cement, and are eight inches high next to the feed passage, four inches high next to the feeding pen, and ten inches wide, inside measurement.

The feed passage, which is five feet wide, is four inches lower than the feeding pen. This is merely a device to show the pigs to better advantage.

Doors.—The purpose of the doors in the partitions between the pens is easily understood. They can be swung back, closing the pigs in the back apartment and leaving a continuous passage for cleaning out the pens. The bedding is also taken in and distributed from this passage. These doors are also used in moving pigs from one pen to another, since there are no doors from the pens into the feed passage. The absence of doors from the pens into the feed passage is a somewhat inconvenient feature of the building, but is hard to avoid where a woven wire partition is used. The woven wire partition, however, is more sanitary than wood, and gives a much better view of the pigs.

Floors.—It will be noticed that the sleeping quarters have cement floors. When bedding is plentiful this may give no trouble, but it would be safer to place a portable wooden platform on the cement.

The floor may be kept warm and free from the ascending soil moisture by placing a layer of tar paper or tar paint between the

layers of concrete when the floor is constructed. The rough part may be painted with two coats of tar, and then the top layer of cement one inch thick or more is placed on the tar. The tar is a perfect insulator from soil moisture. When sows are lying on such a sleeping bed, it becomes warm and retains its heat much as soapstone does.

The roof is supported by four lines of posts to which the partitions are fastened. Each row carries a line of plates which support the rafters.

Light.—There are six windows, each five feet long and two and a half feet high, in the south wall, and the same number in the roof, placed as already described. The north wall has only two windows.

Not Good Farrowing Pens.—The pens as described are not suitable for farrowing pens. As stated in another place, it is better to have the sows in a building away from other pigs, especially during cold weather, when the building must be kept pretty well closed up. The air of a piggery where a large number of pigs are kept does not agree well with little pigs. If a part of the large piggery is to be used for farrowing pens, it should be closely partitioned off from the rest of the building. The same style of pen could be made suitable for sows with little pigs by making the sleeping apartments two feet wider, thus giving beds eight feet square.

The absence of a loft for storing straw will be a strong objection in the eyes of many. The ventilation of the building, however, and the health of the animals are of vastly greater importance than the inconvenience occasioned by the absence of a loft. It is generally possible to locate the building so as to make it comparatively easy to obtain straw for bedding. If it is not possible to have the building situated with one end adjoining a straw shed, a loft for straw could be constructed

over that part of the building used for farrowing pens and feed room.

Study Plans.—It is, of course, impossible to give plans which would likely meet all requirements, and possibly the plan submitted could not be adopted in its entirety by many

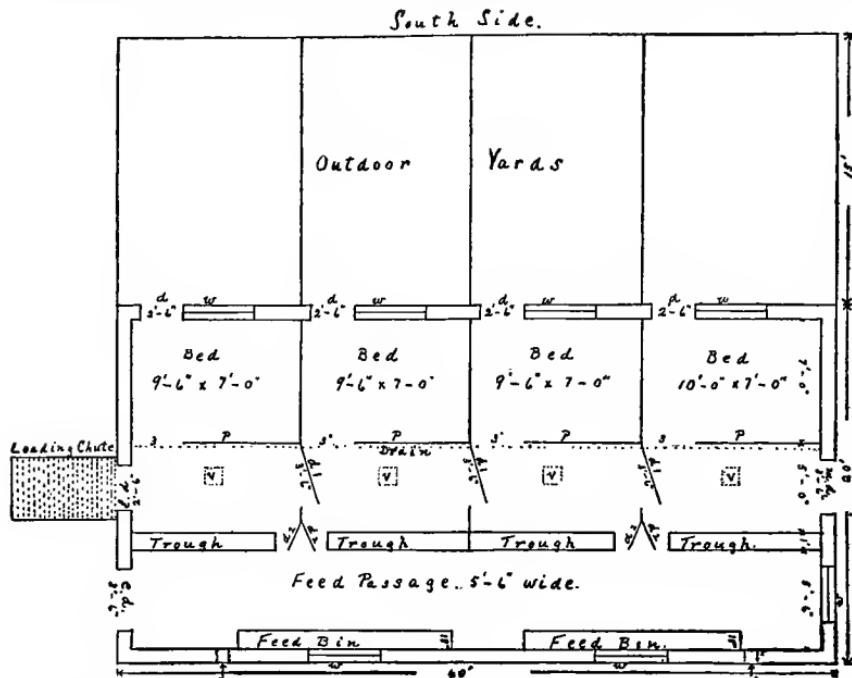


FIG. 72.—Plan of small piggery. *d*, door; *w*, window; *p*, low partition between bed and feeding place; *d1*, doors which form part of partitions when in position, but which can be swung back, shutting the pigs in the part occupied by the bed, when the pen is to be cleaned, or pigs moved from one pen to another, or taken to the loading chute; *md*, door through which manure is taken; *ld*, door leading to loading chute (a sliding door which slides upwards out of the way would be convenient for closing this opening); *ed*, entrance door. Dotted line shows line of drainage, and fall may be made towards whichever end is most convenient.

breeders. At the same time, the plan submitted possesses so many excellent features that it is presented with the hope that it will prove helpful to those interested in the housing of swine.

It is suggested that students and breeders of swine draw and study many plans before actually building.

Plan of Small Piggery. (Fig. 72.)—A good feature of

this building is the placing of the pens and out-door yards on the south side of the building. The main windows are placed on the south side also, thus letting the sunlight freely into the pens. The great objection to this plan is the fact that it is not economical of space, because the same passage could be made to serve another row of pens on the opposite side. If desired, the plan could be changed very easily to put a row of pens on each side of the passage by simply making the building about twelve feet wider, or thirty-two feet wide. If this were done, it would be necessary to have a feed room, because the bins in the passage would interfere with the feeding. The passage could be made narrower, however, if the feed bins were removed.

Beds should be raised several inches above drainage gutter.

Foundation, floors, and troughs are recommended to be made of cement, but walls of wood, as in Mr. Brethour's piggery.

The bed floors should be insulated with a tar layer as already described.

If bedding is plentiful, an overlay of boards or planks need not be placed on the part occupied by the bed. If an overlay is used it should be made so that it can be raised up when desired, to admit of cleaning and disinfection.

The ceiling should be about eight feet from the floor, and a loft may be put over the whole building with straw chutes leading to each bed.

The out-door yards should be cemented, otherwise they become very filthy.

Attention is called to the arrangement of the doors (*d 2*) leading from each pen into the passage. The post at the end of the partition is set back from line of passage. In this way, trough room is economized.

A SOUTHERN PIGGERY.

Bulletin 150 of the Maryland Experiment Station gives plans for a piggery adapted to Southern conditions. Drawings and description of this piggery are given herewith. (Figs. 73, 74, 75.)

“ Each pen is made up of three parts made by different levels of the floor. The central part is a manure pit which is ten inches lower than the rest of the floor. The south division of the pen is a feeding floor with a trough across the end while the north division is the sleeping floor or bed. The entire floor of the building is cement except the feed bins and the sleeping floor.

“ The frame is made of the following pieces:

Sills	6" × 6"	Plates	4" × 6"
Main posts	6" × 6"	Purlines	2" × 8"
Intermediate posts	3" × 4"	Rafters	2" × 6"
Braces	3" × 4"	Joists	4" × 6"

“ This frame is made heavy in order to support the slate roof. The floor in the beds is made of oak planks 2" by 12". The partitions between pens, including the gates, are 1" by 2½" slats 2" apart nailed on 2" by 4" cross-pieces. Under each gate is a movable 2" by 12" oak plank as partition in manure pit. The sides of the building are made of a single thickness of 7/8" by 5" German or Novelty siding. The front is boarded up five feet above foundation and covered with inch-mesh wire from this height to the roof. The troughs are of iron.

“ It may be well to enumerate a few of the special points in construction and some of the advantages of this piggery:

“ It is faced to the south so as to permit the rays of the sun to shine upon the beds of the pigs at the extreme rear end of the pen in the winter season, and also (the slope of the roof is such as) to give shade in that portion in summer.

“ The lattice construction between the pens, at the ends and rear, admits of a free circulation of air in warm weather.

“ The location of the manure pit in the center and below the level of the sleeping and feeding floors with all drainage towards

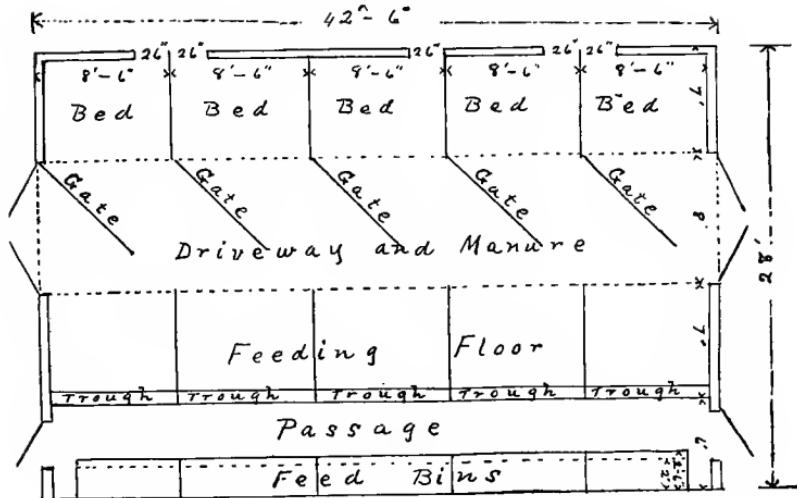


FIG. 73.

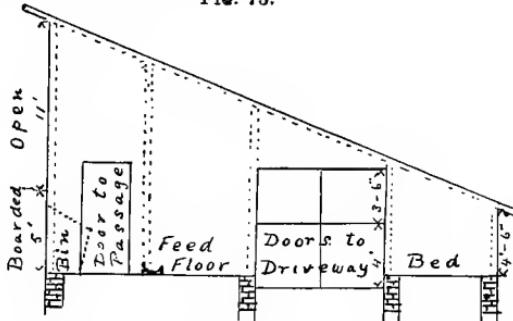


FIG. 74.

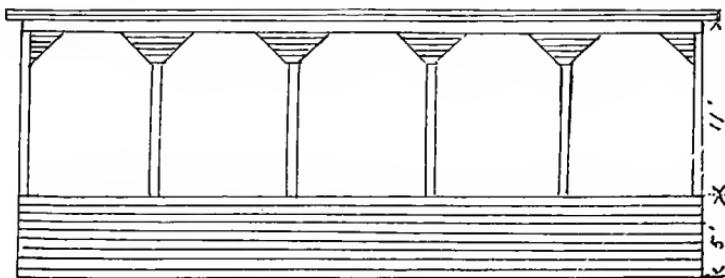


FIG. 75.

FIG. 73.—Ground plan of Maryland piggery. Note gates, which, when swung back, close the pigs in the beds and allow a cart to be driven right through the pen for cleaning out.
 FIG. 74.—Cross-section of Maryland piggery. Note difference in floor levels. The feed bin is 2 feet wide at the bottom, 2 feet 6 inches at widest part, and 2 feet 10 inches high next to passage.

FIG. 75.—Front elevation of Maryland piggery. It is boarded to a height of 5 feet from the ground, and the remaining space left open.

it, aids materially in maintaining a proper sanitary condition. The manure pit is concreted, which enables the saving of all liquid excrements.

"The swinging gates close the pigs into their beds, facilitate the changing of pigs from pen to pen and allow the easy removal of manure.

"The general plan can be used and the dimensions and materials modified so as to meet the demands of circumstances.

"The question most often asked about this piggery is whether it is warm enough. This can be answered in the affirmative except for very cold winter weather. When a sheltered location cannot be chosen, sufficient protection can be furnished by some kind of movable or swinging frames to close the beds during extremely cold nights. Another question often asked is whether the cement floor is conducive to the health and comfort of the pigs. The cement floor is satisfactory in this respect for a large part of the year, and, during winter, the feeding floor is the only part not covered heavily with bedding.

"Provision is made in the plans of this piggery for outlets at the north ends of pens to yards for exercise. The yard is a valuable accessory to a building of this nature, and in choosing the site care should be exercised to allow space for yards."

PORABLE PENS.

The accompanying sketches (Figs. 76 and 77) show a very cheap and easily constructed pen suitable for winter quarters for breeding sows. The pen is sixteen feet long by eight feet wide. It is seven feet high in front and three and a half feet high at the rear. It is boarded with cheap lumber, but all cracks are securely battened. It should be practically wind and rain proof. The opening is at one corner, and the pen should be set with the opening towards the south. A door is not necessary. Plenty of bedding should be supplied and the pen should be banked up outside with fresh horse manure to a

depth of about two feet, in order to prevent draughts about the floor. This method of housing sows is better than close confinement in warm pens, and will be found to answer very

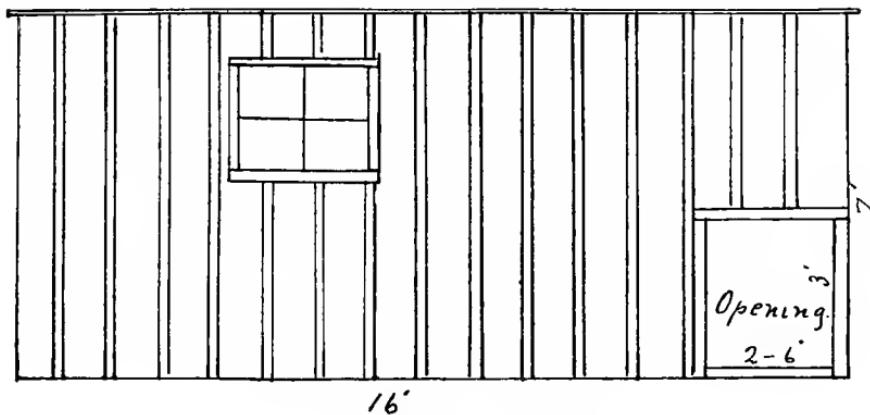


FIG. 76.—Front view of portable pen.

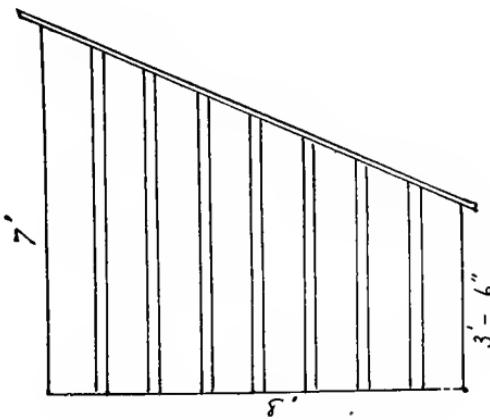


FIG. 77.—End view of portable pen.

well when other means to provide shelter and exercise are not available.

The A-shaped Pen.—The accompanying sketches (Figs. 78 and 79) show a convenient portable pen which may be used

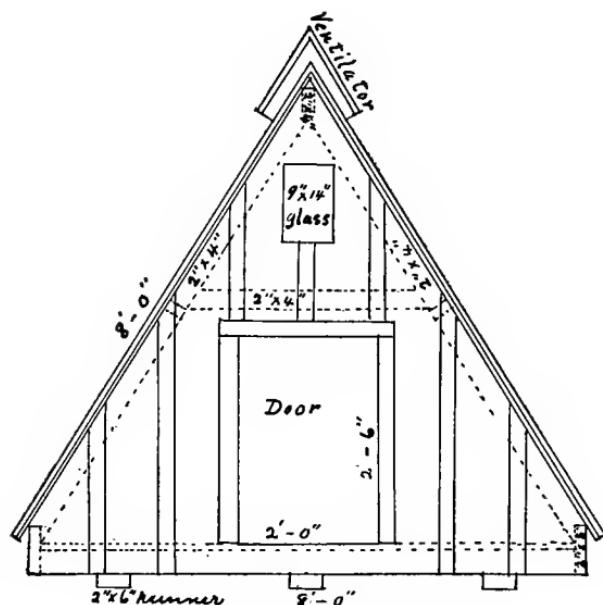


FIG. 78.—End view of A-shaped house.

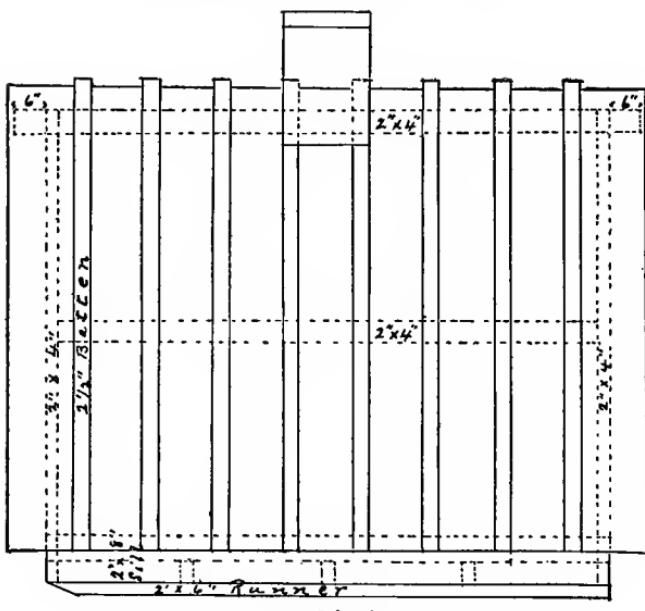


FIG. 79.—Side view of A-shaped house.

for a sow and her litter, or as a shelter for two or three sows. The description is taken from Bulletin 153 of the Wisconsin Experiment Station. The pen is constructed by nailing inch boards on six joists, each 2 by 4 inches, and 7 feet 8 inches long, for the floor. Beneath the joists are nailed three stringers, each 2 by 6 inches, and 8 feet long, which serve as runners for moving the house. Next, a plate piece 2 by 8 inches, and 9 feet 4 inches long, is spiked to the ends of the joists, having the bottom of the 2" by 8" even with the bottom of the joists, which will allow it to project 3 inches above the floor. It will also extend out 7 inches at each end. This 2" by 8" forms a plate to which the rafters and roof boards are nailed. The 7-inch extensions of the plate at the ends support the cornice, and protect the lower corners of the roof, which otherwise would be easily split off. The 2" by 8" planks, besides strengthening the house, raise the rafters and the roof boards nailed to them, at least three inches off the floor, and thereby increase the floor space and capacity of the house.

The following lumber is necessary to construct the A-shaped pen illustrated here:

- Nine pieces, 1" × 12" × 16' and 11 O. G. battens 16' long for roof.
- Five pieces 1" × 12" × 14' for ends.
- One piece 2" × 4" × 10' for ridge.
- Two pieces 2" × 8" × 10' for plates.
- Seven pieces 2" × 4" × 16' for rafters, and braces in frame.
- Three pieces 2" × 6" × 8' for runners.
- Four pieces, 1" × 12" × 16' for flooring.

If the house is to be used in cold weather, a door will be necessary, which may be hung on hinges or made to slide up out of the way. The doorway is shown in the drawing, two feet by two feet six inches. In the case of very large sows, it would be better to make the door three feet high.

The dotted lines in the drawings indicate the scantlings which constitute the framework of the pen.

The ventilator is made by cutting the upper ends from two roof boards, opposite one another. Then 2" by 2" pieces are nailed on top of the battens on each side of the opening, meeting at the top, and boards are nailed on top of these strips on each side of the roof. The upper ends of these boards meet at the top, and the lower ends come an inch or two past the lower sides of the opening.

It is recommended to have a door at the back of the building, similar to the one in front, for purposes of ventilation in hot weather; also a small opening near the peak at the rear of the building, which could be covered with a slide, and used to assist ventilation under some circumstances.

Owing to the fact that the runners are likely to decay, some prefer to have them not fastened to the building, so that they can be renewed conveniently. In the plan shown, the runners are fastened to the structure, but they could be attached by means of bolts, so that it would not be difficult to renew them. An application of tar would save them many years.

The Shed Roof Pen.—(Wisconsin Bulletin 153.) The pen shown in the illustration is six feet four inches wide and eight feet long. In the rear, it is provided with a door, the same size as the lower front door, which is placed diagonally opposite, so that by opening all the doors, it makes a cool house in summer. By closing both lower doors and opening the upper front door for ventilation, it makes a warm house for cool weather. The upper front door can be fitted with a wooden ratchet, by means of which it can be held in any position desired.

To build the pen, construct the frame 8' 0" long, by 6' 4" wide, on seven 2" by 4" joists six feet long. Nail two pieces of 2" by 4" scantling across the ends of the joists, which will make the foundation for the floor 8' 0" by 6' 4". Beneath the frame are nailed three 2" by 4" pieces which serve as runners for moving the building. The pen illustrated here is six feet

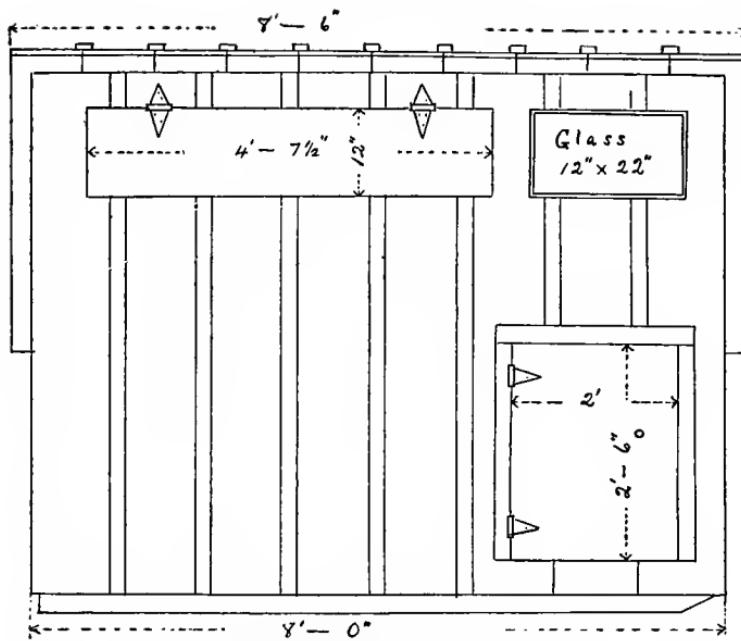


FIG. 80.—Front view of shed-roof house.

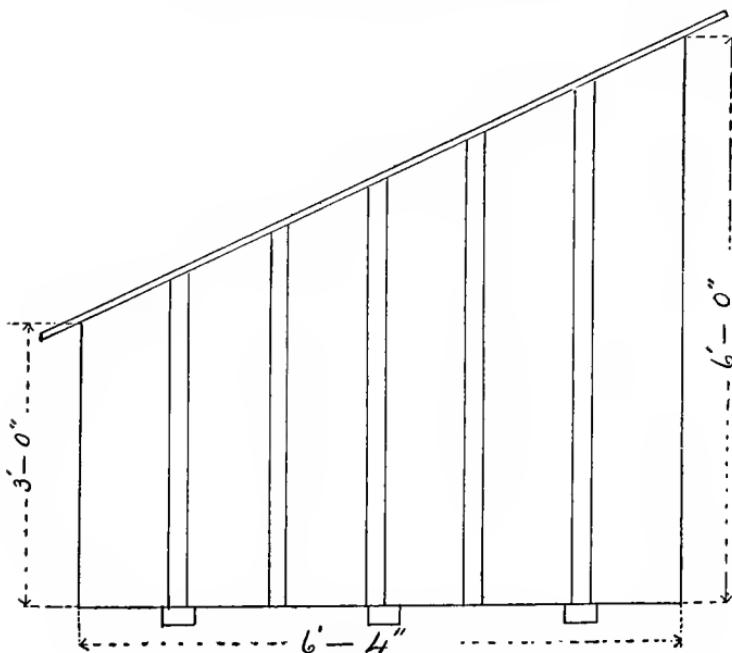


FIG. 81.—End view of shed-roof house

high in front and three feet high at the rear. (Figs. 80 and 81.)

The following lumber is necessary to construct the pen:

Six pieces 2" \times 4" \times 16'.

Five pieces 2" \times 4" \times 12'.

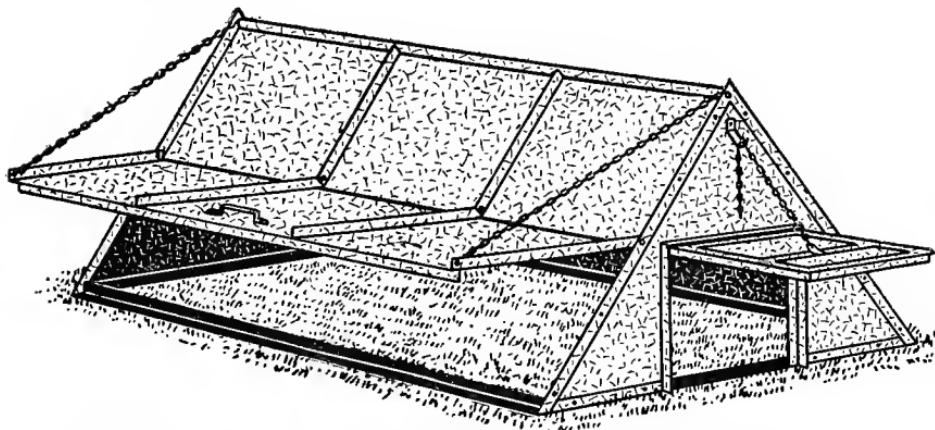
Two pieces 2" \times 4" \times 14' for frame.

Three pieces 1" \times 12" \times 16', rough, for floor.

Eleven pieces 1" \times 12" \times 12' (dressed on one side) for sides and ends.

Five pieces 1" \times 12" \times 16' (dressed on one side) for roof.

Four pieces O. G. battens 16', and eleven pieces O. G. battens 12' long for roof and sides.



Courtesy of National Manufacturing Company, Des Moines, Iowa.

FIG. 82.—A type of galvanized metal portable pen. In hot weather the lower half of the side can be raised as shown in the illustration, increasing the shade and admitting fresh air. In cold weather the side can be lowered to close the opening.

If a shingled roof is desired, the following material is necessary for roofing:

One piece 1" \times 12" \times 14'.

Five pieces 1" \times 6" \times 14' (dressed on one side).

Three bunches of shingles. (Figs. 82 and 83.)

Portable Cold-weather Farrowing Pen.—The farrowing pen shown in the illustrations (Figs. 84, 85) is the one referred to when discussing the management of the sow. The pen is 8 feet square and five feet from the ground to the eaves. The base, the corner posts, and the two plates are made of 4" by 4" scantling, and the remainder of the frame is made

of 2" by 4" scantling. The dotted lines in the drawings show the position of the scantlings comprising the frame.

An opening should be made in the gable at the end farthest from the ventilator. Then, if a few strips are laid across the plates, straw can be shoved in through the opening, filling in the peak of the roof, and making the building warmer. As shown by the dotted lines, the ventilator shaft is run down to near the floor to draw out the foul air and moisture.

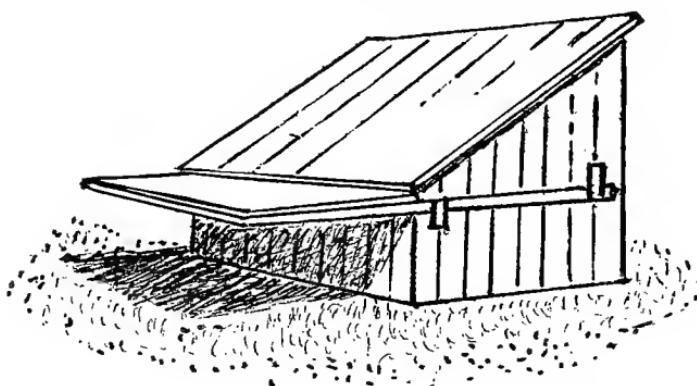


FIG. 83.—Attachment for shed-roof portable pen to give outdoor shade. (Wisconsin Bulletin 242.)

The roof may be shingled, or made of boards with battens over the cracks. The battens are not shown in the drawings, except in the end view of the roof.

Outside, the pen is single boarded with battens over the cracks. Inside, tarred paper may be put on the studding and then tightly boarded, but a better job will be made by first covering the studding with rough lumber, covering this with tarred paper, and then tightly boarding on the inside.

The window comprises three 12" by 14" panes set in a sash, which should be hinged at the top so that it will swing inwards. In hot weather it can be swung up to the ceiling and fastened there, allowing a good circulation of air.

The pen may be built on runners, or temporary skids may

be provided when it is necessary to move the pen. In very cold weather, a lighted lantern hung in the pen will make it quite comfortable for new-born pigs. By the time the pigs are twenty-four hours old, the pen will need no artificial heat.

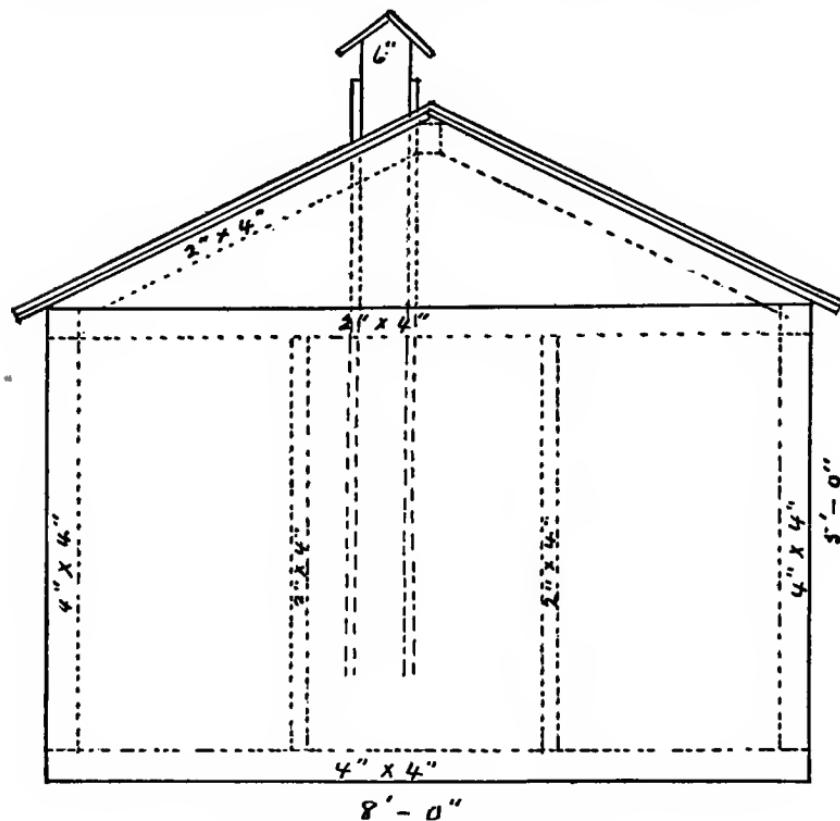


FIG. 84.—End view of farrowing pen.

A pen such as this will be found much safer for winter litters than a large building where other pigs are kept.

The various plans which have been submitted are capable of many modifications, and the man gifted with a little ingenuity may be able to improve upon them so far as his conditions are concerned. They are presented in the hope that

they may prove suggestive of ideas to the man who intends to build, and each man must decide for himself what modifications would render them most suitable to his circumstances.

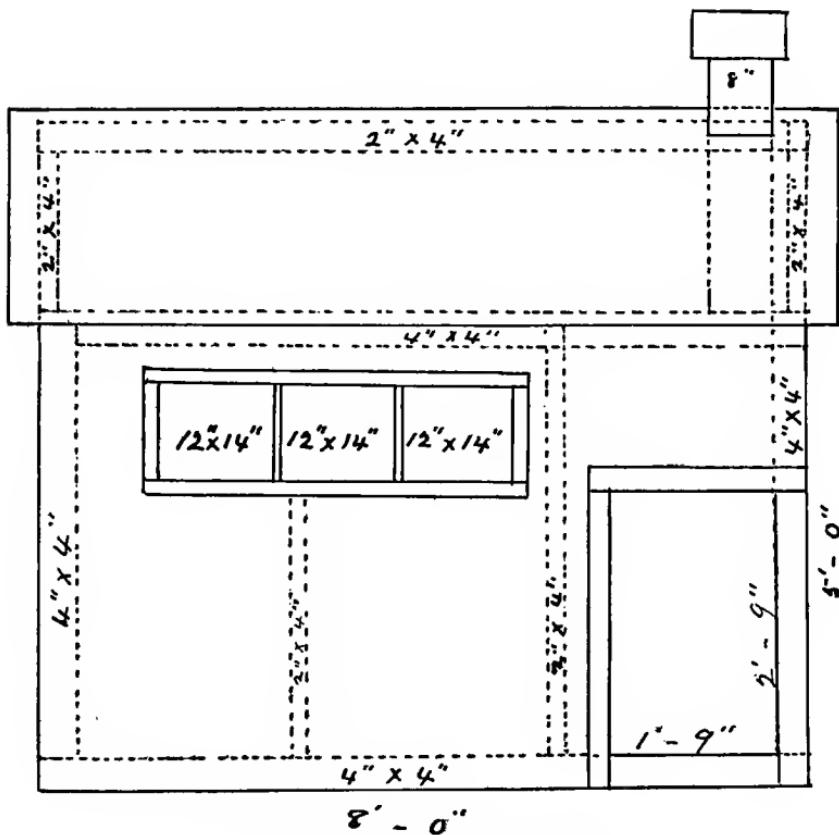


FIG. 85.—Front view of farrowing pen.

Bulletin 152 of the Iowa Station is an excellent treatise upon portable houses for swine. It is worthy of note that the Iowa Station found the temperature in metal pens to vary much more than that in wooden pens.

REVIEW.

1. Tell of the necessity of dryness for swine quarters.
2. Give several advantages of having good ventilation without draft.
3. Describe the intake pipe of a King ventilation system.
4. Describe the outlet shaft of the King ventilation system.
5. Tell how cooker pipes and chimneys may be used to aid ventilation.
6. What are the advantages of direct sunlight in a piggery?

Mr. Brethour.

7. Give several good features of the piggery such as that built by Mr. Brethour.
8. Tell how to insulate the concrete floor of the sleeping bed.
9. Give two important advantages of such insulation.
10. Give several criticisms of the Brethour piggery.
11. Give the good points and any bad points you may discover in the plan of the "small piggery."
12. What are advantages of portable pens?
13. Give the general plan of the portable pen you would prefer.
14. Tell how to make the portable pen warm enough for farrowing in very cold weather.
15. How are portable pens most easily moved to a new location?

CHAPTER XXXIII.

SANITATION.

THE HOG is a difficult animal to treat when attacked by disease, and hence the breeder must adopt every means within his power to prevent disease from entering the herd. One can never be too careful in this matter, and the proverb "An ounce of prevention is worth a pound of cure" is especially applicable in the management of swine.

Cleanliness.—Filth is an excellent harbor and breeding ground for disease germs. Care should be taken to have the pens cleaned frequently, and the pens should be so constructed that there are no places for filth to accumulate where it cannot be cleaned out. Water-tight floors with as few cracks and corners as possible, together with adequate drainage, are important in a piggery.

Disinfection.—Every swine breeder or feeder should acquire the habit of using disinfectants freely. There are numerous proprietary or patent disinfectants upon the market, such as Chloronaphtholeum, Zenoleum, etc., which give good satisfaction. Before purchasing an unknown patent disinfectant, the purchaser should insist upon the seller furnishing results of independent laboratory tests showing the value of the preparation. A mixture of five parts of crude carbolic acid to one hundred parts of water also makes a good disinfectant for pens. Chloride of lime is also good, and is especially recommended by some for pens where cholera has existed. Five or six ounces of chloride of lime to a gallon of water makes an effective disinfectant.

In case of disease, all bedding and manure should be removed and burned. Loose boards or planks should also be

removed, and all adhering filth scraped off the floors, partitions, and troughs. It is of little use applying a disinfectant on top of a coating of filth which may conceal and protect millions of disease germs. A good spray pump is best for applying the disinfectant, so as to force the liquid into every crack and cranny, and it is not wise to be economical in the use of the disinfectant. Every part of the pen should be thoroughly saturated with the solution.

If there are small outside yards attached to the piggery, they should be floored with concrete, and then they can be disinfected in the same way as the interior of the building. If they are not floored it is almost impossible to disinfect them thoroughly, and they are a constant menace to the health of the animals.

Pasture lots and large paddocks or feed lots are more difficult to deal with. Liberal liming and plowing up is about all that can be done. In case of some diseases, such as cholera, it is safer to remove the hogs to other feed lots or pastures for at least several months. Of course, the lots could be disinfected by saturating the surface soil with a good disinfectant, but it would be an expensive operation. (Fig. 86.)

Systematic disinfection of the premises should not be neglected even if there is no disease. A small spray pump and a constant supply of disinfectant to be used at frequent intervals about the buildings constitute an important part of the equipment of a piggery. At least once a year, a general house-cleaning is advisable, and whitewashing the walls, ceiling, and partitions with lime and crude carbolic acid will go a long way towards keeping the building sanitary. A good pint of crude carbolic acid to three gallons of whitewash will answer the purpose.

Quarantine.—Provision should be made in large herds for quarters where hogs that have been purchased, or brought home from shows, can be kept entirely separate from the rest of the herd for at least three weeks. The plan of using portable pens and dividing the herd up into small groups has a marked advantage over keeping the hogs in a large piggery, in case a contagious disease breaks out. With the portable pens, all hogs are not exposed, and it is a simpler matter to effect a quarantine.

Hog cholera is the most dangerous contagious disease that



FIG. 86.—A form of brood house for sow and pigs. Easily removed to a clean place to prevent disease.

the swine breeder has to contend with. In case of an outbreak of either cholera or swine plague in the neighborhood, a most rigid quarantine should be put into force. There should be no visiting back and forth by either man or beast between infected farms and those which are clear, because the virus which causes the disease may be easily carried on the boots of the persons or the feet of animals. Even dogs have been known to carry the disease from one farm to another. Dogs should be tied up until an outbreak of this disease is under control.

On the farm where disease breaks out, healthy animals should be separated at once from diseased animals, and different attendants should feed the two lots, each attendant keeping

entirely away from the premises occupied by the hogs in charge of the other. Carcasses of hogs which die should be burned or buried so deeply that they are not likely to be dug up by dogs or other animals, and disinfection should be systematic and thorough.

Feeding for Health.—Feeding has been dealt with in another place, but the importance of feeding in such a way as to maintain vigor cannot be too deeply impressed. Hogs which are fed in an injudicious manner have their vitality weakened and are more likely to contract disease than those which have been furnished a suitable ration.

Light.—Sunlight is a good disinfectant, and an effort should be made to admit plenty of direct sunlight into all pens. It must be remembered that disease germs flourish best in the dark.

Ventilation and Dryness.—To the difficulty of securing adequate ventilation in the piggery, may be traced a great many troubles which affect pigs. Rheumatism, bronchitis, pneumonia, and scours, the last mentioned being most common in young pigs, are among the commonest winter troubles of swine, and are generally caused by lack of ventilation and consequent dampness in the building. Unless ventilation is provided and the pens kept reasonably dry, good results cannot be expected.

Lice.—When lice once become well established in a herd, it requires a good deal of painstaking effort to eradicate them. They may be the cause of serious loss, and lousy pigs cannot give as good returns for feed consumed as those which are kept clean. It is also claimed by good authorities that lice weaken the vitality of hogs and render them more susceptible to disease.

Almost any of the better-known dips will prove effective if used according to directions. A two per cent solution of

creolin (2 parts creolin to 100 parts water) makes a good dip for lice. Coal oil is very effective, but is apt to blister, and should be applied lightly. Crude petroleum is also recommended by some; it is inexpensive, does not blister, and is more lasting in its effects than some patent preparations. (Fig. 87.)

In applying a dip, care must be taken to wet thoroughly



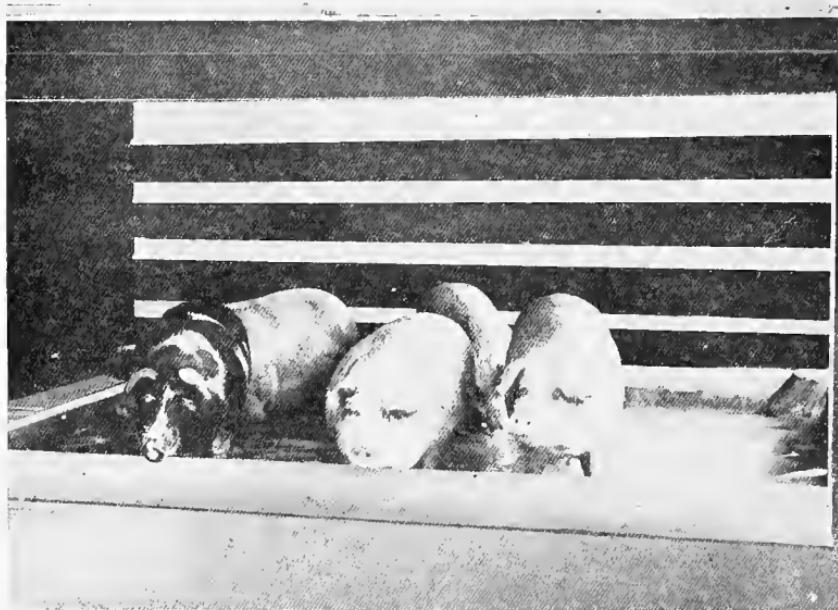
FIG. 87.—Type of hog oiler to destroy vermin. When the hog rubs against one of the upright bars, oil is conveyed down the bar and oils the itchy spot.

all parts of the animal's body. Lice are commonly found on the inside of the legs, about the ears, or in the folds of the skin on any parts of the body, and unless the application of dip is thoroughly made, many of them will escape. Dipping is one of the most effective methods, and, when large numbers are to be treated, it is necessary to have a special dipping vat through which the hogs are compelled to swim. The dip may

also be applied by means of a good spray pump, which forces the dip through the hair and into all crevices. It may also be applied by means of a broom, using a pail to hold the dip. By



FIG. 88.—Hog dipping vat recommended by the Wisconsin Station. (Bulletin 242.)



Courtesy Tennessee Department of Agriculture

FIG. 89.—Concrete hog wallow.

brushing the dip into the hair the job can be done thoroughly.

The cement dipping vat illustrated herewith is the kind recommended by the Wisconsin Station (Bulletin 242). It is provided with a chute at each end, and there is a return drain

apron where the hogs emerge from the tank. By keeping the hogs a short time on this incline after they come out of the tank, a great deal of dip can be saved from waste. (Fig. 88.)

The tank should contain enough lukewarm water, to which the dip has been added, to thoroughly immerse the hogs, the quantity varying with the size of the hogs. If crude oil is used, 12 to 15 gallons to a tank of water is sufficient. The hogs should work their way through the dip by their rear legs, with their noses just out of the water.

When lice have been in a building for some time, it will be necessary to treat the building in practically the same way as recommended for disinfection, the disinfectants being also good insecticides.

In treating for lice, one application of insecticides is seldom sufficient, because there will be many eggs to hatch out to give a new brood. A second treatment, about a week after the first, should always be given, and a third treatment would not be out of place.

Hog Wallows.—Hogs suffer from heat, and enjoy wallowing in water or mud. The ordinary wallow becomes very filthy and is a good breeding ground for disease. Cement hog wallows, located in a shady place, and constructed so as to contain eight or ten inches of water, are sanitary and add much to the comfort of the pig in hot summer weather. Crude oil or coal tar dip may be added to the water in the wallow, and thus help to keep down lice, and to promote sanitary conditions. (Fig. 89.)

REVIEW.

1. How may cleanliness be secured in a piggery?
2. Mention several disinfectants and tell how to use them.
3. Tell of the necessary steps in securing purity of quarters after a disease among the hogs.
4. Mention methods of purifying yards and pastures

5. Give composition and a method of applying a disinfectant white-wash.
6. What is meant by "keeping hogs in quarantine"?
7. Mention special plans for quarantining hogs on the farm.
8. What cautions must be observed when cholera hogs are quarantined?
9. Tell of the relation of feeding to health.
10. How does sunlight help to prevent disease?
11. What diseases are apt to occur if the quarters are damp and poorly ventilated?
12. What is the harm from lice on swine?
13. Mention materials to use in getting rid of lice.
14. Tell how to apply a dip.
15. Tell of other ways of applying the petroleum or other preparation.
16. Why make two applications?

CHAPTER XXXIV.

COMMON DISEASES OF SWINE.

HOG CHOLERA (SWINE FEVER).

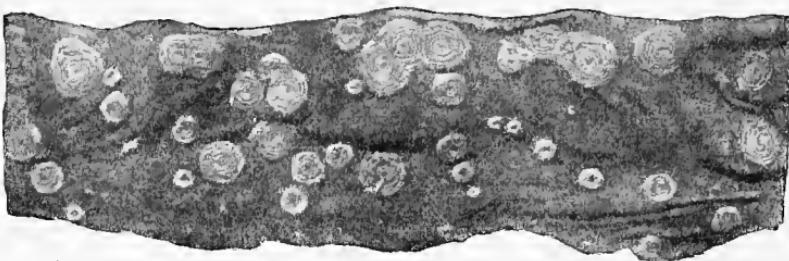
THIS highly infectious disease is due to a germ, and causes a loss of many millions of dollars annually in the United States. It causes an inflammation and ulceration of the stomach and intestines, enlargement and inflammation of the lymphatic glands, and various other disturbances. The most characteristic lesions of the disease are inflamed areas on the lining membrane of the intestines and stomach, which eventually change into raised ulcers, circular in outline. (Figs 90 and 91.)

Symptoms.—The hog usually goes off by itself and lies in a cool place. The back is arched, the hind parts appear stiff, causing the hog to stagger and cross the hind legs as it walks. There is a watery secretion from the eyelids, which later becomes thicker in character, causing the lids to adhere. Owing to increased secretions from the skin, dirt adheres to it, giving the animal a dirty appearance. Alternate diarrhoea and constipation is common, and the diarrhoeal discharge is thin and watery, and sometimes mixed with blood. (Fig. 92.)

Acute cases usually terminate in death in from two days to two weeks, but sometimes death occurs before the symptoms become well marked.

In the subacute or mild form, the symptoms may escape notice, but there is usually a slight fever, with loss of appetite, constipation, and diarrhoea. The pig generally recovers in a few days.

The disease is said to be chronic when it lasts for a con-



Courtesy Tennessee Department of Agriculture.

FIG. 90.—Ulcers (large intestine), chronic form.



Courtesy Tennessee Department of Agriculture.

FIG. 91.—"Button ulcers" (large intestine), chronic form.



Courtesy Tennessee Department of Agriculture.

FIG. 92.—Group of cholera pigs.

siderable time, possibly several weeks or even two or three months. Often the pig becomes a complete wreck, and death at last occurs.

Treatment.—When a hog once contracts the disease, little can be done in the way of treatment. Preventive measures are the only effective means for fighting this disease. In case the disease should be found in a herd, it is safer to divide the herd up into small groups, keeping hogs which have been ex-



Courtesy Tennessee Department of Agriculture.

FIG. 93.—Injecting serum behind shoulder (large hog).

posed to the disease separate from those which have not. Diseased carcasses should be burned, and thorough disinfection of the premises and the animals should be made. The disease enters the system through the stomach, and, therefore, care should be exercised at all times in providing clean water and feed. The importance of quarantine, isolation, and disinfection, and methods of conducting the same, have been dealt with under "Sanitation," which see.

Immunization.—To the investigations of the Bureau of Animal Industry of the U. S. Department of Agriculture, we are indebted for the production of a serum which seems likely to play an important part in the suppression of hog cholera. Briefly, the serum is prepared from the blood of hogs treated in such a way as to render them immune from the disease. The



Courtesy Tennessee Department of Agriculture.

FIG. 94.—Injecting serum into muscle of ham (pig).

serum is injected under the skin of healthy hogs which it is desired to protect from the disease. (Figs. 93, 94, 95.) It is not a *cure* for cholera, but is wholly *preventive* in character, bearing the same relation to hog cholera as vaccine bears to smallpox.

In an address before the American Veterinary Medical

Association, Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, gives results of extensive tests, involving several thousand hogs upon farms, under practical conditions. In the course of his address,



Courtesy Tennessee Department of Agriculture.

FIG. 95.—Injecting serum behind ear (large hog).

Dr. Melvin makes the following statements regarding the experiments:

"In no cases were any of the ordinary methods of combating hog cholera by disinfection and separation of the sick from the apparently healthy practised. Where disease was present at the time of treatment, the treated were

allowed to run with the sick animals along with a number of untreated animals, which served as controls, and the success following vaccination can therefore be attributed to the action of the serum. In the herds where hog cholera appeared subsequent to treatment, all of the vaccinated hogs remained well, while more than 65 per cent of the checks (untreated hogs) died. In the herds which had been exposed, but were apparently well at the time of the treatment, 4 per cent of the treated animals died, while approximately 90 per cent of the checks succumbed. In the herds where disease existed at the time of treatment, and where we did not anticipate very great success, 13 per cent of the treated animals were lost, whereas 75 per cent of the checks died.

"These successful field trials, confirming as they did numerous tests carried out under experimental conditions, have convinced us of the efficiency of this method of dealing with hog cholera, and, though improvements will undoubtedly be made in many of the details of producing the serum, the method is believed to be now in such condition as to make the practical use of it entirely feasible."

This plan of combating hog cholera to be successful must be carried out under the direction of skilled veterinarians, and hence little can be accomplished unless the State comes to the aid of the farmer, supplies the serum at cost, and provides veterinarians to make the injections and to supervise the work.

Three Methods of Vaccinating.—(Kansas Bulletin 182.)

(1) "The first method is to use the *serum alone*. In this method there is simply injected into the tissues of the hog a dose of the anti-hog-cholera serum, which makes the hog immune against cholera for a time varying from a few weeks to several months."

(2) "In this method there is injected at the same time with the serum, but in a different place, a small amount of virulent blood, or blood taken from a hog very sick with cholera." This method is known as the *simultaneous method*, and renders a hog immune for life. It is counted a satisfactory method to use in a herd before it has become infected, but great care must be exercised not to use too much of the virulent blood, lest the hog be given a severe form of the disease.

(3) "This method is known as the *combination method*. The hog is first vaccinated with the serum alone, and ten days later vaccinated with the simultaneous method." This method was originated by the author of the bulletin, Dr. Schoenleber, and the claim is made by him that this is the safest and most satisfactory method that can be employed in an exposed herd.

The bulletin referred to above gives full directions for vaccinating and handling the herd, but recommends that none but skilled veterinarians perform the operation.

From very extensive tests which he has made, Dr. Schoenleber draws the following conclusions: "Vaccination should be done while the animals are still healthy, but if cholera is present, a large per cent is saved through the use of the serum, and the earlier it is used in an outbreak the greater the per cent saved."

SWINE PLAGUE.

Swine plague is sometimes mistaken for hog cholera, and often accompanies the latter disease. It is an infectious disease caused by a germ, and the symptoms are similar to those of cholera. As a rule, the lungs and pleural membrane are in-

flamed, but the button-like ulcers on the lining membrane of the intestines and stomach, which are characteristic of cholera, are absent. The lining membrane of the stomach and intestines is commonly inflamed, and sometimes ulcers are present, but the ulcers differ from those of cholera, being more hollowed out and less button-like in appearance.

The germs which cause swine plague are more easily destroyed and are less readily carried from one farm to another than those of cholera. Healthy hogs should be separated at once from diseased animals, and the premises should be thoroughly cleaned and disinfected. Up to the present, medicinal treatment has not been successful, and the farmer must rely upon preventive measures.

BRONCHITIS.

Bronchitis commonly attacks young, growing pigs, and may be caused by dust, lung-worms, or damp, chilly quarters. A distressing cough, especially when disturbed from their bed, is one of the most prominent symptoms. Many of the pigs become unthrifty, and, if the disease attacks very young pigs, it is likely to cause death.

Dry, comfortable quarters, and nourishing feed will often pull the pigs through, and care should be taken in making the pens and yards sanitary before any more young pigs are put in them.

PNEUMONIA.

Pneumonia is more serious than bronchitis and frequently causes death in a very short time. It often results from a severe cold, and may also be brought on by over-exertion, such as being chased, or driven at too rapid a rate. Damp and

unsanitary conditions in the pen may also be a cause. A cough, fever, and hurried or labored respiration are among the symptoms.

About all the farmer can do is to aim to prevent the disease. If he has a case to deal with, careful nursing is the main thing. Comfortable, well-ventilated quarters, and a light, sloppy diet are important. Daily doses of castor oil will help keep the bowels active, and if the weather is cold the animal should be kept covered with a blanket. Treatment is not very satisfactory, as it is difficult to nurse a very sick pig.

TUBERCULOSIS.

The following extracts are quoted from a report issued by the United States Bureau of Animal Industry:

“Reports gathered from the various meat-packing centres of the United States show tuberculosis of hogs to be on the increase, and causing heavier loss to raiser and packer alike than any other disease.”

“Statistics show that when there were over 56,000,000 hogs in this country, their value at that time was over \$339,000,000. Federal inspection at the abattoirs of the country show two per cent of the hogs slaughtered to be affected with tuberculosis. Reports from Europe show a far more widespread infection, that runs from 5.5 to 7.5 per cent.”

“Hogs from Arkansas, Oklahoma, and Texas are remarkably free from tuberculosis, due to the methods of caring for them, or rather the lack of care. They are not restricted to feed-lots, where disease is commonly found, but roam over large areas to shift for themselves. No prolonged feeding is practised in narrow limits, but from birth to maturity they are pastured on alfalfa, oats, corn, rape, and peanuts. . . . In

striking contrast are the hogs slaughtered at three cities in one of the leading dairy states, where there is a large number of co-operative creameries and the raw skim-milk is fed."

"Buyers for packing-houses are learning from bitter experience to avoid sections of certain states, and two firms will not buy hogs from one state known to be badly infected. In fact, many of the smaller packers in the Central West buy subject to post-mortem inspection, as a measure of self-protection."

"It is known beyond all doubt that the majority of tuberculous hogs are produced by the following causes:

- "1. Feeding raw milk and slime from creameries.
- "2. Feeding hand-separated milk from tuberculous cows.
- "3. Feeding behind tuberculous cattle.
- "4. Feeding tuberculous carcasses.
- "5. Feeding slaughter-house offal.

"The danger of feeding hogs behind tuberculous cattle lies in the fact that such cattle discharge enormous numbers of tuberculosis germs in their faeces."

Symptoms Obscure.—The quotations given show the importance of this disease, and the need for the farmer to be on his guard. It is a contagious disease and must be treated as such. The symptoms are not well marked, and a hog may be badly diseased and show practically no clinical symptoms. If the lungs are affected, the hog usually has a cough, and, if the digestive organs are badly affected, there is generally indigestion, and general lack of thrift; but similar symptoms may show themselves with other diseases, and it requires a great deal of experience to diagnose the disease with certainty.

Treatment is entirely preventive. Since the disease is usually communicated to hogs through their feed, it is neces-

sary to make certain that their feed contains no germs. In dairy districts, the practice of sterilizing skim-milk, butter-milk, and whey is to be commended, because dairy by-products constitute the main medium for transmitting the disease to hogs. Sanitary surroundings, pure feed, and fresh air are the feeder's main safeguards in connection with this dangerous disease.

INDIGESTION.

Indigestion in various forms is caused by mistakes in feeding. Over-feeding and lack of exercise will sometimes bring on the trouble, or the feeding of swill containing injurious substances, such as washing powders, is apt to cause derangement. In the acute form it causes the animal a good deal of pain, causing it to arch its back and give general evidences of suffering. In such cases it is well to have a veterinarian prescribe for the trouble.

The chronic form sometimes follows an attack of acute indigestion, causing an unthrifty, stunted condition of the animal. Perhaps the best home remedy is a dose of castor oil, followed by careful feeding upon easily digested feeds. If the trouble is not relieved, a veterinarian should be consulted.

CONSTIPATION.

As mentioned in another place, constipation is most disastrous in the case of pregnant sows, and is the result of too little exercise and too much concentrated feed. In cases of constipation, perhaps the simplest remedy is to give from two to four ounces of raw linseed oil once daily in the slop of a mature animal. If this is not effective, give four ounces of Epsom salts. Give exercise and supply laxative feeds, such as bran, oil meal, or ground flax-seed, roots or alfalfa.

SCOURS.

Dr. Alexander (Wisconsin Bulletin 184) writes as follows: "When young nursing pigs begin to scour, it is evident that the milk of the sow is disagreeing with them, and immediate attention, therefore, should be directed towards improving her ration. Most often the trouble comes from overfeeding on corn, or other rich feed, just after farrowing, and pigs of fat, flabby, pampered, cross, nervous, constipated sows are most apt to suffer. Sudden changes of feed, or feeding sour or decomposing slop, or feed from dirty troughs or sour swill-barrels, also tend to cause diarrhoea either in nursing pigs or those that have been weaned, and all such causes should be prevented or removed.

"To correct scouring in nursing pigs, give the sow 15 to 20 grains sulphate of iron (copperas) in her slop night and morning, and if necessary slightly increase the dose until effective. Lime water may, with advantage, be freely mixed with the slop as a preventive when there is a tendency to derangement, or after the trouble has been checked, and it is also an excellent corrective for weaned pigs showing a tendency to scour on slop or skim-milk. Where little pigs are scouring severely, each may with advantage be given a raw egg and 5 to 10 grains of subnitrate of bismuth twice daily, in addition to changing the feed of the sow and mixing copperas in her slop. In cases which do not promptly respond to treatment, success may follow the administration of a dose of castor oil shaken up in milk. In all cases it is important to set right all errors in diet and sanitation, and to provide the pigs with dry, sunny, well-ventilated quarters. The derangement is always most apt to occur, and sure to prove disastrous, among pigs kept in unsanitary conditions."

INFECTIOUS SORE MOUTH.

This disease is quite common in small pigs from a few days to several weeks old. It is caused by a germ. Filthy quarters and damp, muddy yards favor the development of the disease.

One of the first symptoms is a disinclination to suck on the part of nursing pigs, or a falling off in appetite in older pigs. The lining membrane of the mouth becomes inflamed, and sometimes the snout and lips become swollen. Later, ulcers form, often involving the lips and snout.

Dr. Craig recommends the following treatment:

"As soon as the disease breaks out in a litter, both the mother and pigs should be removed from the herd. The affected pigs can be treated by dipping head foremost into a four per cent water solution of some reliable tar disinfectant; or permanganate of potassium, one ounce to a gallon of water, can be used. A more thorough way to treat them is to wash out the mouth by injecting the solution directly into it with a syringe. It is advisable to use this method wherever practicable, and especially in advanced cases. It is also advisable to clean the ulcerated parts by scraping away the dead tissue and rubbing the surface of the ulcer with lunar caustic. The above treatment should be repeated twice a day in advanced cases, and in mild ones once a day. It should be kept up for as long a time as necessary. It is usually more economical to kill the badly diseased pigs than it is to treat them, as they are apt to scatter the disease and become badly stunted and deformed."

If treatment is adopted upon the first appearance of trouble, the disease is not too difficult to cure.

THUMPS.

This disease is caused by a disordered digestion which irritates the nerves connected with the diaphragm, causing sud-

den contractions of the diaphragm at irregular intervals. The contractions or spasms of the diaphragm cause a jerking movement of the flank, which is a characteristic symptom of the disease. The pig becomes unthrifty and stunted, and very young pigs are likely to succumb or to become practically worthless.

Too liberal a supply of feed and too little exercise will often bring on the trouble. Young pigs often contract the disease before they are weaned if they have a good mother and are not given much exercise, and it is usually the finest and fattest pig in the litter which is the first to go wrong.

Treatment is mainly preventive, and hence the necessity for providing exercise for young pigs, especially if their mother is a liberal milker and the pigs become very fat. Judicious feeding and exercise will entirely prevent the disease. If a case occurs, it is a signal that a change in methods should be made at once. Sometimes it is difficult to obtain exercise for young pigs in cold weather, and some recommend shutting them in a pen away from the mother for an hour or so twice a day. As a rule, this plan will stimulate the laziest of them to take considerable exercise.

INFLAMMATION OF THE UDDER.

Heavy milkers are most liable to have this trouble. Whatever the cause, the disease calls for prompt treatment. Dr. R. A. Craig, in his excellent book, "Diseases of Swine," recommends the following treatment:

"Milking the sow's udder two or three times a day will usually relieve its congested condition. A physic of Epsom salts should be given every other day, and a sloppy diet fed.

In case the udder becomes inflamed, it should be kneaded gently with the fingers, and the following ointment applied daily: Extract of belladonna and gum camphor (one dram of

1), and vaseline (three ounces). Hot fomentations may be used.

"Sore teats should be bathed daily with white lotion (one part zinc sulphate, three-fourths of a part lead acetate, and twenty parts water) until healed."

ECZEMA.

Eczema, and similar skin troubles, can usually be successfully treated by washing or spraying with a one per cent solution of creolin, or some of the well-known tar disinfectants. The hog should be kept in a clean, dry place, and out of the sun until cured. It sometimes requires time to effect a cure, the treatment should be given every day until the disease is conquered.

RHEUMATISM.

In northern latitudes, rheumatism often occurs among hogs, especially during cold, damp weather. Damp, ill-ventilated pens are a common cause, and it may sometimes be caused by overfeeding. Piggeries built with stone or concrete walls and floors are generally more dangerous than those built of wood. When such walls are hollow and the floors insulated with a tar layer, they are much safer.

The hog becomes very lame and stiff and moves about with difficulty. Sometimes the joints become swollen and very painful, and the animal becomes practically helpless. In such cases it is seldom that the hog makes a recovery.

The feeder must be on his guard against this disease. Dry, well-ventilated pens and careful feeding will generally enable him to avoid disaster. Animals which become affected should be kept in dry, warm quarters. Dr. Craig ("Diseases of Swine") says: "Salicylate of soda is the most useful drug

to give in this disease. The dose is twenty or thirty grains in the feed, or as a drench, three times a day. Larger doses, and at more frequent intervals, may be given in acute cases for a short time. Quinine and bitter tonics can also be given. Blistering ointments and liniments should be applied to the inflamed articulations."

RICKETS.

In this disease, which is commonly found among young pigs, there is enlargement, bending, and distortion of the bones of the joints and limbs, and fractures of leg bones are not uncommon. The bones do not contain their normal proportion of mineral matter, and hence lack strength. It is claimed that the disease is most common among closely in-bred hogs. The excessive feeding of corn throughout generations of swine is believed to be an exciting cause, or any conditions which interfere with proper nutrition, such as disease or unsanitary surroundings, may predispose towards the disease in question.

Dr. Alexander of Wisconsin says: "Pigs affected with rickets can seldom be profitably treated. Prevention is to be sought by avoiding the causes mentioned, maintaining sanitary conditions about the hogs, providing adequate supplies of various feeds rich in all the requisites of a perfectly nourished animal, and obviating degeneracy by careful selection of robust sows and timely infusion of new blood."

Plenty of mineral matter should be provided at all times during the life of the pig. Methods and forms of supplying mineral matter have already been given in this book.

PARALYSIS.

In Virginia Bulletin 189, Dr. Mayo writes: "The disease first appears as a slight loss of control of the hind legs, as

shown by a weaving of the body, knuckling of the fetlocks, and finally a paralysis more or less complete. The animal is unable to raise itself on its hind legs and often drags the hind quarters as it moves about. The disease occurs in swine of all ages. This disease is popularly supposed to be caused by 'kidney worm,' but there is no evidence to support this belief. The disease seems to be located in the spinal cord at the lumbar region, but the actual cause is unknown at present.

"Some cases recover without treatment, but a majority of the cases prove fatal. Generally the treatment is to give a purgative of from one-half to two ounces of castor oil, depending upon the size of the animal, followed by nourishing, easily digested feed. Rubbing the back vigorously with a good veterinary liniment once daily is also beneficial."

MANGE.

Mange is caused by very small animal parasites called mange mites, which burrow in the outer layer of the skin.

The disease is most troublesome in young pigs, causing great irritation, indicated by the little pigs scratching and rubbing themselves. Later, the hair stands erect, and thick scabs form at the roots of the hair on the neck and shoulder top and about the ears and face. Often the scabs extend along the back to the root of the tail.

Dr. Mayo, of the Virginia Experiment Station, strongly recommends the lime and sulphur dip, which is made as follows: Take 8 pounds of fresh lime and slake with enough water to form a thick paste. Sift into this paste 24 pounds of flowers of sulphur and mix thoroughly with a hoe. Place in a kettle with 25 or 30 gallons of water and boil for at least one hour, then add enough water to make 100 gallons of dip. The dip should be used warm, about 100 or 110 degrees Fahrenheit.

The coal-tar dips, such as chloro naphtholeum, zenoleum, and others of this class, give good results, and are more convenient when a small number of animals are to be treated.

It is very important that the animals be kept wet with the solution until all the scabs are thoroughly soaked through, and it is a good plan to scrub with a stiff brush to remove as much as possible of the scabs. Two thorough treatments, ten days apart, are necessary.

Pens should be thoroughly cleaned and disinfected. Sows should be treated as well as the young pigs, though the disease may not show to any extent on the older pigs. The disease is transmitted by contact, and the young pigs almost invariably become infected through coming in contact with a diseased mother.

INTESTINAL WORMS.

Common Round Worm.—The most common intestinal worm affecting swine is the round worm, which is found mainly in the small intestine. If a post-mortem examination is made some time after death, the worms may be found in the stomach, having made their way there after the death of the animal. The worms vary from six to eleven inches in length, and taper somewhat towards the extremities. In color they are usually a yellowish white. The eggs of the female pass out with the excrement and become scattered over the premises. Eventually, some of them are taken up by other hogs along with their feed.

They do not seem to cause the hog any inconvenience unless they are present in very large numbers, when they may cause digestive troubles, and the writer has known death to result. There can be little doubt, however, that a pig affected with worms cannot make the best use of its feed, even though it may appear quite thrifty.

Thorn-headed Worm.—This parasite is much less common than the round worm. It is usually found attached to the wall of the intestines by its hooked proboscis, from which it derives the name of "thorn-headed." In length it is similar to the round worm, but its surface is somewhat wrinkled, and the posterior extremity is blunt. Though only a few are usually found in an animal, they do much more damage than the round worm, irritating the lining of the intestine, and sometimes causing severe inflammation. It would be difficult to distinguish the symptoms from other intestinal derangements, but a post-mortem examination would readily reveal the presence of the worm.

Pin-Worm.—The pin-worm is very small and might be easily overlooked in a careless post-mortem. It is usually found near the beginning of the large intestine, often hidden in the folds of the lining membrane. It is a very common parasite of swine, and does not seem to cause much inconvenience to the animal.

Whip-Worm.—This is also a small worm, being about one and one-half inches long. It attaches its head to the lining of the intestine, and is usually found in the beginning of the large intestine. The anterior portion is very thin and hair-like, and the posterior portion is thick and cylindrical in shape. Like the pin-worm, it does not seem to create much disturbance, but must be more or less injurious.

Treatment for Intestinal Worms.—Preventive treatment consists in keeping buildings and surroundings clean and sanitary. Feeding in filthy yards and allowing to drink stagnant water are practices which favor the spread of parasites.

As to medicinal treatment, the writer has found that allowing hogs to have access to a mixture of charcoal and salt, or charcoal, wood ashes, and salt, seems to be quite effective in driving out round worms.

Turpentine is commonly recommended for worms, especially the thorn-headed worm. The dose is a teaspoonful for every eighty or one hundred pounds live weight of the hogs to be treated. It can be given in the feed, and the hogs should be fasted at least twelve hours before treatment. A dose each day for three days will generally prove effective.

Another remedy which is recommended is five grains of calomel and eight grains of santonin for every hundred pounds live weight of the hogs. This remedy can also be given in the feed. It is generally advisable to give a physic after treatment for worms.

LUNG WORMS.

The lung worm is a small, thread-like, whitish worm, sometimes found in large numbers in the air-passages of the lungs. Ordinarily, about the only symptom is a spasmodic cough, which is somewhat similar to the cough which accompanies bronchitis. Sometimes the irritation caused by the worms produces inflammation and consolidation of the lung tissue, in which case the animal dies, but in many cases no bad effect is apparent. In a post-mortem examination, the worms can be detected by cutting the lung near the apex and then squeezing the tissue next to the cut. The pressure forces the thread-like worms out upon the cut surface.

There is practically no effective treatment for this parasite. Clean pens, in which disinfectants are liberally used, and clean, well-drained yards will help keep the worm in check. Filthy yards and wallows favor its development. Ploughing up old hog lots and re-seeding them is also a preventive measure.

FOOT-AND-MOUTH DISEASE.

Dr. A. S. Alexander, veterinary editor of the Breeder's Gazette, gives a very full summary of the nature of foot-and-mouth

disease in "The Gazette" of November 12, 1914. The following points are taken from the article in question: "So highly contagious is the character of foot-and-mouth disease that its eradication and control necessitates instant isolation and slaughter of affected animals, deep burial of the carcasses in quicklime, thorough cleansing, disinfection, and whitewashing of the infected premises, strict quarantine of all infected stables, farms, and areas, restriction of the movement of animals and pasteurization or boiling of milk." Hogs usually take the disease from cattle, hence it is important to be able to recognize the disease in any class of stock.

Symptoms.—Following are some of the characteristic symptoms as given by Dr. Alexander: "The temperature of the cow rises 2 to 4 degrees, the pulse accelerates, appetite diminishes, shivering may be seen, while the hair is roughened, the muzzle hot and dry, the teats and membranes of the mouth become red, saliva drools or froths from the mouth, and a characteristic smacking of the tongue is heard. Tenderness of the feet is shown by lameness and soreness. In two to three days large and small vesicles (blisters) develop on the inner surface of the lips and cheeks, the gums, palate, and top and borders of the tongue. . . . Simultaneously, with the eruption of vesicles upon the mucous membranes of the mouth, vesicles may develop in cattle on the muzzle, and at the base of the horns, and in hogs on the snout. . . . Sheep, goats, and swine do not commonly show severe lesions of the mouth when attacked by the disease. In these animals the feet are most affected."

Dr. Charles F. Lynch, in "Diseases of Swine," says: "In an outbreak of foot-and-mouth disease, cattle are usually first affected, and the disease may then spread to the swine. The characteristic symptoms of this disease are the finding of large numbers of vesicles or blisters between the toes and along the lower part of the mouth. There may also be some blisters in the mouth and on the tongue."

What to Do.—Probably enough has been said to enable the farmer to recognize this dread disease. If he should be so unfortunate as to find it on his farm there is only one thing to do, and that is to notify the Government authorities immediately he makes the discovery. It is of no use to try to hide it, because matters will only go from bad to worse, and the sooner the proper authorities are notified, the sooner the outbreak can be brought under control.

OTHER DISEASES.

The diseases which have been mentioned represent only a few of the troubles which may affect the hog, and no attempt has been made to treat the subject from a veterinarian's stand-point. There are other diseases. The aim has been to note only a few simple remedies for common ailments, and to emphasize especially the importance of prevention, rather than the cure of disease. The hog is not easy to treat for disease, and the main effort of the farmer should be towards maintaining health and preventing the entrance of disease into his herd. In regard to the long list of diseases which have not been mentioned, together with many of those included in the list, it will generally be advisable to consult a skilled veterinarian, but the services of a veterinarian can often be rendered unnecessary if the farmer makes the best use of the means at his disposal.

Examine Carcasses.—Every man who has to deal with stock should make a practice of holding a post-mortem upon every animal that dies upon the farm. He will soon learn what healthy organs should look like, and will be able to locate the seat of the trouble. If he cannot determine the nature of the disease, he can take the diseased organ or organs to a veterinarian, or send them immediately to the nearest Experiment Station, and have the disease identified. Experiment Stations

exist for the purpose of helping the farmer, and the officers of the stations will be glad to send him any information they can to help him overcome his difficulties.

ADMINISTRATION OF MEDICINE.

Medicines which are not distasteful can be given with the feed, provided the hog has not completely lost its appetite. Wherever possible, the administration of medicine in the feed is preferable to drenching.

Dr. Craig ("Diseases of Swine") recommends the following method of drenching hogs:

"To hold the animal while drenching it, a noose of sash-cord or quarter-inch rope can be placed around the upper jaw well back toward the angles of the lips, and the medicine thrown into the back part of the mouth with a dose syringe. As there is danger of the hog breaking the syringe, it is best to use a metal one. Sometimes, when the drench is bulky and the hog hard to hold, it is necessary to elevate the head and raise the fore-feet off the ground. For this purpose a pulley and rope wire stretcher is recommended. It is best to wait until the hog has become quiet and well under control before giving it the drench, as there is some danger of the medicine getting into the air-passages and doing harm."

The writer has seen more than one hog killed in the operation of drenching. If the drench is poured too rapidly into the throat, it is almost sure to be drawn into the lungs, and the hog will probably die in a few minutes. The medicine should be poured very slowly, and it is best to pour it just inside the cheek instead of into the throat.

REVIEW.

1. What parts are attacked by the cholera germ?
2. Describe the symptoms of this disease.

3. What measures should be taken in case of an outbreak of cholera among swine?
4. What can be done to make hogs immune to cholera?
5. How was it proved that the serum treatment was effective?
6. Describe the first method of vaccination (serum alone).
7. Give the "simultaneous method."
8. Give the "combination method."
9. What is the proper time to use the serum in a herd?
10. What are the differences between swine plague and cholera?
11. Give several points regarding bronchitis.
12. Give causes and symptoms of pneumonia.
13. What is said regarding the wide-spread existence of tuberculosis?
14. How does the feeding of raw skim-milk spread this disease?
15. Why are hogs sometimes bought subject to post-mortem inspection?
16. What can you say of the difficulty of detecting the disease?
17. Mention several preventive measures against tuberculosis.
18. Give causes and dangers of indigestion.
19. Give causes of and remedies for constipation.
20. Mention several causes of scours in young pigs.
21. What are some of the best remedies? How applied?
22. Mention causes and symptoms of infectious sore mouth.
23. What treatment is recommended?
24. Describe the disease called "thumps."
25. Give causes and treatment.
26. Give treatment for inflamed udder of sows.
27. What are good preparations to use on the skin for eczema?
28. In what sections of the country is rheumatism most prevalent?
29. Give its causes and prevention.
30. Give a description of the disease called rickets.
31. What precautions should be taken to prevent it?
32. What is said of the dangers of swine paralysis?
33. Describe mange, and give remedies.
34. Tell of the importance of the trouble from common round worms.
35. Describe the thorn-headed worm.
36. Where are pin-worms and whip-worms most commonly found in swine?
37. Mention several preventions and remedies for intestinal worms.
38. What are the dangers from lung worms?
39. What are the best means of preventing them?
40. Give reasons for examining the diseased parts of a hog after death.
41. Give suggestions as to methods of giving medicine to hogs.

CHAPTER XXXV.

COMPOSITION OF FEEDING STUFFS.

THE table which follows has been taken mainly from Prof. Henry's "Feeds and Feeding." The table is not complete, but it covers most of the feed-stuffs which are at all likely to be used for hogs, and a number which are not suitable for hogs are included for purposes of comparison.

It will be noted that the table gives the composition of the feed-stuffs, and not the digestible constituents. There are three main reasons for using this style of table in preference to one showing digestible constituents. In the first place, digestion trials are usually conducted with ruminants (sheep or cattle), and the digestive powers of ruminants, in some cases at least, are different from the digestive powers of the hog; consequently the table might be misleading if it purported to show the digestible matter only. In the second place, digestion trials have not been made with all of the feed-stuffs mentioned. Finally, in the case of feed-stuffs which are sold under guarantee, it is the composition and not the digestible matter which is shown in the analysis, therefore, when purchasing feeds, a table showing the composition of feed-stuffs would be much more valuable for purposes of comparison than one showing digestible matter.

Ash represents the mineral matter in the feed, and is useful in building up the skeleton of the growing animal.

Crude protein is the nitrogenous part of the feed, and is useful in forming muscle or lean meat, blood, milk, and nearly all tissues.

Carbohydrates are similar to starch or sugar in composition. It will be noted that they are divided into two classes, fibre and nitrogen-free extract. The former represents the woody portion of the feed, which is difficult to digest. The nitrogen-free extract is the more soluble and easily digested portion of the carbohydrates, as starch and sugar. Carbohydrates, in general, are useful in forming fat and keeping up the heat of the body.

Fat is the oily part of the feed, and its functions are similar to those of the carbohydrates.

It would be extremely valuable to the purchaser of feed-stuffs, if there were some exact means of arriving at the actual money value of a feed-stuff as compared with other feed-stuffs. Unfortunately, no such method of comparing values is available, but there are a few general facts, which may be helpful in studying the composition of a feed.

Generally speaking, home grown feeds are inclined to be low in protein, but contain an abundance of carbohydrates; consequently, a high percentage of protein is always a strong recommendation. Other things being satisfactory, we would be willing to pay more for a feed-stuff rich in protein in making a purchase.

On the other hand, a high percentage of fibre is always a serious objection, especially in feeds for hogs, because hogs cannot handle much fibre to advantage. Other things being nearly equal, the feed-stuff containing a high percentage of fibre is worth less per ton than one lower in fibre, but just how much less will depend upon the percentage of other constituents, and upon how much it exceeds the other in fibre.

Of course it stands to reason that a high percentage of water necessarily reduces the value per ton of a feed-stuff.

Average Composition of Feeding Stuffs.

Feeding Stuffs.	Water. Per cent.	Ash. Per cent.	Crude protein. Per cent.	Carbohydrates.			Fat. Per cent.
				Fibre. Per cent.	Nitrogen-free extract. Per cent.		
Acorns.....	55.3	1.0	2.5	4.4	34.8	1.9	
Alfalfa, green.....	71.8	2.7	4.8	7.4	12.3	1.0	
Alfalfa hay.....	6.4	8.6	16.3	27.1	39.2	2.4	
Alsike clover, green.....	74.8	2.0	3.9	7.4	11.0	0.9	
Alsike clover, hay.....	9.7	8.3	12.8	25.6	40.7	2.9	
Apple pomace.....	83.0	0.6	1.0	2.9	11.6	0.9	
Apples.....	80.8	0.4	0.7	1.2	16.6	0.4	
Artichoke, Jerusalem.....	79.5	1.0	2.6	0.8	15.9	0.2	
Barley.....	10.8	2.5	12.0	4.2	68.7	1.8	
Beet pulp, dried.....	8.4	4.5	8.1	17.5	60.8	0.7	
Beet pulp, wet.....	89.8	0.6	0.9	2.4	6.3	...	
Bermuda grass, green.....	71.7	2.1	2.2	5.9	17.2	0.9	
Brewer's grains, dried.....	8.7	3.7	25.0	13.6	42.3	6.7	
Brewer's grains, wet.....	75.7	1.0	5.4	3.8	12.5	1.6	
Broomcorn seed.....	12.8	2.8	9.9	7.0	64.3	3.2	
Buckwheat.....	13.4	2.0	10.8	11.7	59.7	2.4	
Buckwheat bran.....	8.2	4.9	12.6	32.9	37.9	3.5	
Buckwheat hulls.....	13.2	2.2	4.6	43.5	35.3	1.1	
Buckwheat middlings.....	12.8	5.0	26.7	4.4	44.3	6.8	
Buttermilk.....	90.1	0.7	4.0	...	4.0	1.1	
Cabbage.....	90.0	0.8	2.6	0.9	5.5	0.2	
Carrot.....	88.6	1.0	1.1	1.3	7.6	0.4	
Cassava.....	66.0	0.7	1.1	1.8	30.2	0.2	
Chufa.....	79.5	0.4	0.7	2.2	10.5	6.6	
Cocoanut cake.....	10.3	5.9	19.7	14.4	38.7	11.0	
Common beet.....	88.5	1.0	1.5	0.9	8.0	0.1	
Common millet, green.....	80.0	1.0	1.5	6.5	10.5	0.3	
Corn.....	10.6	1.5	10.3	2.2	70.4	5.0	
Corn-and-cob meal.....	15.1	1.5	8.5	6.6	64.8	3.5	
Corn cob.....	10.7	1.4	2.4	30.1	54.9	0.5	
Cotton seed.....	10.8	3.5	18.4	23.2	24.7	19.9	
Cotton-seed hulls.....	11.1	2.8	4.2	46.3	33.4	2.2	
Cotton-seed meal.....	7.0	6.6	45.3	6.3	24.6	10.2	
Cowpea.....	14.6	3.2	20.5	3.9	56.3	1.5	
Cowpea, green.....	83.6	1.7	2.4	4.8	7.1	0.4	
Cowpea hay.....	10.5	14.2	8.9	21.2	42.6	2.6	
Cow's milk.....	87.2	0.7	3.6	...	4.9	3.7	
Cow's milk, colostrum.....	74.6	1.6	17.6	...	2.7	3.6	
Crimson clover, green.....	80.9	1.7	3.1	5.2	8.4	0.7	
Distillers' grains, dried.....	7.6	2.0	31.2	11.6	35.4	12.2	
Dried blood.....	8.5	4.7	84.4	...	...	2.5	
Dried fish.....	10.8	29.2	48.4	...	...	11.6	
Emmer (speltz).....	8.0	3.9	11.5	11.1	62.9	2.2	
Flax seed.....	9.2	4.3	22.6	7.1	23.2	33.7	
Fodder corn, green.....	79.3	1.2	1.8	5.0	12.2	0.5	

Average Composition of Feeding Stuffs.—Continued.

Feeding Stuffs.	Water. Per cent.	Ash. Per cent.	Crude protein. Per cent.	Carbohydrates.		Fat. Per cent.
				Fibre. Per cent.	Nitrogen-free extract. Per cent.	
Gluten-feed.....	9.2	2.0	25.0	6.8	53.5	3.5
Gluten meal.....	9.5	1.5	33.8	2.0	46.6	6.6
Hairy vetch, green.....	85.3	2.1	3.6	4.0	4.6	0.4
Hairy vetch, hay.....	11.3	7.9	17.0	25.4	36.1	2.3
Hog millet, green.....	80.0	1.4	1.5	6.5	10.2	0.4
Hominy feed (chop).....	9.6	2.7	10.5	4.9	64.3	8.0
Horse bean.....	11.3	3.8	26.6	7.2	50.1	1.0
Horse beans, green.....	84.2	1.2	2.8	4.9	6.5	0.4
Hungarian grass, green....	71.1	1.7	3.1	9.2	14.2	0.7
Hungarian grass seed.....	9.5	5.0	9.9	7.7	63.2	4.7
Kafir.....	9.9	1.6	11.2	2.7	71.5	3.1
Kentucky blue grass, green.....	65.1	2.8	4.1	9.1	17.6	1.3
Linseed meal, new process.....	9.0	5.5	37.5	8.9	36.4	2.0
Linseed meal, old process.....	9.8	5.5	33.9	7.3	35.7	7.8
Malt sprouts.....	9.5	6.1	26.3	11.6	44.9	1.6
Mangels.....	90.9	1.1	1.4	0.9	5.5	0.2
Meat and bone meal.....	6.0	37.4	39.5	...	6.3	10.8
Meat scrap.....	10.7	4.1	71.2	...	0.3	13.7
Millet seed.....	12.1	2.8	10.9	8.1	62.6	3.5
Milo maize seed.....	9.0	2.3	10.7	3.0	72.2	2.8
Molasses beet pulp, dry.....	7.0	5.5	9.6	16.1	61.3	0.5
Molasses, black strap.....	20.9	8.8	...	...	60.4	...
Molasses, Porto Rico.....	25.9	6.3	2.7	...	65.1	...
Oat dust.....	6.5	6.9	13.5	18.2	50.2	4.8
Oat feed.....	7.0	5.3	8.0	21.5	55.3	2.9
Oat hulls.....	7.4	6.7	3.4	30.7	50.5	1.3
Oat middlings.....	8.8	4.5	16.2	7.1	56.5	6.9
Oats.....	10.4	3.2	11.4	10.8	59.4	4.8
Oats and peas, green.....	79.7	1.6	2.4	6.1	9.6	0.6
Oats and vetch, green.....	80.0	1.8	3.0	6.3	8.4	0.5
Orehard grass, green.....	73.0	2.0	2.6	8.2	13.3	0.9
Palmnut cake.....	10.4	4.3	16.8	24.0	35.0	9.5
Parsnips.....	88.3	0.7	1.6	1.0	10.2	0.2
Pasture grass.....	80.0	2.0	3.5	4.0	9.7	0.8
Peanut cake.....	10.7	4.9	47.6	5.1	23.7	8.0
Peanut kernels, without hull.....	7.5	2.4	27.9	7.0	15.6	39.6
Peanut vine, hay.....	7.6	10.8	10.7	23.6	42.7	4.6
Peas, Canada field.....	15.0	2.4	23.7	7.9	50.2	0.8
Peas, Canada field, green.....	84.7	1.3	2.8	4.4	6.3	0.5
Potatoes.....	79.1	0.9	2.1	0.4	17.4	0.1
Potato pomace.....	91.7	0.3	0.7	1.0	6.4	0.1
Pumpkin.....	90.9	0.5	1.3	1.7	5.2	0.4
Rape.....	85.7	2.5	2.2	2.1	7.0	0.5
Rape-seed cake.....	10.0	7.9	31.2	11.3	30.0	9.6

Average Composition of Feeding Stuffs.—Concluded.

Feeding Stuffs.	Water. Per cent.	Ash. Per cent.	Crude protein. Per cent.	Carbohydrates.		
				Fibre. Per cent.	Nitrogen-free extract. Per cent.	Fat. Per cent.
Red clover, green.....	70.8	2.1	4.4	8.1	13.5	1.1
Red clover, hay.....	15.3	6.2	12.3	24.8	38.1	3.3
Red dog flour.....	9.9	2.6	18.4	3.0	63.5	4.0
Rice.....	12.4	0.4	7.4	0.2	79.2	0.4
Rice bran.....	9.7	9.7	11.9	12.0	46.6	10.1
Rice hulls.....	8.8	15.6	3.2	36.2	35.2	1.0
Rice meal.....	10.2	8.1	12.0	5.4	51.2	13.1
Rice polish.....	10.8	4.8	11.9	3.3	62.3	7.2
Rough rice.....	11.2	4.9	7.3	8.0	66.6	2.0
Rutabaga (Swede turnip)	88.6	1.2	1.2	1.3	7.5	0.2
Rye.....	8.7	2.1	11.3	1.5	74.5	1.9
Rye fodder.....	76.6	1.8	2.6	11.6	6.8	0.6
Rye middlings.....	11.8	1.7	14.3	2.4	66.9	2.9
Sanfoin, green.....	75.0	2.1	4.4	6.0	11.6	0.9
Sanfoin, hay.....	15.0	7.3	14.8	20.4	39.5	3.0
Skim milk, centrifugal.....	90.6	0.7	3.1	....	5.3	0.3
Skim milk, gravity.....	90.4	0.7	3.3	....	4.7	0.9
Sorghum fodder, green.....	79.4	1.1	1.3	6.1	11.6	0.5
Sorghum seed.....	12.8	2.1	9.1	2.6	69.8	3.6
Sow's milk.....	80.8	1.1	6.2	....	4.8	7.1
Soy-bean.....	11.7	4.8	33.5	4.5	28.3	17.2
Soy-bean, cake.....	11.3	5.9	42.7	6.0	28.1	6.0
Soy-bean, green.....	75.1	2.6	4.0	6.7	10.6	1.0
Starch feed, wet.....	68.8	0.4	5.0	2.9	19.9	3.0
Sugar beet.....	86.5	0.9	1.8	0.9	9.8	0.1
Sugar-beet molasses.....	20.8	10.6	9.1	....	59.5	....
Sugar cane, green.....	84.2	1.1	1.2	4.0	9.0	0.5
Sunflower seed.....	8.6	2.6	16.3	29.9	21.4	21.2
Sunflower-seed cake.....	10.8	6.7	32.8	13.5	27.1	9.1
Sweet potato.....	68.3	1.1	1.9	1.1	26.8	0.7
Tankage.....	7.0	15.9	53.9	5.8	5.6	11.8
Timothy, green.....	61.6	2.1	3.1	11.8	20.2	1.2
Turnip, fall.....	90.1	0.9	1.3	1.2	6.3	0.2
Velvet bean, green.....	82.2	1.9	3.5	5.1	6.6	0.7
Wheat.....	10.5	1.8	11.9	1.8	71.9	2.1
Wheat bran.....	11.9	5.8	15.4	9.0	53.9	4.0
Wheat flour.....	12.4	0.4	12.0	....	74.0	1.2
Wheat middlings, flour.....	10.0	3.2	19.2	3.2	59.6	4.8
Wheat middlings, standard (shorts).....	11.2	4.4	16.9	6.2	56.2	5.1
Whey.....	93.8	0.4	0.6	5.1	0.1

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