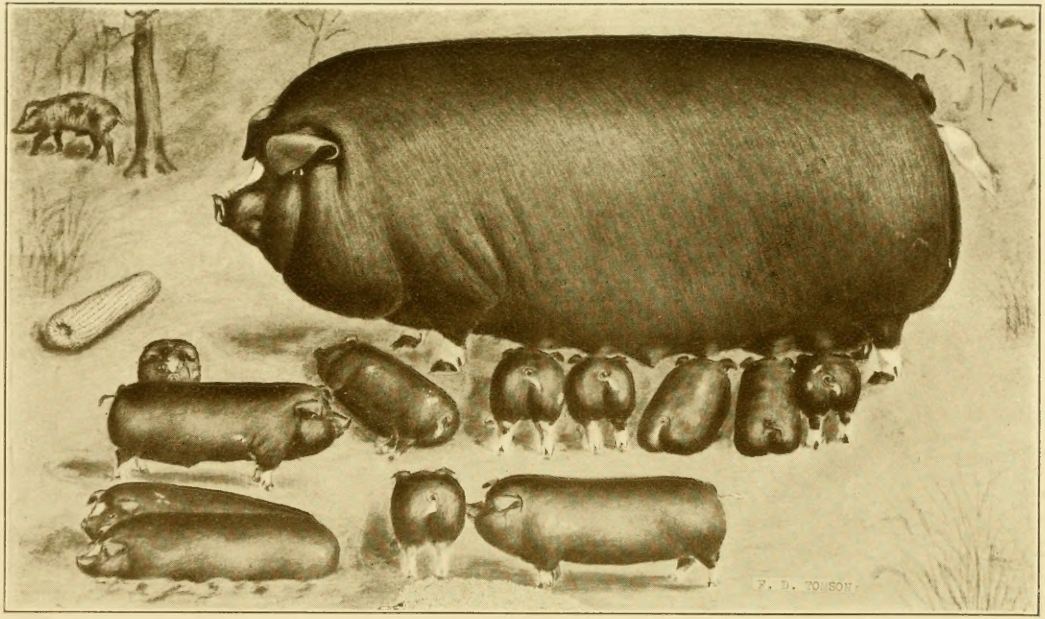

THE AMERICAN FARM-MORTGAGE-REMOVERS

# Swine in America

## A Text-book for the Breeder, Feeder & Student

¶ I have not great learning, but what little I have acquired was paid for from the proceeds of some wheat and hogs.— *Benjamin Harrison*

¶ In the American Hog we have an automatic, combined machine for reducing the bulk in Corn and enhancing its value. He is also a mint, and the Corn of our common country is the bullion he transmutes into golden coin. —*J. Sterling Morton*

*By* F. D. Coburn
Secretary Kansas Department of Agriculture

*Illustrated*

NEW YORK
ORANGE JUDD COMPANY
LONDON
KEGAN PAUL, TRENCH, TRÜBNER & CO., Limited
1912

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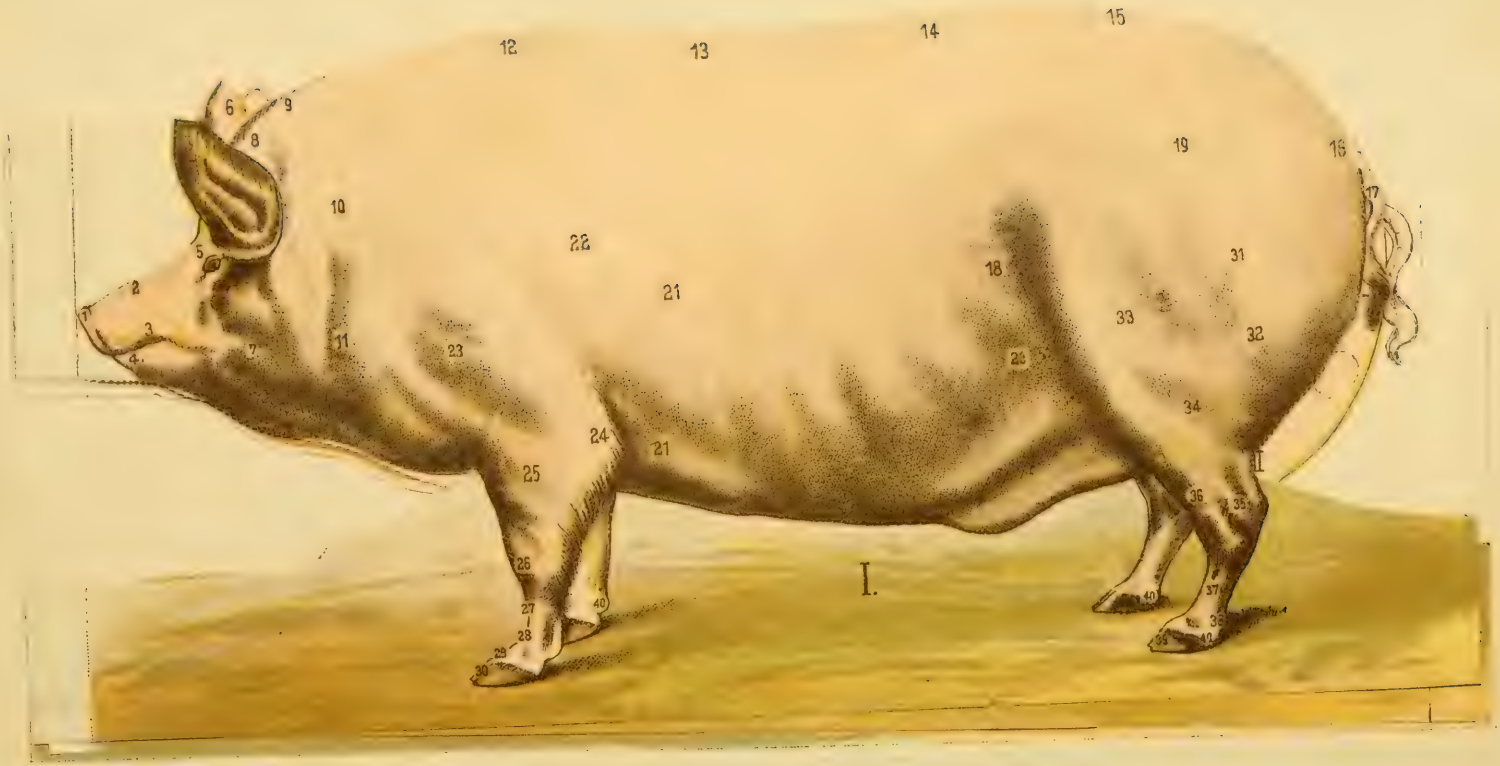
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# EXPLANATION OF COLORED PLATE ON SWINE

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1 Snout
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5 Eye
6 Ear
7 Jowl
8 Occiput
9 Nape of neck
10 Neck
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17 Tail
18 Side
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26 Knee joint
27 Shank
28 Pastern
29 Crown of hoof
30 Hoof
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32 Ham
33 Knee joint
34 Lower leg
35 Hock
36 Hock joint
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40 Hind hoofs

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8 Lachrymal
9 Nasal
10 Os rostri
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19 Dorsal vertebrae
20 Lumbarvertebrae
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22 Caudal vertebrae
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26 Ilium
27 Ischium
28 Pubis
29 Hip joint
30 Scapula
31 Humerus
32 Radius
33 Ulna
34 Knee joint
35-40 Carpal bones
41 Metacarpals
42 Cannon bones
43 Coronary
44 Coffin bones
45 Femur
46 Patella
47 Tibia
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56 Metatarsals
57 Cannon bones
58 Coronary bones
59 Coffin bones

### Blood System

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VI Right fore foot
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IX Kidney
X Largest intestines
XI Small intestines

Arteries red, veins blue

#### ARTERIES

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2 Posterior aorta
3 Brachio-cephalic
4 Left subclavian
5 Dorsal
6 Deep cervical
7 Vertebrarterial
8 Cephalic
9 Inner thoracic
10 Outer thoracic
11 Coronary
12 Tracheal
13 Esophageal
14 Omocervical
15 Temporal
16 Masseter branch of same
17 Anterior auricular
18 Facial
19 Lower labial
20 Upper labial
21 Infraorbital
22 Upper nasal
23 Brachial
24 Humeral
25 Radial
26 Digital
27 Intercostal
28 Anterior abdominal aorta
29 Anterior mesenteric
30 Renal
31 Lumbar
32 Branch to ureter
33 Inner spermatic
34 Posterior mesenteric
35 Outer spermatic
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38 Pudic
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46 Lateral caudal
47 Rectal
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52 Tarsea perforans
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9 Buccal
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24 Deltoid
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27 Extensor of foot
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29 Sterno-humeral
30 Outer oblique abdominal
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35 Thigh extensor
36 Semitendinosus
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38 Superficial gluteal
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40 Extensor of foot
41-44 Toe extensors
45-46 Flexors of foot
47 Extensor pollicis
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50-51 Flexors of foot
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18 Right ventricle
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21 Auricles
22 Mouth
23 Tongue
24 Pharynx
25 Esophagus
26 Stomach
27 Mucous folds of stomach
28 Spleen
29 Small intestines
30 Caecum
31 Colon
32 Rectum
33 Anus
34 Left kidney
35 Ureter
36 Bladder
37 Prostate gland
38 Penis
39 Sigmoid flexure of same
40 Gland of same
41 Testicles
42 Vas deferens
43 Liver
44 Left lobe of same
45 Right lobe of same
46 Abdominal cavity
47 Pelvic cavity

# CONCERNING THE ILLUSTRATIONS

¶ Of some of the illustrations in this volume it may be said by the censorious that they exaggerate; that they are overdone, and that there never were animals of the porcine tribe so nearly perfect as the illustrations represent. There is but a measure of truth in this, and persons familiar with the foremost animals of the different breeds know there have been and are innumerable individuals equal if not superior to any in pictures drawn or published in good faith. In fact, a photograph, directly from life too, owing to difficulties which photographers and artists understand, is more liable to do the original an injustice than an artist's drawing is to flatter it. It is no untruth to say there has seldom been made a photograph, or its faithful reproduction, of a highly developed domestic animal that was fair to the original until corrected with pencil and brush and tool. Again, the illustrations which might be criticised as most extravagant are those of animals — when at their very best—fitted and fattened to the highest degree that experience and skill have made possible, and only those observant of and familiar with such results and the means by which they are produced know they are attainable. Those acquainted only with the ordinary farm hog, in his everyday form and more or less soiled apparel, can scarcely comprehend the extent to which his high-bred, educated, and richly fed relatives may become marvels of porcine beauty and behavior when bathed, anointed, manicured and curled. It is as incredible to them as that a two-months pig can be trained to walk and perform tricks upon a tight-rope in a circus, yet this is a fact to which many thousands can bear witness.

¶ These pictures are not presented as illustrations of what more than a rare few are likely to equal, but rather that students and the ambitious may observe the degree of perfection to which improvement can be and has been pushed, and be assured that similar achievements are possible because such possibilities have already been many times demonstrated.

¶ To those unacquainted with the business of fitting and exhibiting, too, it is but fair, if not clearly a duty, to say that the animals seen at the leading shows may be considered as looking the best that the best individuals in the hands of expert breeders, fitters and showmen can possibly be made to look, with the best of care and food, under the most skillful management, and without serious regard for expense or economy. Also, that except in the hands of others equally skilled and equally regardless of time, expense and effort they will probably never look so well again.

THE AUTHOR.

# SWINE IN AMERICA

## *and Its Author*

Introduced by Prof. W. A. Henry

---

Thirty-odd years ago F. D. Coburn gave to the American farmer the best book we have had on swine husbandry. Since then the subject has grown and Mr. Coburn has grown, and all these intervening years, while growing, he has been collecting, sifting and arranging matter for a larger and far more complete work. A really good book is not the product of a month or a year, but rather the fruitage of a wholesome, industrious lifetime of observation, accumulation and refined wisdom.

There still remains in this country a limited number of farmers who harbor a mild enmity and narrow suspicion toward those who write books on agriculture, or those who read such books. It is a steadily diminishing number, fortunately. Now, reader, suppose that you and I were to meet a successful farmer or stockman on the highway, at a farmers' picnic, on the railway train, or any other place, and drew from him practical, helpful observations and experiences in the line in which he excelled; we would not only be interested, but also regard what he said as something practical and helpful. We would both agree that such information was practical. Now, suppose we had a stenographer to take down not

only what this man said, and to write out his experiences, but also those of hundreds of other successful men along the same line. Suppose, further, that we placed all this matter in the hands of a careful, capable person, who would arrange, condense, and express in a simple, plain, helpful way all that he had so accumulated. Would any of the information so gathered be less valuable because it finally appeared in print than if it were to fall on the ear, soon to be largely forgotten and lost? The middleman in agriculture is just as important in his way as is the practical man, who produces; we must have both, and let us appreciate both and despise neither.

Mr. Coburn occupies a large place in the hearts of American farmers—a place peculiarly his own, for there is none other just like him. He has given us other books, but this will, without doubt, be what those who are learned would call his "*magnum opus*," which is simply Latin for "great work." Since Mr. Coburn writes in good, substantial English, that everybody can understand, this is probably the only Latin that will appear in his book.

I have said nothing about the hog, for Mr. Coburn will fill to the limit every page that follows, with useful information concerning that most useful, humble member of the farm domain.

W. A. HENRY.

University of Wisconsin, College of Agriculture, Madison, Wis.

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# LIST OF ILLUSTRATIONS

# SWINE IN AMERICA.

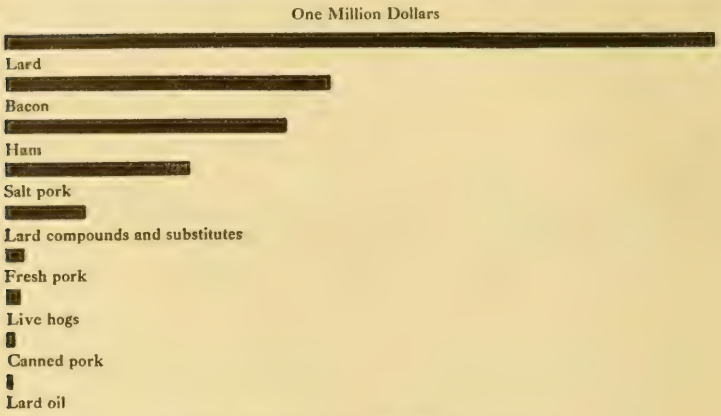
## CHAPTER I.

## Their Numbers, Importance, Distribution, Markets and Values.

America, and especially the United States, is the great swine-producing region of the world. The principal seat of this industry is the Mississippi valley, where Indian corn is grown in greatest abundance and at least expense. Nowhere else are the conditions so favorable; nowhere else are grain and pasturage, the basis of all economical meat production, grown in such profusion or to such advantage. It is this territory to which frequent allusion is made in this volume as the corn belt. It is the cornfield, not only of America, but of the world.

North America has in round numbers 58,000,000 swine, of which 95 per cent are in the United States and 5 per cent in Canada. These constitute almost half the hogs in the world. The United Kingdom has but about 3,500,000. The value of the swine industry to the United States is graphically represented below by the one item of its surplus products exported each year to other countries. The enormous value of these amounts to $130,000,000 annually.

VALUES OF EXPORTS OF SWINE PRODUCTS DURING THE YEAR ENDING JUNE 30, 1907

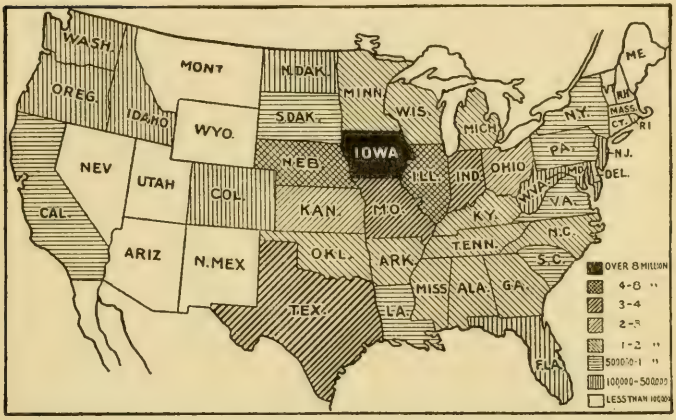



## THE LEADING SWINE STATES

The number of hogs in the United States January 1, 1908, in thousands, as reported by the Department of Agriculture was 56,084,000. Of these, 69 per cent were in 12 states, as follows:

| States | Number of Swine |
|---|---|
| Iowa | 8,413,000 |
| Illinois | 4,672,000 |
| Nebraska | 4,243,000 |
| Missouri | 3,593,000 |
| Indiana | 3,159,000 |
| Texas | 3,147,000 |
| Kansas | 2,663,000 |
| Ohio | 2,559,000 |
| Wisconsin | 1,910,000 |
| Georgia | 1,599,000 |

| States | Number of Swine |
|---|---|
| Tennessee | 1,502,000 |
| Michigan | 1,388,000 |
| Total | 38,848,000 |



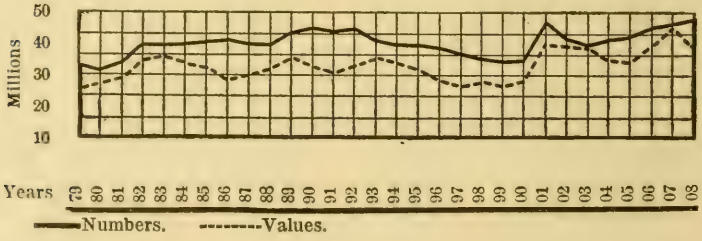

DISTRIBUTION OF SWINE IN THE UNITED STATES

From the foregoing it is seen that the bulk of the surplus swine of the world—the surplus from which armies, navies, and nations less fortunate than ours are fed—is grown in a strip of the United States, the principal waters of which find their outlets to the sea through the Mississippi river. The great swine states also coincide remarkably with the great corn states. It will be seen in the map above that in numbers the swine of America are gathered about a center in the state of Iowa. All of the great corn states show totals amounting to millions. The southern, eastern and far western states comprise a territory showing a much smaller number of

swine, and in New England and the Rocky mountain states the total number falls to the minimum.

### THE WEALTH THAT SWINE REPRESENT

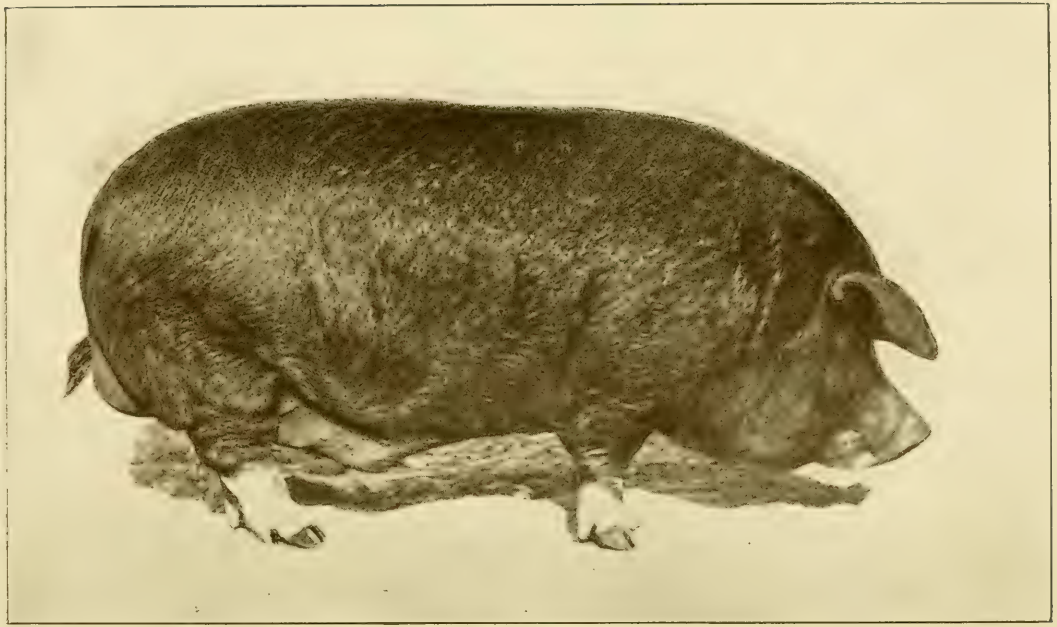
The value of the swine in the United States in January, 1908, was $339,030,000, and in 12 states alone they were valued at $239,317,000, which shows the degree to which swine raising has been concentrated in a few states of the corn belt. The values in these states do not follow the order of numbers, as will be seen by referring to the Appendix at the close of this volume. Texas, for instance, has over 3,000,000 head, valued at $16,500,000. In numbers Texas exceeds Ohio by over half a million, while in values Ohio leads Texas by over $100,000. Similar contrasts may be noted as to numbers and values in other states. The larger value per head in certain states may be attributed in a great measure to improved breeding in those states.




CHANGES IN NUMBERS AND VALUES OF SWINE FOR 30 YEARS.

The numbers and farm values of swine for the past 30 years have shown a somewhat irregular increase. From


A PAIR OF KANSAS-REARED POLAND-CHINAS



A FAMOUS POLAND-CHINA BOAR

a total of 34,766,000 in 1879 to 56,084,000 in 1908, the numbers have increased. During the same interval the total farm value has grown from $110,508,000 in 1879 to $339,030,000 in 1908. Annual changes of numbers and values are shown on page 4, based upon the table in the Appendix. It will be noted that the changes in numbers and values have followed each other, except in a few instances, the general trend, however, being the same.

### THE GREAT HOG MARKETS AND PACKING CENTERS

The number of hogs slaughtered at the principal packing points in the United States in the year ending March 1, 1908, was reported as 34,400,000, averaging 226.58 pounds per head, and costing the packers $5.52 per 100 pounds, or a total of $427,353,000. Of these hogs 27,981,000, costing $350,053,000, were slaughtered at what are called western packing points; i. e., not east of Cincinnati, Indianapolis and Chicago. The average yield of lard for all was 14.35 per cent, or 32.51 pounds.

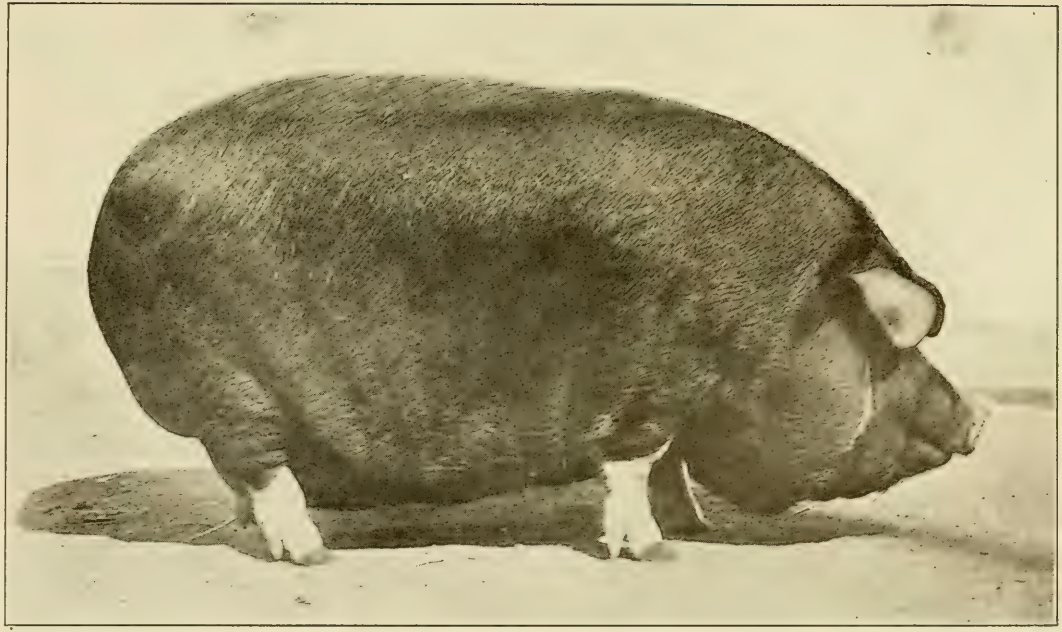
The greatest swine market as well as hog slaughtering point in the world is Chicago. There have been marketed there 87,716 hogs in one day (February 10, 1908); more than 300,000 in a single week; more than 1,100,000 in a month, and nearly 9,000,000 in a year. Of these, about 7,500,000 were slaughtered in Chicago establishments. The total number received there in the 42 years since the Union stock yards were established (to and including the year 1907) is a little less than 247,000,000. In the year last named the receipts were 7,201,061 head, or 101,122

carloads, valued at $102,918,041, or an average price of $6.10 per 100 pounds, live weight, for all kinds and qualities, their average weight being 234 pounds.

The second most extensive hog market in the world, and packing point as well, is Kansas City, Kansas, where, since the establishment of stock yards there in 1871, to December 31, 1907, were received 67,689,255 swine. The receipts in 1907 were 2,923,777 head, having, alive, an average weight of 212 pounds. Of these 2,729,628 head were used by local slaughterers. The largest receipts for a day at Kansas City were 34,334 head; for a week, 132,030; for a month, 503,514 (January, 1908); for a year, 3,716,404 head, or 37,752 carloads. Of these but 1,570 carloads were reshipped. In the month of January, 1908, the hogs slaughtered by Kansas City packers numbered 548,264.

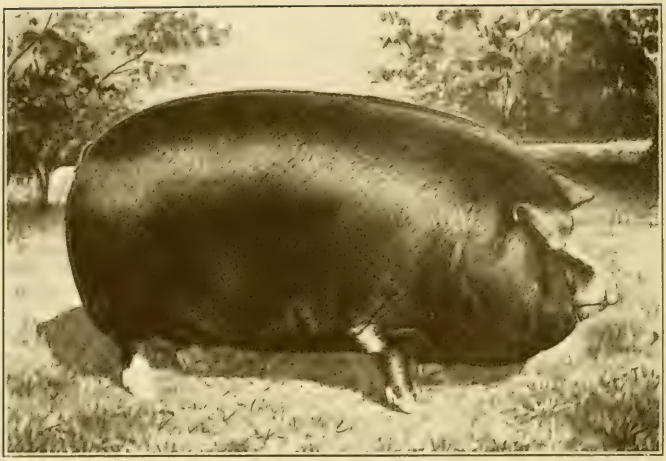
Omaha, like Kansas City, a Missouri river town, is the world's third swine market and packing metropolis. In the 24 years, including 1907, since stock yards were established there the receipts of live hogs have exceeded 39,000,000 head. The receipts there for the calendar year 1907 were 2,253,652 head, and the number packed was 2,150,244. Their average live weight was (about) 250 pounds.

Cincinnati, which fifty years before was supposedly the center, and would remain the headquarters of the swine-growing industry, then leading all the world as a hog-killing point, occupied in 1907 but eighth place in such a list; and seven cities, viz., Chicago, Kansas City, Kansas, Omaha, St. Louis, St. Joseph, Indianapolis and



**POLAND-CHINA SOW, U. S. PERFECTION 133834**

Senior champion sow of her breed at the World's Fair, St. Louis, 1904



Poland-China Sow, Lady Lucile 222222

A Great Poland-China Boar

Milwaukee, which have grown up to the west and northwest, annually slaughter from two to ten times as many swine as are killed at Cincinnati.

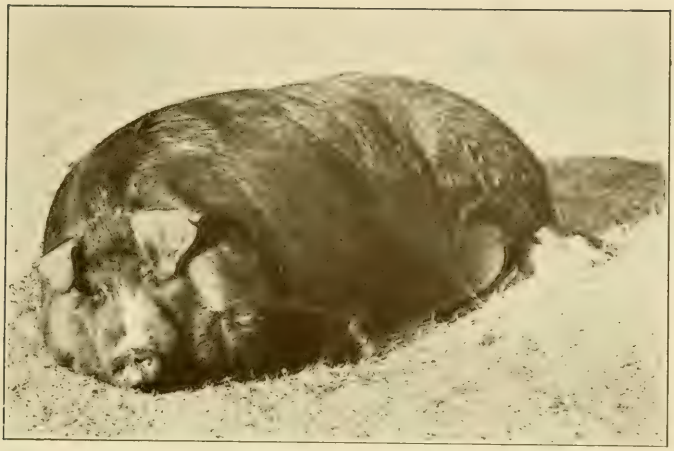
### CHANGES IN SWINE, AND VARIATIONS IN VALUES

Since about the year 1865 importation, crossing, selection, castration, feeding and careful study have wrought wonderful changes in the swine of America. Objectionable characteristics have been bred out and fed out, weight of undesirable or cheap parts lessened, that of the more valuable parts augmented, and the tendency to early maturity increased 30 to 50 per cent. The proportion of pure-breds, or animals that, if used for breeding purposes, would improve the quality of the general stock, is greater by several hundred per cent; the proportion of improved blood prevalent in the general stock is a thousand-fold greater, and the spirit of further improvement has been, and is abroad everywhere, but to a much greater degree in some sections of the country than in others. A striking indication of the correctness of this latter statement is disclosed in the values placed by the presumably impartial United States Department of Agriculture on the swine in the different states. For example, the report for January 1, 1908, rates the hogs of Florida at $3.75 per head; of Arkansas, $3.80; of Mississippi and Louisiana, $4.50; Alabama and Kentucky, $4.60; and Tennessee, $4.65. The same report gives the value of Connecticut hogs as $10.50 each; Massachusetts, $10.25; Rhode Island, New Jersey, Montana and Nevada, $10; New York, $8.90; Pennsylvania, $7.80; Illinois, $6.60; Iowa, $6.50,

etc. While it would probably be quite misleading to aver that the higher values accredited to some of the states stood for the much greater improvement or superiority their proportions would suggest, it is safe to say that the lower values represent and are due to lack of and indifference to swine improvement in the states to which the astonishingly lower figures are ascribed. The figures do not signify that there are not swine of good breeding and quality in all of the states having the low values, but in whatever measure the estimates point to a low general average in quality and breeding, and lack of interest in swine production, they are close to the borders of accuracy.

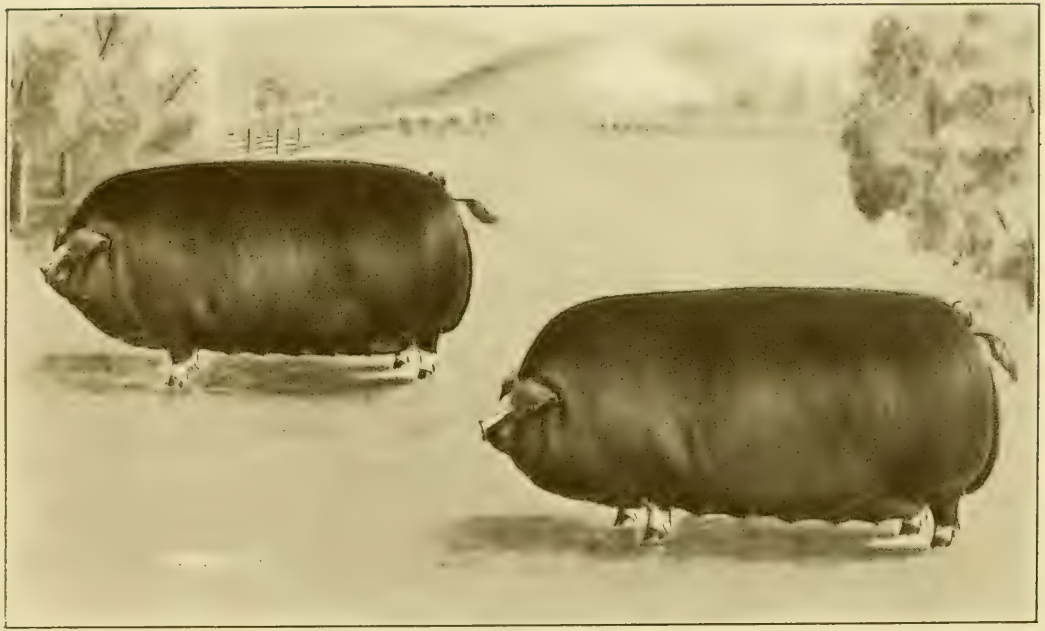
Their value is not given as averaging nearly so high, yet in Iowa, Illinois, Ohio or Kansas, there are doubtless a hundred hogs to one of as good quality in Massachusetts, Connecticut or Rhode Island, the limited number in the latter named states, and their being maintained chiefly for the family pork barrel, in very small groups, under the most favorable conditions and with much better individual care, making easily possible a higher average in both individual value and quality—not in any wise for breeding purposes, but for immediate consumption—than is profitably attained under the conditions existing and practices prevailing in the vast territory where farms turn off swine, at intervals throughout the year, by carloads

Fifty years ago large size, almost regardless of the time required for its attainment, was in the grower's eye an important object, but conditions have changed to such



A 400-pound Poland-China Barrow at 9½ Months

Poland-China Boar, Heavyset 96607, a Great Prize-Winner



**TWO GREAT POLAND-CHINA SOWS**

These meet the breeder's ideals

an extent that now the old-time mammoth is no longer reared or wanted, and his possession, even though he were champion, would cause the producer to be pitied rather than envied. The tendency is toward breeds and combinations of breeds that will give, with generous keep, a vigorous animal of 175 to 400 pounds, of flesh rather than lard, with 15 months as the maximum time for making the heaviest weight.

### LIVE WEIGHTS AND LARD AVERAGES

The average live weight of hogs packed in the West during the winter seasons (ending March 1) and their average yield of lard, in pounds, for 30 years from 1879 to 1908, has shown a fairly steady decline. According to figures compiled by the *Cincinnati Price Current* the heaviest average weight was 271 pounds in 1879 and the lightest yearly weight was 206 pounds in 1902. For the last five years the average weights have ranged around 223 pounds, as shown in detail in the Appendix.

The average weight of hogs and yield of lard from hogs packed in the West during the summer seasons (ending November 1) for 16 years from 1892 to 1907 has shown but a slight change from 241 pounds in 1896 to 230 pounds in 1907. The exact weights for each year are given in detail in the Appendix.

### YEARLY COST OF HOGS

The cost per 100 pounds of hogs, alive, packed in the West in summer and winter seasons has fluctuated greatly

during the last 24 years, as tabulated by the *Price Current*. The lowest cost was reached in 1896-97, estimated at $3.30 per 100 pounds. The highest cost yet recorded was that in 1902-03, when it reached $6.81 per 100 pounds. Figures for each year from 1883-84 to 1907-08 are given in the Appendix.

### EXPANSION OF THE SWINE AND CORN-GROWING INDUSTRY

That the swine interest has been one of steady and constant expansion, and has followed and been contemporaneous with the expansion of the American cornfield is well attested by official statistics. These show that 40 years ago there were 24,693,000 hogs in the United States, and the corn crop was 768,320,000 bushels, and that in four decades since the hogs have increased (127 per cent) to 56,084,000 head, and the corn yield to 2,592,320,000 bushels.

### IMPROVEMENTS MADE AND THE ROOM FOR OTHERS

It is probable that but a very moderate per cent of all the swine raised for pork are pure-breds, or of a single breed. A majority are black, with slight markings of white, mostly confined to the feet, face and tip of tail, and in that respect more like the Berkshires than any other breed. A percentage of these are Poland-Chinas and Berkshires, but a largely preponderating number are a mixture of these two breeds. Spotted black and white hogs are extremely rare, which indicates that the direct crossing of black breeds with white is practiced but little;

likewise an entirely black hog is rather an unusual sight. Sandy hogs spotted with black are not uncommon, and are the results, generally quite satisfactory, of interbreeding swine largely black with the reddish Duroc-Jerseys or the Tamworths.

By the use of pure-bred sires, particularly, the work of improvement is pushed forward every year, and the scrub is being steadily eliminated. This is especially true in those states where swine husbandry has largest recognition as a profitable factor in agricultural prosperity. High-class agriculture comprehends high-class animal husbandry, and, conversely, a shiftless agriculture is satisfied with and lends countenance to a low grade of farm animals. There is no exception to this.

However, in spite of the constant improvement going on for so long a time, there is yet ample room for much more, even in those sections where advancement has been most general. The reasonable explanation of this, strange as it may seem, is the indifference to, or failure to recognize, the benefits that accrue from the persistent use of pure-bred sires, and being shiftlessly content to use grades or nondescripts because of the supposed saving of five or ten dollars in original cost. If attention is paid at all by the owners of such stock to the character of the sire (which too often is not the case) a pig of some home litter, of no particular blood, breeding, or possible prepotency, is reserved for or permitted to do service, and that too under conditions and in an environment adapted to making a scrub of him and likewise of his get. Persisted in, this can lead only to chaos

so far as quality or any desirable uniformity is concerned, and while by no means the rule it is yet unnecessarily and unjustifiably common. The encouraging feature of the situation as it exists is that reliable material with which to work improvement was never before so abundant, so readily available, and at a cost so nearly nominal—almost unappreciable considering possible results—as in the first decade of the twentieth century.

CHAPTER II.

# The Breeder and Breeding

The hog is more of an individual than a machine, and his breeder should treat him as such. Methods which may be accepted as established have been worked out in swine breeding, but adherence to all of them cannot, for many practical reasons, be rigid. The breeder himself, his breeding stock, environment, feed resources, climate and other factors are so largely involved that one man's success may spell another man's failure. A common-sense type of hog in the hands of a common-sense breeder constitutes a combination best calculated for satisfaction and profit during a succession of years.

Live stock husbandry represents a high type of constructive effort, and swine breeding offers as much satisfaction and gain as any other branch. It may profitably engage the attention of the man who raises hogs merely from financial motives, but a breeder who attains a foremost place in his calling has an interest in his business not inspired solely by rewards in money. The compensations of swine raising are ample for the man who desires to make his work a profession, as hundreds who have a just pride in their achievements can testify.

Intelligence used in his breeding and care has raised the hog from the plane of the veriest savage, unsought except when hunted like any other wild beast, to that of

a benefactor, contributing a wide variety of meats, among them the most toothsome known to the epicure, and other products essential to the best tables, to commerce and to the trades. The hog's disposition has yielded to the influence of good breeding and changed from that of the outlaw, ready for conflict with man or beast, to the peaceable temperament belonging with propriety to the barnyard resident. His conformation has been molded by skillful methods from bony, angular uncouthness into a structure of massive width, depth and thickness, affording a marvelous yield of pork and lard. Incidentally, by domestication and generations of breeding him for early maturity and quick fattening, the length of his intestines has been increased, it is claimed by scientists, more than 130 per cent

### EFFECT OF ENVIRONMENT

Swine are as susceptible as other animals to the influences of environment, and three or four generations cover a period long enough to bring about great changes in them. Experiments made at the Wisconsin station in crossing the wild or Razor-Back hogs and their crosses with the improved and approved breeds showed that a marked improvement in appearance and quality in the wild hogs' progeny was possible, although in constitution and gains of flesh they did not compare with pure-breds. The second generation, as may be seen by the illustration at the beginning of this chapter, does not give marked evidence of Razor-Back ancestry. Yet when cholera struck the station herds these supposedly

hardier hogs were the first to succumb. Their feeding habits were irregular; on one day they would gorge themselves so that they would be found fasting for the next day or more. These compelling forces of heredity made plain that both right breeding and right environment are essential to the attainment of right results. At the same time environment may be, in some cases, as destructive in its results as in other cases it is beneficial. Swine typical of the best breeding require but two or three generations of wrong environment to degenerate to the level of the most unapproved types. Much, therefore, depends upon the breeder and his provisions for and care in handling.

### BREEDING AS A BUSINESS

Breeding is a business and should be conducted on that basis. Whether supplied with unlimited capital or restricted to a few hogs and meager facilities the breeder has excellent opportunity to exercise his business sense, and swine raising will pay him well therefor. The man who is careless or indolent may have as much or more ill "luck" in raising hogs as in any other similar undertaking.

When hogs for some time bring more than ordinarily high prices the tendency and temptation are for rushing pellmell into swine raising, and likewise to be forgetful of quality in obtaining quantity. It has always been so, and probably always will be. But the author's observation is that it has taken persistent and skillful mismanagement to lose money in hog raising with prices as they have ranged for 30 years past, barring, of

course, some such epidemic as the so-called cholera. There is no branch of farming or stock husbandry which, conducted with a reasonable amount of fair horse sense and stayed with systematically, one year with another, will do better by its proprietor [illegible] more successfully keep the wolf and sheriff from his door than the rearing of well-bred swine. This, if he is satisfied with reasonable gains and such substantial, steady growth as pertains to the better class of farming, conducted with skill and intelligence. If the experience of the best men is worth anything, if their observations and bookkeeping have any value as standpoints from which to judge, there is surely a profit in wisely bred, wisely fed hogs, and there always has been, at any price for which they have been sold two years in succession within the observation of men now in active life.

As a good business man, the breeder should inquire into his own qualifications and special fitness for raising swine. In any line of work, and especially in agriculture, the man who would obtain results must possess and apply enthusiasm, method, energy and knowledge. Whosoever lacks at least the germ of each of these errs when he begins. No man in whom there was not born a pleasure in the handling and care of animals should have anything to do with live stock husbandry. His efforts will not advance the development of any breed, nor is he likely to ever become the shipper of any market-toppers. The shiftless, careless man whose study is to devise plans for avoiding work, to whom feeding his animals is a drudgery, and their

cleanliness and exercise too unimportant for special attention, may make a reputation, but it will be one that is unenviable and unsalable. If he cannot interest himself in his work and enjoy results attained by systematic and persistent effort, he will more than likely find swine raising too taxing for his capacity.

Some knowledge of hogs and their rearing is essential, but an inexperienced man with an open mind may accomplish much. He has many sources of information—his neighbors and other breeders who have had practical experience, the standard and current literature on swine, the work of the state and national agricultural departments and stations, the agricultural press, meetings of breeders, farmers' institutes, and others. No one knows everything about swine husbandry, but anyone with a desire for knowledge can find abundant opportunity to learn. An excellent principle worth recalling in this connection is that wrong practices once acquired are difficult to overcome, just as wrong traits bred into a herd require a long time for eradication. Slow, but sure, is a good motto for the swine breeder.

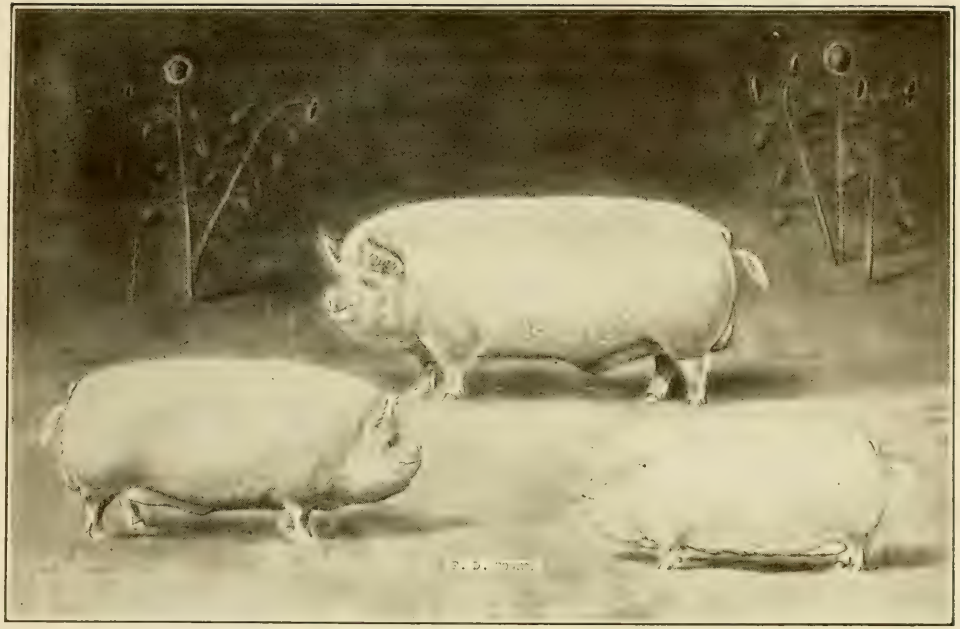
Perhaps the most important characteristic the breeder should possess is love for his work. The man who is not willing to be more than a mere owner and marketer of his swine is not likely to make any large gains. He must be their friend as well; one whose steps they learn to recognize and whom they will not object to as a visitor. He should be their family physician, alert to ward off any of the maladies that swine are heir to, and willing, if needed, to get up in the middle of a winter's night to

see that the new pigs are given the right warmth and care. He is their landlord, and they will not pay the rent if he fails to furnish proper foods, with decent housing and exercise grounds. It is in his hands, in large measure, to stunt their growth and make scrubs from thoroughbreds, or to bring his hogs toward that perfection which shall give him an enviable reputation, alike at the market, in the show yard, on the farms and with the agricultural press.

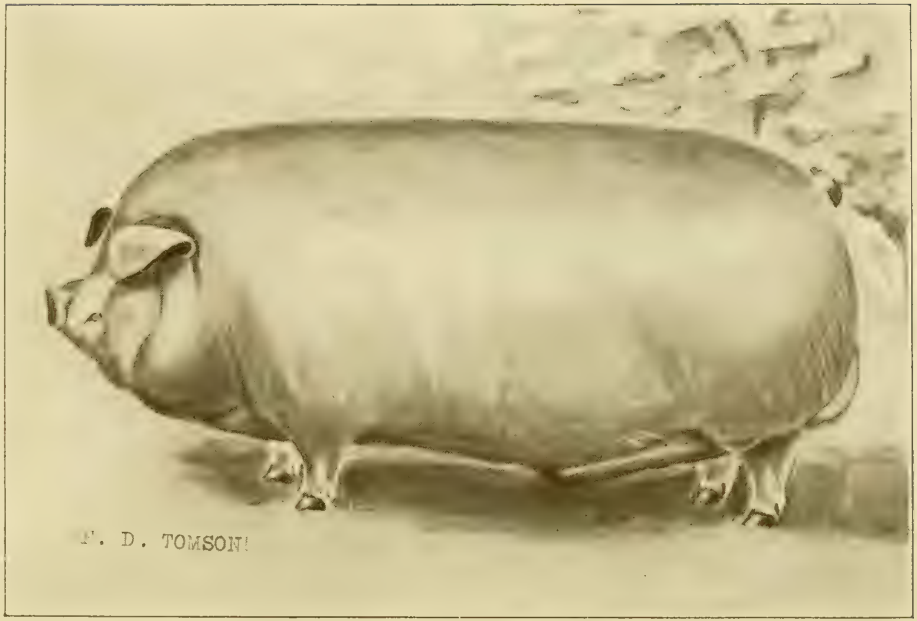
It is frequently said there is no "best breed," but that is not quite true. There is a best breed for every man, but, inasmuch as there are many types and classes of men, it is but natural that there are various breeds and types of swine. Each breed possesses some characteristics, marketable or ornamental, to recommend it, but one man's taste may be another's dislike. The beginner should choose a breed with characteristics appealing to his individual liking, preferably after study of the arguments presented by the champions of various breeds. Black, red or white color, length, form or set of ear, dish of face, and other features depend in their rating upon the individual breeder's personal taste; and it is well for him to be sure his choice suits him. Having made his choice, he should then, so far as able procure the best of its kind, continue with the breed and persistently aim to make its progeny better than its ancestors.

### THE COMMON-SENSE HOG

After all, as has been well said by an excellent authority, swine breeders, with all their breeding and feeding, their study of types, families, and pedigrees, should



GOOD SPECIMENS OF MIDDLE YORKSHIRES




A FINE TYPE OF CHESTER WHITE BOAR

keep in mind the common-sense hog, which the practical, everyday farmer, who cares more about types than breeds, and more about form than pedigree, needs must have, and in the end will have. To supply the farmer with this kind of a hog is the end of all breeding. It is easily possible to run to fancy points until the men who dote on these are supplied; in the end, however, it is the farmer's ideal, approved by the packer, that is accepted. Fundamentally, the farmer, as a rule, does not care whether the hog wears red, white or black hair; whether its ears hang down or stand up; whether it has swirls and cowlicks, or combs its hair straight. What he wants first is an animal with constitution; and any system of breeding, whether inbreeding or outbreeding, whether straight, crooked or otherwise, that enfeebles the constitution is the kind of breeding the farmer does not want in his herd. To closely inbreed or line-breed merely for the development of some particular unimportant marking, curl in the tail or droop of ear, at the same time weakening the constitution or dwarfing the size, is to venture upon dangerous ground.

The farmer does not care, either, for hogs "bred in the purple." He is not particular whether the great grandsire of his stock sold for one, three, or five thousand dollars. His chief interest is in this: What breed or type of hogs, for the care and feed it is practicable for me in my situation to give them, will yield the largest return in pork and money? He is furthermore interested

in having hogs as nearly immune from disease as possible, and to this end he wants those with vigorous constitutions; pigs that will fight each other for the best teat before they are a day old, even if doing so leads to the vice of stealing later. He does not hold his pigs amenable to the code of morals enunciated in the Sermon on the Mount. The common-sense hog must be a greedy fellow, and more or less of a rustler on occasion. He must not be an animated lard keg, a gob of fat, nor a fastidious loafer, to be fed on dainties. He must not be delicate, or a mincing eater, but growthy, vigorous, healthy, and as good a looker as possible consistent with the sterling swine virtues mentioned.

Breeders of any breed can produce this type if they will. The farmer has his fancies to a limited extent, and breeders can furnish him the hog desired, with red, white or black hair, and with any sort of an ear called for, but not nearly so readily if they keep an eye too much to fashion, or to fancy pedigree. If from any of the breeds they will select only the well-formed, robust types, and consign all others to the fattening pen, it will not be very many generations or years until their clients, the farmers, will have little reason to complain of their hogs being too delicate, too fine in the bone, too short in the body, or too long in the legs.

The hog is the most plastic of all farm animals. In his wild state he is of unflinching gameness, an intrepid fighter, fleet as a race horse, and almost as cunning as a fox. Our ancestors transformed him into a domestic animal, and adapted him to their use, by breeding, selec-

tion and feeding. The intelligent breeder can make from an animal so plastic about what he pleases, and the farmers have a right to demand that usefulness be the aim of every breeder and the reason for every purchase. All admire a good-looking hog, and there is no reason why good looks should not go with the highest usefulness, but neither good looks nor fancy breeding should stand for a moment in the way of the hog that combines vigor of constitution, growthiness, and reasonably early maturity with a form pleasing to the eye of either breeder or farmer. When we come to the final test of beauty, "pretty is as pretty does." The prettiest hog, after all, is the one that is most profitable; the one that makes the most and best pounds of gain from a hundred pounds of the most inexpensive dry matter; the one that makes the largest contribution toward providing for the family necessities; toward meeting the interest on the mortgage, and to paying the mortgage itself; for the addition to the house, the new carpet, the piano or organ, the new dresses for the girls, or for their education at school. If the breeders of any breed depart from this practical hog they make a mistake, for sooner or later the common-sense farmer will demand the common-sense hog, waiving any preference he may have for points merely fanciful.

### THE FECUNDITY OF SWINE

No other farm animal increases and multiplies so rapidly and profitably as does the hog, when given proper treatment. It is probable that few who are actually in the business of swine breeding fully realize the ratio of increase of which swine are capable, and it is equally

probable that many who embark in the business begin with a larger number of sows than their situation justifies, through failure to realize the increase easily possible from a single sow and her progeny within a comparatively short time.

The following will serve to show what such increase may be: Beginning with a sow pig, suppose that she and all her female increase farrow for the first time when they are a year old, and give birth to a litter every six months thereafter, and that each litter will average six pigs, and only three of them females. At the end of the first year there is the sow and six pigs—three males and four females. In 18 months the sow has a second litter. This brings the total up to seven sows and six males. At the end of two years the original sow has her third litter, and each of the three sows of her first litter also farrow. This gives a total of 19 sows and 18 males. In two years and a half the three sows of her second litter are old enough to farrow. This brings the number up to 40 females and 39 males. In three years the sows of the first, second and third litters will farrow, and in addition the nine that were born to the three of the first litter. This increases the number to 97 females and 96 males. Thus it goes on in progression, until at the end of four years there would be a total of 502 females and 501 males, or enough hogs, descendants from the one sow pig, to pay for a good-sized farm.

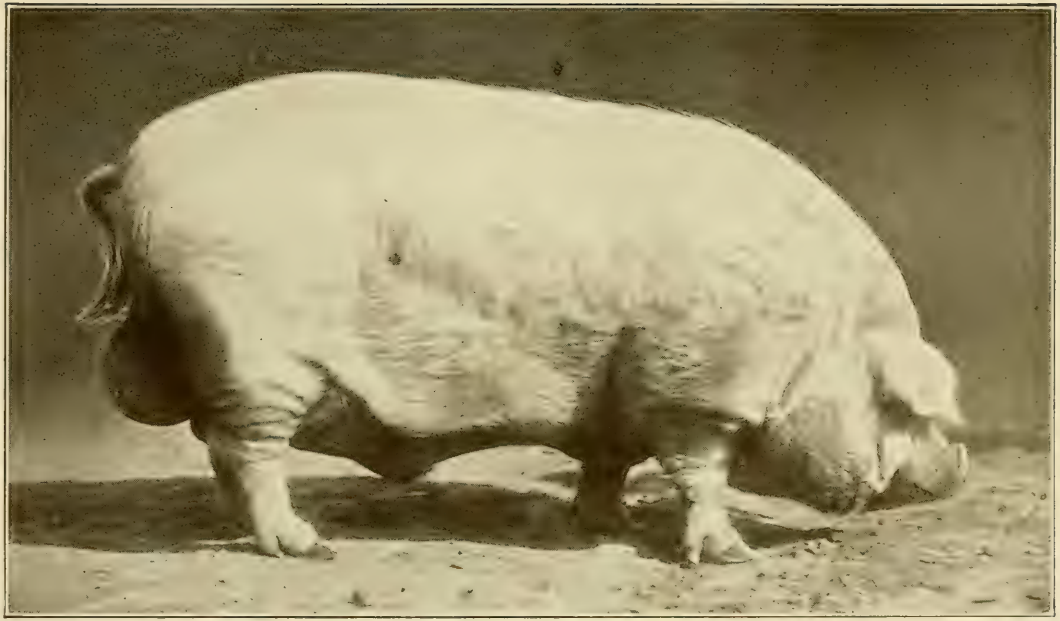
### "BACON" HOGS VERSUS "LARD" HOGS

Since about the beginning of the present century there has been much written and printed in advocacy of what

the writers term "bacon" hogs, and the importance if not necessity of giving more attention to their production and less to what are disparagingly designated as "lard" hogs; extolling the higher prices and the virtues of lean pork and the superiority of the lean or non-fattening breeds and types, including Razor-Backs, all claimed as yielding the much-coveted streak of lean and streak of fat. The effect, however, of this propaganda has not been widespread in the United States; in fact, in a commercial way, scarcely perceptible. Bacon production in America from what breeders term the "bacon" breeds is most largely a Canadian industry, and in territory where the staple swine food is other than corn.

In America and the markets, in spite of proposed reforms, alleged demand, higher prices and imagined competition, the type and style of hog that for decades has been a food reliance for the millions, the "lard" hog of the corn belt, still not only occupies the stage, but fills it. The feeling existent in reference to bacon growing is well expressed by a Nebraska editor, who says: "The farmer is not governed in his work to any perceptible extent by sentiment or fancy. With him it is a plain business proposition of raising crops to get the largest returns in dollars and cents for the labor and expense put into the work. While hog raisers like to satisfy their fancies as to breed, they will not do this with a plain understanding that they are thereby making a money sacrifice. When the time comes that there is a reliable special market established for the bacon hog, and at prices that will justify his production in preference

to others, then there will be converts to the bacon-hog industry. This must be demonstrated, however, by a very decided advance in the market price above that for the widely predominant lard hog."



CHESTER WHITE BOAR, LEADER'S CHIEF 6585

A FAMOUS PRIZE-WINNING CHESTER WHITE SOW

CHAPTER III.

# Breeds, Popularity and Distribution

Breeders of the leading breeds of swine have associations for registering the pedigrees of the best of their pure-bred stock, establishing and maintaining standards of excellence, and advancing the merits and interests of the breeds generally. The number of pure-bred registered hogs in America is perhaps about one-half of one per cent of the total number of swine, but the influence of this pure-bred stock is vastly more important than these figures would on their face seem to indicate.

### CHOICE OF BREEDS

Every breed has its admirers and promoters, who urge its excellence and adaptability. The question of the "best breed" will always be open for discussion, but success in swine husbandry depends much more upon the best man and the best food than upon this or that breed. In some sections certain breeds will remain the most popular because of their adaptability to the climate of these sections. Thus, in that part of the United States west of the 85th meridian the white hog is not looked upon with favor, because there white swine are more liable to be sun-scalded or to have scurvy, if not mangy skins. In the corn belt the extreme bacon types doubtless will never be most popular because their characteristics are not

such as will result in the greatest profit from the material most abundantly at hand. In selecting a breed the buyer's personal preference is likely to exert a controlling influence, but this should be governed by his location and purposes, although the characteristics of any breed can be in a considerable degree modified by feeding and environment.

As a rule, the extensive concerns that slaughter the bulk of the country's hogs have but slight preference for any one breed. Questions are frequently raised as to whether the red hogs are supplanting the black breeds, and whether the white types are on the increase, and the packers, better than all others, are in position to observe the facts. The following opinions of different packers on these questions were given to the author in September, 1907:

Armour & Company, Chicago—We have had a very decided increase of red hogs and hogs of red mixture, particularly in the last two or three years. We think about 25 per cent of the hogs are of that type. We see no decided increase in white hogs. Ten per cent would cover the number, and the remaining 65 per cent are of black or black mixtures. We have no preference for breed if the hogs are well formed and well fattened.

Armour Packing Company, Kansas City—Sixty per cent of the hogs received at the Kansas City market are black, and black and white spotted, black predominating. Thirty per cent are red, and red and black spotted, and 10 per cent are white. The red and the red and black spotted hogs are increasing in numbers every year.

White hogs show no material increase. The demand for the product makes a market for all weights, but the 300 to 325-pound averages are most desirable in the fall and winter. Breed counts for very little when the quality is the same.

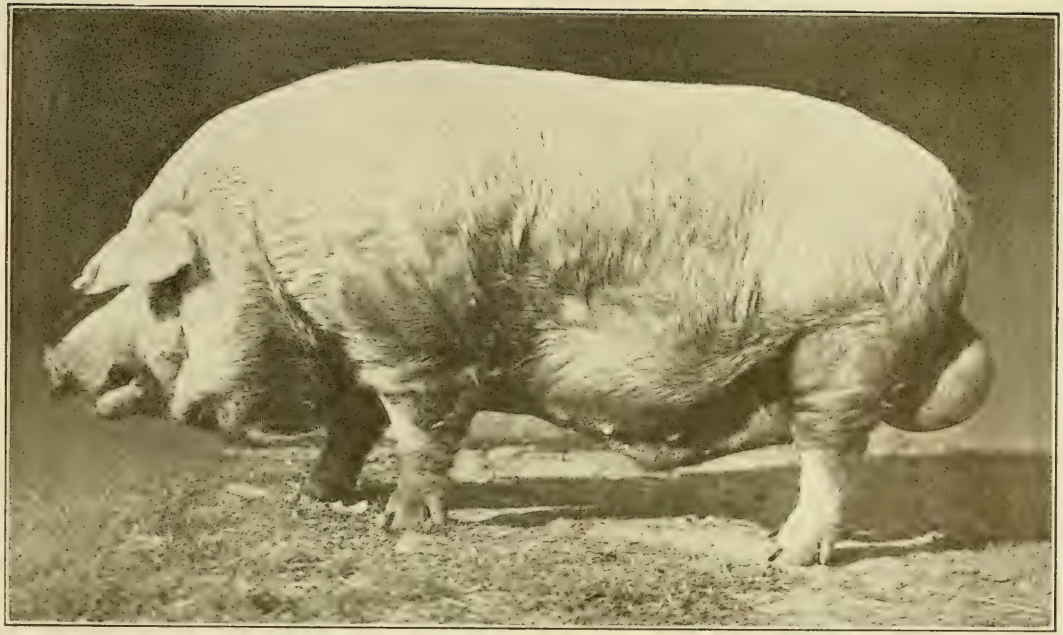
Cudahy Packing Company, Omaha—Our buyers state that fully 70 per cent of the hogs now being marketed and that have been marketed for some time past, are of red or brownish color. About 10 per cent of white hogs are being received, and the other 20 per cent are black and spotted. The increase in the number of red hogs has been somewhat remarkable. Twelve or 15 years ago hardly 10 per cent of the hogs were red, but the percentage has been growing larger ever since, the farmers of this territory evidently feeling that red hogs were hardier and of a better breed than those formerly raised. There has also been an increase in the number of white hogs, compared with former years, but on no such scale as that of the red hogs. At certain seasons of the year a decided preference is given 300 to 325-pound properly fattened hogs at 12 months; on the other hand, or taking it at the present time, they would sell at a big discount, compared with light hogs, partly on account of the length of time it would require to cure a heavy hog, compared with a light one, the spot or nearby quotations on provisions being higher than the distant ones. On the whole, however, well-fattened hogs, unless they are old sows, are always salable.

Fowler Packing Company, Kansas City—We estimate black and spotted hogs represent about 85 per cent of the

receipts, red and spotted hogs about 14 per cent, and white, say about 1 per cent, although there are so few of the latter coming to market now they are hardly noticeable. There has been a very decided increase during the last two years in the number of red or red-spotted hogs marketed. Prior to that, the increase was very small. We are receiving less white hogs in recent years than formerly. As a breed, we prefer the Berkshires or Poland-Chinas.

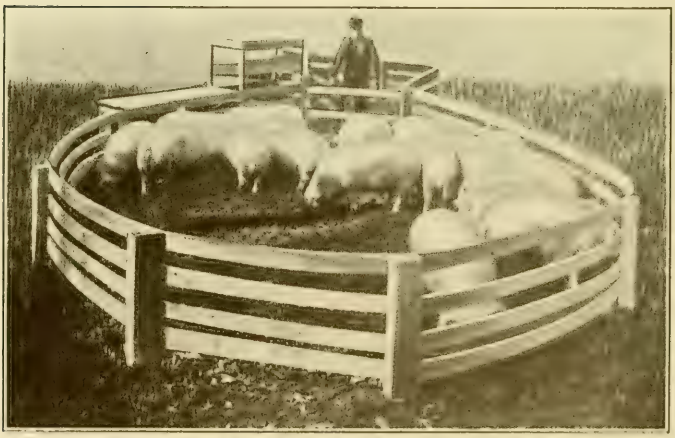
Kingan & Company, Limited, Indianapolis—Our buyers estimate the approximate percentage of the different colored hogs found in this market at the present time as follows: Black 45 per cent, red and red mixed 50 per cent, and white 5 per cent. They give it as their opinion that there has been a notable increase in the red-mixed variety during the past few years, but possibly a decrease in the number of pure red hogs. Speaking as a whole, however, there is no doubt that there has been a decided increase in the reds. As to white hogs, the buyers say they are decreasing, and have been slowly for years past. They are unpopular with the breeders, as they cannot withstand so well the extremes of climate, being of a more delicate nature than either the reds or blacks. Our opinion is that the Berkshire hog is the most suitable of all for the packer, regardless of size.

Morris & Company, Chicago—In the past five years the red and red mixture have been very much on the increase. In fact, about 35 per cent of our receipts are of this kind, 45 to 50 per cent black and less than 5 per cent white, the remainder being of mixed breeding and



A TWO-YEAR-OLD CHESTER WHITE BOAR

A Champion Yearling Chester White Sow



A Pen of Chester White Boars

color. The hogs' breed and color make no difference to the packer, providing they are well bred and properly finished. Hogs of all breeds and colors sell at the extreme top of the market, but this is not true with the heavy hogs at this particular time of the year.

Morris & Company, East St. Louis—There has been a notable increase in the number of hogs of red mixtures received at this point in the past two or three years. The approximate percentage at the present time probably would be 30 per cent of red mixed and 5 per cent white, and the rest black. There has been very little increase in the number of white hogs this season. Very few hogs come to this market weighing 300 to 325 pounds that are not older than 12 months. If hogs are prime, we have no preference as to breed.

Schwarzschild & Sulzberger Company, Kansas City—In estimating the percentage of different colored hogs offered on this market we would judge them to be 60 per cent black, 35 per cent red and 5 per cent white. There has been a notable increase in the number of red hogs, and a material decrease in the number of white hogs. We consider the red hogs rather coarse when heavier than 300 pounds, and believe we would have a slight preference for the other breeds.

Swift & Company, Chicago—This year's purchase of hogs on the Chicago market would show approximately 50 per cent black, 30 per cent red and 20 per cent white. Red and white hogs are on the increase. We have no particular preference as to breed.

Swift & Company, Kansas City—We estimate the percentage of colored hogs at our market as follows: Black 55 per cent, red 35 per cent and white 10 per cent. There is a noticeable increase of red hogs, but no increase in the number of white hogs. The breed of a well-formed hog, weighing from 300 to 325 pounds, does not make any particular difference to the packer.

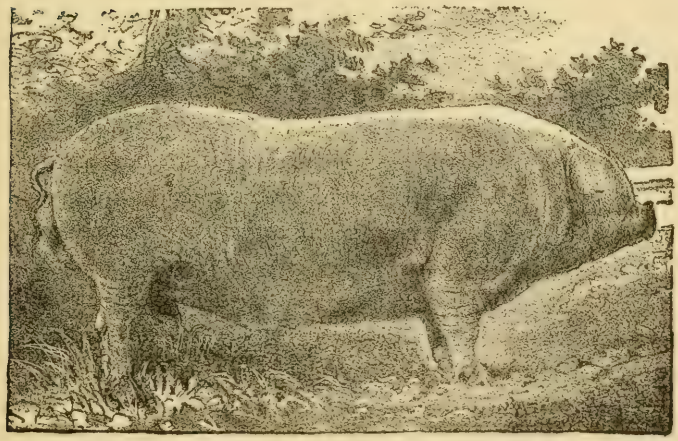
Suggesting, in a measure, the popularity of the different breeds in different states or localities, and perhaps something as to the ratio of their numbers in the various sections of the country to which it refers, is the following table, showing the number of each breed exhibited at the state or prominent fairs named, in the year 1907.

| Fair or Exhibition | Poland-Chinas | Duroc-Jerseys | Chester Whites | Berkshires | Tamworths | Yorkshires | Hampshires | Essex | Victorias | Cheshires |
|---|---|---|---|---|---|---|---|---|---|---|
| Iowa | 989 | 1,205 | 497 | 148 | 67 | 98 | 2 | .. | .. | .. |
| Kansas | 192 | 85 | 85 | 38 | .. | .. | 2 | .. | .. | .. |
| Minnesota | 438 | 247 | 61 | 102 | 48 | 37 | .. | .. | .. | .. |
| Nebraska | 517 | 738 | 155 | 101 | .. | .. | .. | .. | .. | .. |
| Ohio | 253 | 407 | 148 | 100 | 56 | 62 | 86 | .. | .. | .. |
| Illinois | 373 | 404 | 171 | 169 | 38 | .. | 85 | .. | .. | .. |
| Wisconsin | 155 | 152 | 92 | 125 | 45 | 15 | .. | .. | .. | .. |
| Missouri | 675 | 449 | 272 | 223 | .. | .. | .. | .. | .. | .. |
| Texas | 409 | 220 | 57 | 96 | 101 | .. | .. | 43 | .. | .. |
| Indiana | 222 | 286 | 142 | 129 | 98 | 57 | 60 | .. | .. | .. |
| California | 50 | ... | ... | 61 | .. | .. | .. | 10 | .. | .. |
| Sioux City Interstate Fair | 254 | 287 | 96 | 17 | .. | 3 | 4 | .. | .. | .. |
| New Jersey | 50 | 44 | 131 | 45 | .. | 40 | .. | 35 | 22 | 39 |
| Washington | 56 | 16 | 30 | 39 | .. | 11 | .. | 22 | .. | .. |
| N. Carolina | 2 | 11 | 3 | 36 | .. | .. | .. | .. | .. | .. |
| Kentucky | 46 | 71 | 55 | 98 | .. | 12 | 29 | .. | .. | .. |
| International Live Stock Show, Chicago | [1]38 | 37 | 28 | 71 | 17 | 20 | 47 | .. | .. | 8 |
| Total | 4,719 | 4,659 | 2,023 | 1,598 | 470 | 335 | 315 | 110 | 22 | 47 |

[1] Barrows exclusively.

A further suggestion is afforded by a census of the pure-bred swine in Indiana, in June, 1907, as reported by the state bureau of statistics, which showed in that typical swine-growing state, 24,632 Poland-Chinas, 26,729 Duroc-Jerseys, 7,834 Chester Whites, 4,811 Berkshires, 76 Tamworths, 168 Yorkshires, 337 Hampshires, 240 Essex, 47 Victorias, 21 Suffolks and 229 Mule-Foots.

Careful estimates made by De Witt C. Wing, an editor of the *Breeder's Gazette*, of the numbers of living registered pure-bred swine in America, of the different breeds, at the beginning of 1909, were as follows: Poland-China, 70,000; Duroc-Jersey, 60,000; Berkshire, 15,000; Chester White, 10,000; Hampshire, 3,000; Large Yorkshire, 2,000; Tamworth, 3,800. Grand total, 163,800.



**A Chester White Boar, as Portrayed in 1870**

CHAPTER IV.

# Breeds and Types

Although the hog is older than history, his conspicuous improvement through selection and judicious breeding is a feature of the last half of the nineteenth century. Since 1840, in the United States, and in great part since 1875, the advances made in swine husbandry are quite as remarkable in their way as those in any other line of endeavor

By some of the ancient nations the hog was considered a sacred animal. By others it was regarded as unclean, and prohibited as food. This prohibition among the Jews was regarded by Tacitus and others as having been because of a feeling that pork was often unfit to eat in warm climates, and apt to encourage the spread of leprosy. Moses is thought to have forbidden the eating of pork because it was liable to give the Israelites diseases that would make them unable to endure the long march out of Egypt. In those days, when cooking was crudely done, there was no doubt much reason to fear trichina

The original wild hog was generally rather small and of a slaty color. Environment changed his size and color according to the climate and the difficulty in obtaining sustenance. Thus, in a tropical region where luxuriant herbage made it easier to obtain food, the hog

waxed fatter than in the forests farther north, where to maintain himself he was compelled to roam more widely and venture into more dangerous regions. For the same reason the color of the tropical hog is said to have changed toward black, giving him better protection against the heat of the sun.

Under domestication, even in earlier days, when no attention was paid to the development of characteristics especially desirable, decided changes came about. The principal changes attributable to domestication of swine are given in the following summary by Prof. Thomas Shaw, in his book, "The Study of Breeds": "(1) The ears become less movable, the tusks and muscles of the neck diminish in size, the back and sides lengthen, the flank and hindquarters deepen, the body becomes less capacious, the limbs grow shorter, the bristles are partially or wholly removed, and the animal becomes much less active. (2) The stomach and intestines enlarge, they desire more food, and the tendency to obesity increases. (3) The male loses the solitary habit, the female breeds more frequently, has larger litters, and they seek their food in the day."

Most of the breeds now known in America may be traced back to or through those of Great Britain, and the latter were chiefly improved by crossing Chinese or Neapolitan boars upon the native sows. The Chinese were used mostly in the modification of the white stock and the Neapolitans in improving the black sorts. These boars were smaller than the native British stock, and had the effect of refining the structure and flesh of their offspring, while enhancing the fattening qualities.

## CLASSIFICATION AND RANK OF BREEDS

Breeds in the United States are variously classified, sometimes according to size and color, and at times by comparison of their respective ability to produce lard or bacon

If classified according to size, the Poland-Chinas, Chester Whites, Tamworths, Duroc-Jerseys, Yorkshires, and most of the modern Berkshires would be grouped together as large hogs; the Small Yorkshires (or Suffolks) and Essex as small hogs; with the Middle Yorkshire, Victoria and Cheshire as medium breeds.

The Tamworth and Yorkshire, and sometimes the Berkshire and Chester White, are classified as bacon hogs, and the other breeds as lard hogs, although the two breeds last named are more frequently in the corn belt classified as lard hogs. The locality in which the hogs are raised has more to do with this classification than any distinctness of breed type, as any hog will assume more or less of the characteristics of one type or the other, depending much on whether it is raised upon corn and other concentrates or is given less fattening food.

In color, Poland-Chinas and Berkshires are now practically the same, viz., chiefly black, with a dash of white on the face or jowl, feet, ankles and brush of tail; the Essex are entirely black; Chester Whites, Yorkshires, Victorias and Cheshires wholly white; the Duroc-Jerseys and Tamworths, red, bronze or sandy; and Hampshires, black, with a broad belt of silvery white across the shoulders and extending downward the length

of the forelegs and feet. Some strains of Hampshires have white markings other than those mentioned.

Ranked according to their numbers and popularity, the breeds of swine, or their grades, most largely raised in America in the first decade of the twentieth century are the Poland-China, Berkshire, Duroc-Jersey and Chester White. Of these, the Berkshire is directly of English origin, while the other three may be termed American breeds.

### CHESTER WHITES

The Chester White breed had its beginning about 1820, or slightly earlier, in Chester county, Pennsylvania, by the use of some white boars brought from Bedfordshire, England, for crossing upon the better class of sows then reared in Chester county, and mostly white. By careful selection and mating, during the ensuing forty years, the more painstaking of the thrifty Quakers, who found a market in Philadelphia for their surplus swine, had a stock quite uniform and notable in its characteristics. These were: Length and good size, growthiness, good breeding qualities, remarkably quiet and gentle dispositions, short legs, rather large, coarse ears, drooped so much as to almost obscure the eyes, and hair usually abundant and not too coarse, frequently quite curly or wavy and always silvery white, although the skin itself might sometimes show here and there a brown spot or freckle

Following the Civil war, these Pennsylvania hogs had a wide reputation, which was largely added to by shrewd advertising. As the supply was confined to but

two or three counties and was, therefore, quite limited, the demand was met by shipment from speculators and others of almost any sort of white pigs that could be found, especially if the pigs had large ears. Nondescripts of this kind were distributed over the country as pure-bred Chester Whites, and in consequence the reputation of the breed received a backset, from which it has never fully recovered. A few of the original breeders kept some of the pure stock, persevering in its breeding and improvement until now they have better Chesters than were known in the earlier days, and the demand for and appreciation of them is steady.

Soon after the close of the Civil war some northern Ohio men began crossing the Chester county hogs on stock found in their locality, and the descendants of these are now recognized as a breed somewhat distinct from the others and designated as the "Ohio Improved Chester," or more briefly as the "O. I. C." swine. In a general way, these are not now essentially different from the swine descended wholly from the Chester county stock, but it may be that the best of them have slightly more compactness and a less lubberly style, fatten more quickly, and reproduce themselves with equal certainty. At the same time, only the man who had reared a given animal could from its appearance alone be positive as to which family of Chesters it belonged. There are many high-class individuals in both, while, as in all other breeds, some are unworthy of propagation.

The Chesters of either family are appropriately classed among the largest swine known. The ordinary weights

when mature range from 500 to 600 pounds, but much heavier weights are by no means uncommon, and individuals weighing as much as 1,000 pounds or even more have not been rare. This is not mentioned as an argument in favor of this, or any other large breed, as the chances are that weight above 500 pounds, put on any hog, returns little profit, and the pork added from feed given a hog weighing 600 pounds is likely to represent a cost far greater than its money return. Experiments and experience have long since taught the teachable that it is the feed given to young and growing animals which returns the quick and large gains, and profit.

In an early day the author had considerable experience with Chester Whites, perhaps as good individuals as Chester county afforded, on a Kansas farm where conditions were quite primitive, and proved that these swine had many characteristics extremely likable, but they were discarded as other white breeds have been, for their one conspicuous defect, namely, susceptibility to skin disease, especially mange. The wind, sun and mud and other exposure they encountered on the ordinary pioneer's prairie farm told severely against the hardiest of them; but this does not prove that judicious management and breeding may not do much to rid them of their seeming tenderness, if it has not been already accomplished. There is no herd of swine more attractive than one of well-bred, well-fed, healthy, latter-day Chester Whites.

The standard of excellence, scale of points and detailed description for Chester Whites, adopted by the American Chester White Record Association, read as follows:

| | Points |
|---|---|
| *Head:* Short, broad between the eyes, and nicely tapering from eyes to point of nose; face slightly dished; cheeks full | 5. |
| *Eyes:* Large, bright and free from overgrowing fat | 2. |
| *Ears:* Drooping; thin; pointing outward and forward; well proportioned to size of body | 2. |
| *Jowl:* Full, firm and neat, carrying fullness well back to neck and brisket | 3. |
| *Neck:* Full, deep, short and well arched | 3. |
| *Brisket:* Full; strong; well let down; extending well forward and on line of the belly | 3. |
| *Shoulders:* Broad; deep; thickness in proportion to the side and ham; full and even on top | 6. |
| *Girth around Heart:* Full back of shoulders; ribs extending well down; wide and full back of forelegs | 10. |
| *Back:* Broad, straight or slightly arched, carrying width well back to the hams, and of medium length | 7. |
| *Sides:* Full, deep, carrying width and thickness well down and back | 6. |
| *Ribs:* Well sprung, carrying fullness well back, and deep | 7. |
| *Belly:* Wide and straight, width approximating that of the back | 4. |
| *Flank and Loin:* Flank well let down and full; loin broad, strong and full; measure of flank girth equal to heart girth | 10. |
| *Hams:* Broad, full, deep, of medium length; coming down well over hock | 10. |
| *Limbs:* Medium length, short rather than long; set well apart and well under; muscles full above knee and hock; bone firm and not coarse; pasterns short and strong; feet short | 7. |
| *Tail:* Small, tapering, smooth and well set on | 2. |
| *Coat:* Fine and thick | 3. |
| *Color:* White. (Blue spots in skin, and black specks shall not argue impurity of blood) | 1. |
| *Action:* Easy, prompt, fine and graceful | 5. |
| *Symmetry:* Uniform build, and all points in animal in proportion | 4. |
| Total | 100. |

A standard, scale and description for "O. I. C." swine, adopted by the Ohio Improved Chester Swine Breeders' Association, reads:

| | Points |
|---|---|
| *Color:* White. Black spots in hair disqualify, but blue spots in hide (freckles), while objectionable, do not argue impurity | 2. |
| *Head and Face:* Head short and wide; cheeks neat (not too full); jaws broad and strong; forehead medium, high and wide; face short and smooth; wide between the eyes, which should be prominent, clear and bright, and free from surrounding fat; nose neat, tapering and slightly dished | 5. |
| *Ears:* Medium size, soft, not too thick, not clumsy, pointing forward and slightly outward, drooping gracefully and fully under control of the animal | 2. |
| *Brisket:* Full, well let down and joined well to jowl in line with belly | 3. |
| *Jowl:* Smooth, neat, firm and full, carrying fullness well back to shoulders and brisket when head is carried up level | 2. |
| *Neck:* Wide, deep, short and nicely arched; neatly tapering from head to shoulder | 3. |
| *Shoulders:* Broad, deep and full, extending in line with the side, and carrying size down to line of belly | 6. |
| *Chest and Heart Girth:* Full around the heart and back of the shoulders; ribs extending well down; wide and full back of fore legs | 10. |
| *Back:* Broad, straight or slightly arched and of uniform width; free from lumps or rolls; same height and width at shoulders as at ham | 7. |
| *Sides:* Full, smooth and deep, carrying size down to line of belly; even with line of ham and shoulder | 5. |
| *Ribs:* Long; well sprung at top and bottom, giving animal a square form | 7. |
| *Loin:* Broad and full | 7. |
| *Belly:* Same width as back; full and straight; drooping as low at flank as at bottom of chest; line of lower edge running parallel with sides | 4. |
| *Flank:* Full and even with body | 2. |
| *Ham and Rump:* Broad, full, long, wide and deep, admitting of no swells; buttocks full, neat and clean; stifle well covered with flesh, nicely tapering toward the hock; rump slightly rounding from loin to root of tail, same width as back, making an even line with sides | 10. |

| | Points |
|---|---|
| *Tail:* Small, smooth, nicely tapering; root slightly covered with flesh; carried in a curl | 2. |
| *Legs:* Medium length; strong and straight; set well apart and well under body; bone of good size, firm, and well muscled; wide above knee and hock, round and tapering below knee and hock, enabling the animal to carry its weight with ease; pasterns short and nearly upright | 5 |
| *Feet:* Short, firm and tough; animal standing well up on toes | 8. |
| *Coat:* Fine; either straight or wavy, with preference for straight; evenly distributed and covering the body well; nicely clipped coats no objection | 3 |
| *Action:* Easy and graceful; high carriage; active; gentle and easily handled. In males testicles should be readily seen and of same size and carriage | 3. |
| *Symmetry:* A fit proportion of the several parts of the body to each other, forming a harmonious combination | 4. |
| Total | 100. |

## POLAND-CHINAS

Much discussion, some of it quite acrimonious, has taken place in earlier years as to the origin of this breed and the proper placing of credit for its upbuilding. This has resulted in several Poland-China breed associations and records. It is unquestioned, however, that the breed originated in Butler and Warren counties, Ohio, and its establishment was well summed up by the late John M. Millikin, a local historian and an observant and prominent citizen for more than half a century. In 1877, Mr. Millikin, after an extensive research covering the beginnings of the breed, its material and make-up, wrote to the author as follows:

"The truth is, no one man can say he had more to do with the formation of this breed than another. It was the result of the labors of many. It grew out of the introduction of the China hogs by the Shakers of Union Village, their crossing with the Russian and Byfield, and the subsequent crossing with the Berkshires and with the Irish Graziers. After 1841 or 1842, these breeds ceased to exist in either Butler or Warren counties and have had nothing whatever to do with the Poland-China breed for the last 34 years."

Controversies as to the precise crosses and by whom and under what particular circumstances they may have been made, prior to the middle of the last century, to form the breed, may interest a few; but what is vastly more important to the practical swine breeder is the fact that there was produced a race of swine now bearing the name of Poland-China that has been able to hold its own for three-fifths of a century as the most popular and most widely distributed pork-making machine in the foremost pork-producing region of the world.

It has been called by numerous different local names, among these being "Butler County," Warren County," "Miami Valley," "Poland," "Poland and China," "Great Western," "Shaker," "Union Village," "Dick's Creek," "Gregory's Creek," "Magie" and "Moore." "Big Chinas" were brought to Ohio about 1816 by a member of the Shaker society in Butler county. These were white hogs, with some black or sandy spots. They were of medium size and of excellent form and quality, and were crossed by the Shakers on the Russian and Byfield stock, with superior results. The Irish Grazier was brought to Ohio about 22 or 23 years later from Ireland. Berkshires were brought about the same time from New York. The foreign blood, as pure-bred, was soon extinct, and the hog that is now known as the Poland-China was developed by combinations of the various breeds or families mentioned. In 1872 the name "Poland-China" was adopted at a National Swine Breeders' convention in Indianapolis.

The Poland-China is a large breed hog, weighing at maturity, alive, 500 to 1,000 pounds. It has reasonably early maturity and is much liked throughout the corn-producing sections of the United States For crossing by other breeds the Poland-China sows have a popularity not surpassed by those of any other. They have the hardiness, docility and good feeding qualities that breeders like, and Poland-China sires transmit these qualities to their get from sows of any breed. For these reasons by far the greater part of the marketed hogs in the United States have Poland-China blood.

In some ways the refinement of this breed, or rather some families of it, has been carried too far, and their breeders are severely criticised for over-developing fanciful points to the exclusion or neglect of others more important, resulting in diminished size, vigor and prolificacy; but the tendency at the present writing is to guard against or overcome this by more intelligent management.

Prior to about the year 1870 the Poland-Chinas averaged larger than now, were inclined to coarseness, or sponginess of bone, had much heavier, drooping ears, and were spotted with about even proportions of black and white. Since then the tendency each year has been to breed them with more black, until now those in highest esteem have identically the color and markings so long characteristic of the Berkshires, viz., solid black, with white feet, white tip of tail, a little white on or about the face and jowl, and occasionally a splash of white elsewhere. Their ears are medium or small in size, but still drooping, and are pliable and silky. A. C. Moore

of Fulton county, Illinois, and D. M. Magie of Butler county, Ohio, were the men who, by judicious selection, careful breeding and extensive exhibiting and advertising, probably did most to bring this stock of hogs, in its early days, to wide and favorable public attention.

Following are the standard of excellence, detailed description and scale of points for Poland-Chinas, adopted by the National Association of Expert Judges:

| | Points |
|---|---|
| *Head:* Broad, even and smooth between and above the eyes. Slightly dished, tapering evenly and gradually to near end of nose. Broad lower jaw. Head inclined to shortness, but not enough to give the appearance of stubby nose. In male a masculine expression | 4. |
| *Eyes:* Full, clear, prominent and expressive | 2 |
| *Ears:* Attached to head by a short, firm knuckle, giving free and easy action. Standing up slightly at the base to within two-thirds of the tip, where a gentle break or drop should occur; in size neither too large nor too small, but even, fine, thin, leaf-shaped. Slightly inclined outward | 2. |
| *Neck:* Short, wide, even, smooth, well arched. Rounding and full from poll to shoulder, with due regard to the characteristics of the sex | 2. |
| *Jowl:* Full, broad, deep, smooth and firm, carrying fullness back near to point of shoulders and below line of lower jaw, so that lower line will be as low as breastbone when head is carried up level | 2. |
| *Shoulders:* Broad, oval at top, showing evenness with back and neck, good width from top to bottom and even smoothness extending well forward | 6. |
| *Chest:* Large, wide, deep and full; even underline to shoulder and sides, with no creases; plenty of room for heart and other organs; large girth. Brisket smooth, even and broad; wide between legs and well forward, showing in front. | 12 |
| *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 | 14. |
| *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 | 10. |
| *Belly and Flank:* Belly broad, straight and full, indicating capacity and room, being about the same or on a level at the flank with underline of the chest. Underline straight, or nearly so, and free from flabby appearance | 4. |
| *Hams and Rump:* Hams broad, full, deep and long from rump to hock. Fully developed above and below; wide at point of hip, carrying width well down to the lower part of the hams. Fleshy, plump, rounding fullness perceptible everywhere. Rump rounding and gradually sloping from loin to root of 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. Greater width in females not objectionable | 10. |
| *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 | 10. |
| *Tail:* Tail of medium length and size, smooth and tapering well, and carried in a curl | 1. |
| *Coat:* Fine, straight, smooth, lying close to and covering the body well, and evenly distributed | 3. |

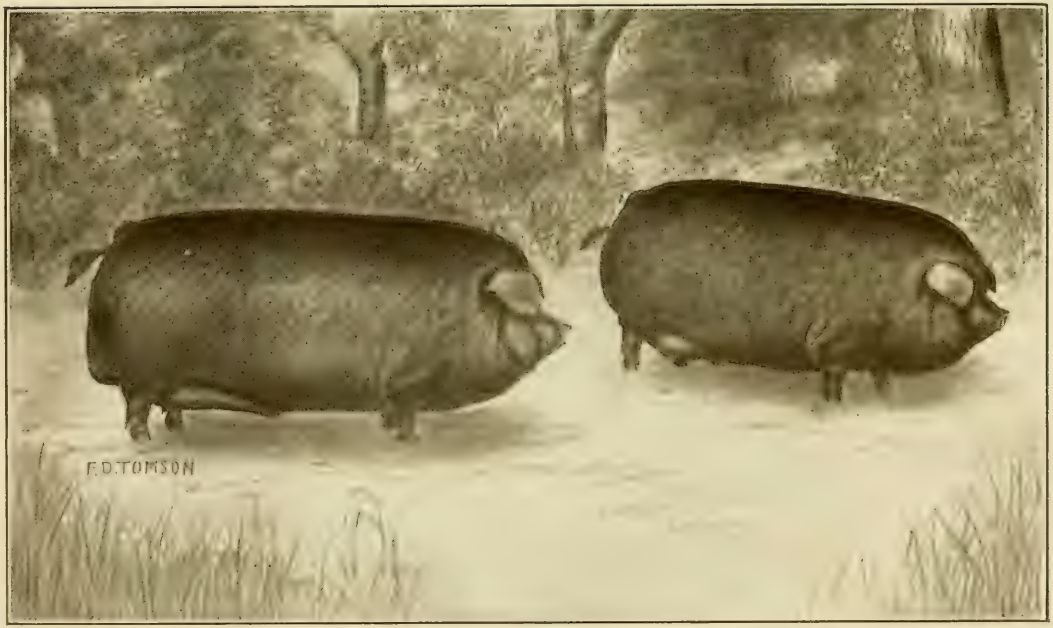
| | Points |
|---|---|
| *Color:* Black, with six white points—tip of tail, four white feet and white in face, on nose or point of lower jaw; all to be perceptible without close examination; splashes of white on jaw, legs or flank, or a few spots of white on the body not objectionable | 3. |
| *Size:* Large for age. Condition, vigor and vitality to be considered. There should be a difference between breeding animals and those kept or fitted for 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. Boars 1 year and over, 400 pounds; sows, 350 pounds. Boars 18 months, 500 pounds; sows, 450 pounds. Boars and sows 6 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 | 5. |
| *Action and Style:* Action vigorous, easy and graceful. Style attractive, high carriage; and in males testicles should be prominent and of about the same size, and yet not too large and pouchy | 3. |
| *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 the body; good feeding qualities | 2. |
| *Disposition:* Lively, easily handled, and seemingly kind and responsive to good treatment | 2. |
| *Symmetry or adaptation of points:* The adaptation of all the points, size, and style combined to make the desired type or model | 3. |
| Total | 100. |

## DUROC-JERSEYS

The swine which have made the most notable progress toward homogeneity, improvement in quality and steady advance in numbers and popular favor in the quarter of a century prior to 1908, are the now well-established Duroc-Jerseys of sandy, bronze or red color. This advancement may be traced directly to the "getting together" of men in New York and New Jersey, who had been breeding hogs of varying and different characteristics and with no particular similarity other than that they were called "red" and grew rapidly to large size, and by agreement upon a type toward which they would breed thereafter, a common name by which the resulting type should be known, and a carefully kept public register of the pedigrees of such animals, from the succeeding improvement, as were deemed desirable for purposes of propagation.

In the years when the advocates of these revised and consolidated breeds were making something like an organized attempt to bring their stock to the front, say about 1880, and before, the red hog was greeted with considerable ridicule and criticism for its coarseness, low-bred appearance, lack of uniformity in size and color, and the possession of very little that stockmen would recognize as style and finish. Evidently, however, some source or other gave good blood to a portion of the foundation stock, and this asserted itself with so marked an effect in later breeding and was so supplemented by judicious selection, mating and feeding, that an excellent type resulted, and this, constantly improving, has placed the red hogs at the beginning of the twentieth century in the first rank.

The principal material which the new effort had as a basis was found in swine that had achieved considerable local reputation in New Jersey, particularly in Burlington county, where they grew to enormous size and were known as "Jersey Reds." A different style of sandy or red hogs, with less size and smaller bone, had found much favor in Saratoga county, New York, where they were known as "Durocs." Tradition has it that the New Jersey hogs came from Spain about or perhaps before 1820, and the Durocs from an English importation made at nearly the same time. The late General Cassius M. Clay, of Kentucky, who was an ardent admirer of the red hogs raised in some portions of his state, informed the author that they were introduced there from Spain or Portugal in 1849 or 1850 by James B. Clay when the




A PAIR OF EXCELLENT DUROC-JERSEYS

A GROUP OF DUROC-JERSEY GILTS

latter was charge d'affaires. General Clay felt confident that descendants of these had found their way from Kentucky to the eastern states and contributed to the improvement of the stock there.

The Duroc-Jerseys, while they may not have been widely exploited as gaining the heavy weights reached by overgrown specimens of the Poland-China or Chester White breeds, are so nearly the same size as to properly be classed as large hogs, and undoubtedly they will, under the right conditions, produce as much pork in the same length of time and from the same quantity of feed as swine of any breed. They are prolific, rearing large litters, and are of the most quiet, peaceable disposition.

Notwithstanding the fact that certain strains of these hogs are inclined to coarseness, there are some that carry greater weight on smaller bone than those of any other breed of which the author has knowledge. In fact, in some Duroc-Jerseys, the limbs have appeared entirely too small to sustain the bodies, yet the animals were perfect in their movements and stood as firmly on the best of feet and with ankles as erect, sustaining and stout as those of a young mule. One respect in which the breeders of Duroc-Jerseys have so far failed is the securing of uniformity in color. The ideal color toward which the more fastidious and ambitious breeders have worked is a "cherry red," from which such variations as "bright red" and "dark cherry" are allowable. While considerable progress has been made in establishing strains with this color, it has, as yet, by no means become

the rule. Families of superior merit are seen with all shades of rusty yellow, rusty gray, or yellowish or rusty brown, often verging close to a dirty black. Others are light or dark sandy, and still others have unlimited variations of "red," bronze, or copper color. No one of these represents a monopoly in quality, for individuals of the highest excellence may be found in each color, yet it must be admitted that a collection of the cherry red, other qualities being equal, affords, by far, the most attractive exhibit. It is not improbable that eventually this color, most popular with the majority, will, with possibly slight variations, be the prevailing one for the breed.

Herewith is a scale of points adopted by the American Duroc-Jersey Record Association, and description in detail, prepared by the National Association of Expert Judges:

| | Points |
|---|---|
| *Head and Face:* Head small in proportion to size of body and wide between eyes; face nicely dished (about halfway between a Poland-China and a Berkshire) and tapering well down to the nose; surface smooth and even | 4. |
| *Eyes:* Lively, bright and prominent | 2. |
| *Ears:* Medium, moderately thin, pointing forward downward and slightly outward, carrying a slight curve; attached to head very neatly | 2. |
| *Neck:* Short, thick and very deep; slightly arching | 2. |
| *Jowl:* Broad, full and neat, carrying fullness back to point of shoulders and on a line with breastbone | 2. |
| *Shoulders:* Moderately broad, very deep and full, carrying thickness well down and not extending above line of back | 6. |
| *Chest:* Large, very deep, filled full behind shoulders, breastbone extending well forward so as to be readily seen | 12. |
| *Back and Loin:* Back medium in breadth, straight or slightly arching, carrying even width from shoulder to ham; surface even and smooth | 15. |
| *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 | 8. |
| *Belly and Flank:* Straight and full and carrying well out to line of sides. Flank well down to lower line of sides | 6. |
| *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 | 10. |
| *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 | 10. |
| *Tail:* Medium large at base and nicely tapering and rather bushy at end | 1. |

| | Points |
|---|---|
| *Coat:* Moderately thick and fine; straight, smooth, and covering the body well | 2. |
| *Color:* Cherry red, without other admixtures | 2. |
| *Size:* Large for age and condition. Boars 2 years old and over should weigh 600 pounds; sows, same age and condition, 500 pounds; boars 18 months 475 pounds; sows, 400 pounds; boars, 12 months, 350 pounds; sows, 300 pounds; boar and sow pigs 6 months, 150 pounds. These figures are for animals in a fair show condition | 5. |
| *Action and Style:* Action, vigorous and animated. Style, free and easy | 4. |
| *Condition:* Healthy; skin free from any scurf, scales, sores, and mange; flesh evenly laid over the entire body and free from any lumps | 4. |
| *Disposition:* Very quiet and gentle; easily handled or driven | 3. |
| Total | 100. |

## BERKSHIRES

The Berkshire, a breed extremely popular with many in the United States, is native to England, and was improved there in the latter part of the eighteenth century, by crossing with Chinese, Siamese and Neapolitan stock. By judicious selection and care the breed had become one of the most esteemed in all parts of England and also in Scotland as early as the beginning of the nineteenth century.

According to A. B. Allen, who was awarded a prize of $100 by the American Berkshire Association shortly after its organization for the best collected information on the Berkshire breed, "the first importation of Berkshires to America was made in 1823 by John Brentnall, an English farmer who settled in English Neighborhood, New Jersey. The next importation was in 1832, by Siday Hawes, an English farmer who settled at Albany, New York." Other importations followed and animals from the New York stock were introduced both west and south.

The Berkshire may be classified as either a medium-sized or large breed. The mature animals in breeding condition will weigh from four to eight hundred pounds.

Their size, ready growth, hardiness, easy fattening, docility, uniformity and wide adaptability, commend them to breeders everywhere. Among the qualities claimed for them by their advocates are robust muscular power and vitality, rendering them less than others susceptible to disease; strong digestive and assimilating powers, and prolificacy; the sows are careful nurses and good sucklers; they can be fattened for market at any age, or grown to any reasonable weight desired, and they make the best quality of pork. The Berkshires are noted for their uniformity in reproducing color, marking and quality.

In an early decade following their introduction into the United States, there raged in America what might appropriately be called the "Berkshire fever," and through the efforts to sell the imported stock at fancy prices a mushroom reputation was given the breed by speculators. The careless, neglectful methods then in vogue with many farmers fell far short of maintaining the superior qualities given by English breeding and feeding, and deterioration followed. A prejudice arose, which for a time impaired the reputation of the stock. Since 1865, however, new importations of the best Berkshires of Great Britain have been made, and from the organization in 1875 of the American Berkshire Association, an alert and aggressive society, the breed's reputation, quality and numbers of the stock have been wonderfully enhanced.

The Berkshire especially makes claim to notice as an animal thriving on good pasturage. Where excellent

grazing is available, the Berkshire holds his own as a feeder and pork maker.

In color, the Berkshires have progressed from the old unimproved half-black and half-white, spotted, or reddish brown, to black, with some white on the face, jowl and tail, and usually with white feet. Their ears are rather erect, though in the aged animals they incline to drooping, and are medium to small in size.

A standard of excellence, description and scale of points for judging swine were first formulated in 1875, at Springfield, Ill., by the American Berkshire Association, for the Berkshire breed, and they are as follows:

| | Points |
|---|---|
| *Color:* Black, but skin and hair occasionally showing tinge of bronze or copper color, with white on feet, face, tip of tail and occasional splash on arm | 4 |
| *Face and Snout:* The latter short, broad, and meaty, the former fine, well dished and broad between the eyes | 9. |
| *Eyes:* Very clear, rather large, dark hazel or gray | 2. |
| *Ears:* Sometimes almost erect, but generally inclined forward, medium size | 4. |
| *Jowl:* Full and heavy, running well back on neck | 4. |
| *Neck:* Short and broad on top | 4. |
| *Hair:* Fine and soft; inclined to thickness in male | 3. |
| *Skin:* Smooth and pliable | 4. |
| *Shoulder:* Smooth and even on top and in line with side, thick through chest | 7. |
| *Back:* Broad, long, and straight, or slightly arched, ribs well sprung | 10. |
| *Side:* Deep and well let down; straight side and bottom line | 6. |
| *Flank:* Well back and low down on leg, making nearly a straight line with lower part of side | 5. |
| *Loin:* Full and wide | 8. |
| *Hams:* Deep and thick, extending well up on back and holding thickness well down to hock | 10. |
| *Tail:* Well up on line with back, not too fine, short or tapering | 2. |
| *Legs and Feet:* Short, straight, and strong, set wide apart, with hoofs nearly erect and capable of holding good weight | 8. |
| *Size and Symmetry:* Size all that is possible without loss of quality or symmetry, with good length | 7. |
| *Style:* Attractive, spirited; indicative of thorough breeding and constitutional vigor | 3. |
| Total | 100. |

## SECONDARY BREEDS

Other breeds, while they have strong adherents and may in the future rank much higher than at the time

of making this book, are, so far, of secondary importance in numbers and influence in America. These are the Yorkshire, Tamworth, Hampshire, Victoria, Essex, Cheshire and Suffolk. The Hampshire was, for some time, known as the Thin-Rind, but at the time of preparing for exhibition at the Louisiana Purchase Exposition at St. Louis in 1904, leading advocates of the breed agreed upon the name Hampshire. The Tamworth, Yorkshire, Suffolk, Hampshire and Essex are English breeds, while the Victoria and Cheshire are American.

### YORKSHIRES AND SUFFOLKS

Among the so-called bacon breeds, the Large Yorkshire (more generally called in England Large White) has attained the most popularity. It is of English origin and improvement and in Great Britain there are three types, known as the "Large White," "Middle White" and "Small White." The last named is also known in the United States as the Suffolk, sometimes advocated as a distinct breed in America, but it is in no wise essentially different from the English Small White.

The earliest known Large Yorkshire hog was a large white animal with enormous drooping ears, and wattles hanging from each side of the throat. About 1850 other white breeds were crossed with the Large Yorkshire, with a considerable improvement in the latter. For a time an attempt seems to have been made only to attain size, which was quite successful, but to the detriment of other qualities. At the larger exhibitions numerous specimens weighing more than one thousand pounds each

have been shown. In the United States, their breeding is practically confined to the more northern states. The first Yorkshires in the United States were probably brought from England about 1830, and ten years later they were introduced in Ohio.

The Middle Yorkshire, or as it is known in England the Middle White, is an animal of medium size and of better fattening type than the Large Yorkshire, which is a good growing, but slow fattening animal. The Middle Yorkshires are not established as a breed in the United States, and those which would be so classified in England are often registered as Large Yorkshires in this country.

The Small Yorkshire is earlier in maturing than either of the other two; is a good feeder and quick fattener. In fact, on fair keep it is always fat and chuffy, and never grows to any great size. It is considered too prone to fatness for good bacon. Its form is extremely compact and its weight when matured 200 pounds or above. These swine are not of great fecundity and the sows are not good milkers. Like the Essex, Victorias and Cheshires, they, as already suggested, cut no figure of consequence in the pork production of America or elsewhere.

The American Yorkshire Club has promulgated the following description and scale of points for Large Yorkshires:

| | Points |
|---|---|
| *General Outline* 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. |
| *Outline of Head:* Moderate in length and size, with lower jaw well sprung, and considerable dish toward snout, increasing with advancing maturity | 4. |
| *Forehead and Poll:* Wide | 1. |
| *Eyes:* Medium size, clear and bright | 1. |
| *Jowl:* Medium, not carried too far back toward neck, and not flabby | 1. |

| | Points |
|---|---|
| *Snout:* Turning upward with a short curve, increasing with age | 1. |
| *Ears:* Medium in size, standing well out from the head, of medium erection and inclining slightly forward | 1. |
| *Neck:* Of medium length, fair width and depth, rising gradually from poll to withers, muscular, but not gross, evenly connecting head with body | 3. |
| *Outline of Body:* Long, deep and of medium breadth, equally wide at shoulders, side, and hams; top line slightly arched, underline straight | 7. |
| *Back:* Moderately broad, even in width from end to end; strong in loin; short ribs of good length | 10. |
| *Shoulders:* Large, but not massive, not open above | 6. |
| *Arms and Thighs:* Broad and of medium length and development | 2. |
| *Brisket:* Wide and on a level with underline | 3. |
| *Sides:* Long, deep, straight and even from shoulder to hip | 8. |
| *Ribs:* Well arched and deep | 5. |
| *Heart Girth and Flank Girth:* Good and about equal | 8. |
| *Hind Quarters:* Long, to correspond with shoulders and sides, deep with moderate and gradual droop to tail | 5. |
| *Hams:* Large, well let down on thigh and twist, and rear outline somewhat rounded | 10. |
| *Twist:* Well down and meaty | 1. |
| *Tail:* Medium; not much inclined to curl | 1. |
| *Legs:* Medium in length; strong, not coarse, but standing straight and firm | 5. |
| *Hair:* Abundant, long, of medium fineness, without any bristles | 4. |
| *Skin:* Smooth and white, without scales, but dark spots in skin do not disqualify | 2. |
| *Color:* White on every part | 1. |
| *Movement:* Active, but not restless | 5. |
| Total | 100. |

## TAMWORTHS

The Tamworth, although said to be one of the oldest types known, has very little on record concerning its early establishment. An English authority, who calls it the "Mahogany" or "Grizzly" pig, says it was extensively bred in several of the midland counties of England early in the nineteenth century, when the droves were mainly kept in the woods and forests. About 1877 a demand grew up for more hogs of a bacon type, and breeders of Tamworths brought their favorites to the front. A considerable change and improvement in the type came about in the succeeding ten years, and in 1882 the first importation to the United States is said to have been made by Thomas Bennett, an Illinois breeder. The desire of Canadian breeders to find good bacon animals led to the introduction of Tamworth boars into Ontario

in and following 1888, and most of the stock of that breed in the United States has since then been brought from Canada.

The Tamworth is considered slow in maturing, but a fairly good feeder, and has obtained a foothold here and there where the idea of raising "bacon" is paramount. In size, the Tamworth is large, averaging 500 to 600 pounds or more at maturity. Its head and legs are more than ordinarily long, and its ears large. The color is of varying shades of "red;" occasional black spots are considered an objection, but not an indication of impurity, and are not a bar to registration. Even in late years some of the best Tamworths have had small black spots, but breeders are endeavoring to eliminate these and produce stock that will be reliably red. The Tamworth is noted for hardiness and activity, and never becomes very fat. It is not nearly as popular in any part of the United States as it is in Canada.

Champions of the breed claim it has two characteristics for which it is entitled to pre-eminence; viz: An unusual proportion of lean meat, and large litters of pigs; also that Tamworths will make as many pounds of gain, largely lean meat, from a given weight of feed as will hogs of any other breed.

For three years on the Colorado Agricultural College farm the average for all sows was ten live pigs to a litter. A two-year-old sow weighing 750 pounds had 18 live pigs at one farrowing, and a Tamworth at the Iowa Agricultural College raised 33 pigs in one year.

According to H. M. Cottrell "the strongest objection to the Tamworth comes from farmers who neglect their

pigs during the summer when field work crowds, planning to give them extra attention in the fall. The surplus fat of the lard hog will carry him over a period of neglect; the Tamworth does not have the lard."

The Arkansas station (Bulletin 103) found, in testing Yorkshires, Tamworths, Berkshires, Poland-Chinas, Duroc-Jerseys and O. I. C. breeds, that "the Tamworth proved least adapted for growth on an exclusive corn ration."

Many stockmen who have raised other hogs dislike the Tamworth, because to them it looks like a "Razor-Back." They do not like its long nose, long legs and thin, long body, and think it must be a hard feeder. The first cross of a pure-bred Tamworth on other breeds produces an easy feeder that matures quickly and is generally popular with stockmen. The second cross, one authority says, is often unsatisfactory, the pigs in the same litter frequently being of entirely different types, some chunky and others extremely lengthy, with a variety in mixtures of colors.

The standard of excellence for Tamworths as adopted by the National Pig Breeders' Association of Great Britain has thus far been accepted and used by Americans, and reads as follows:

*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 tasseled.
*Sides:* Long and deep.
*Ribs:* Well sprung and extending well up to flank
*Belly:* Deep, with straight underline.
*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 ears, short or turned up snout, heavy shoulders wrinkled skin, inbent knees, hollowness at back of shoulders.

### HAMPSHIRES

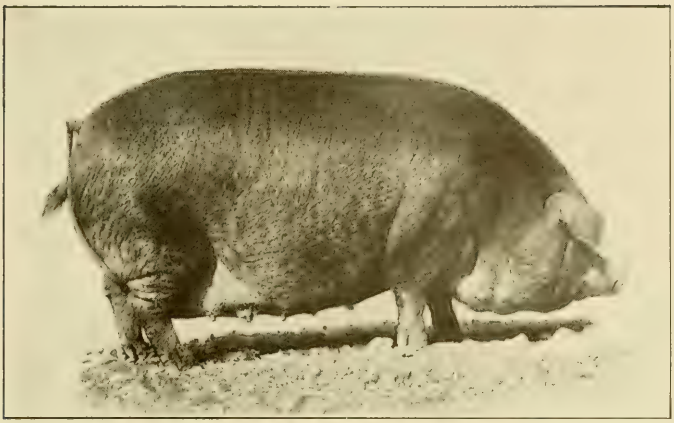
The Hampshire, known in its earlier days as the Thin-Rind or Belted hog, has been given recent popularity because of the quality of its meat. It is said to have been imported from Hampshire, England, to Massachusetts, between 1820 and 1830, by a ship owner named Mackay living in Boston, although the evidence is not clear that these hogs were then belted. They were known in Massachusetts, where they obtained some popularity, as Mackay hogs. The true belted Thin-Rind seem to have been preserved in Kentucky, to which state they were brought from Pennsylvania by Major Joel Garnet in 1835. They were popular in central Kentucky, and from there were taken to Illinois, and in addition to being called Thin-Rind were sometimes spoken of as the rhinoceros hog. They are not widely disseminated.

The American Thin-Rind Record Association, composed of the breeders of this type, concluded that the appellation Thin-Rind was misleading, and in January, 1904, the name of the Association was changed to "The American Hampshire Swine Record Association," and individuals of the breed it represented were the same year shown at the World's fair in St. Louis as Hampshires, in deference to their supposed origin in Hampshire, England. The breed known in England as Hampshire is, however, of a different type, being black.

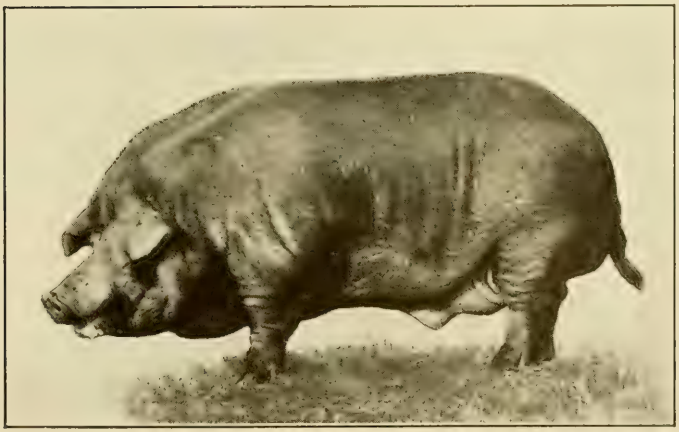
The American Hampshire is of good size, weighing 300 pounds and above at 12 months, an excellent grazer and of good fecundity. The sows rank well as mothers and nurses, with good dispositions. They are hearty, responsive feeders, with the desirable quality of bone, and of a style that suggests the "bacon" rather than the "lard" hog. Some of them are a little inclined to legginess, and to have quite long, sharp faces. They are not dishfaced, and their ears are of moderate size, pointing forward rather than erect or drooping. The breed is especially distinguished by a white belt encircling the forepart of the body, from four or five to 12 inches wide and including the forelegs. The color is otherwise chiefly black. These swine do not always breed true to color, many being born entirely black, and others but partly belted.

The American Hampshire Swine Record Association uses the description and scale herewith as indicative of what a first-class Hampshire should be:

| | Points |
|---|---|
| *Head and Face:* Head medium length and rather narrow; cheeks not full; face nearly straight and medium width between the eyes, surface even and regular | 4. |
| *Eyes:* Bright and lively, free from wrinkles or surrounding fat | 2. |
| *Ears:* Medium length, thin, slightly inclined outward and forward | 2. |
| *Neck:* Short, well set to shoulders, tapering from shoulders to head | 2. |
| *Jowl:* Light and tapering from neck to point, neat and firm | 2. |
| *Shoulders:* Deep, medium width and fullness, well in line with back | 6. |
| *Chest:* Large, deep, and roomy; full girth, extending down even with line of belly | 12. |
| *Back and Loin:* Back straight or slightly arched; medium breadth, with nearly uniform thickness from shoulders to hams and full at loin; sometimes higher at hips than at shoulders | 15. |
| *Sides and Ribs:* Sides full, smooth, firm; carry size evenly from shoulders to hams; ribs strong, well sprung at top and bottom | 8. |
| *Belly and Flank:* Straight and full, devoid of grossness; flank full and running nearly on line with sides | 6. |
| *Hams and Rump:* Hams of medium width, long and deep; rump slightly rounded from loin to root of tail; buttock full, neat and firm; devoid of flabbiness or excessive fat | 10. |
| *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 | 10. |



Duroc-Jersey Sow, My Choice



A Great Duroc-Jersey Boar

A Prize-Winning Duroc-Jersey Boar

A Great Duroc-Jersey Sow

| | Points |
|---|---|
| *Tail:* Medium length, slightly curled | 1. |
| *Coat:* Fine, straight, smooth | 2. |
| *Color:* Black, with exception of white belt encircling body, including forelegs | 2. |
| *Size:* Large for condition; boars 2 years and over, 450 pounds; sows, same age, 400 pounds; 18 months boars, 350 pounds; sows, 325 pounds; 12 months boars or sows, 300 pounds; 6 months, both sexes, 140 pounds | 5. |
| *Action and Style:* Active, vigorous, quick and graceful; style, attractive and spirited | 4. |
| *Condition:* Healthy; skin free from all defects; flesh evenly laid on and smooth and firm; not patchy, and devoid of grossness | 4. |
| *Disposition:* Docile; quiet and easily handled | 3. |
| Total | 100. |

### VICTORIAS

The name Victoria has been applied to two different types of swine, not related in origin. One known as the "Curtis Victoria" was introduced by Col. F. D. Curtis of Saratoga county, New York, and developed by crossing native hogs of Irish Grazier blood with the Byfield, and by subsequent crosses with the Yorkshire. The name is said to have been given from a sow known as Queen Victoria.

The "Davis Victoria" was obtained by breeding together Berkshires, Poland-Chinas, Chester Whites and Yorkshires, by George F. Davis of Lake county, Indiana. Colonel Curtis introduced his type about 1850, and the Davis breed was developed some 20 years later. Most of the Victorias now bred trace to the Davis stock.

The Victoria will weigh around 500 pounds at maturity. It is white and resembles in appearance the Middle White or Yorkshire. It is sometimes spoken of as the "White Berkshire." Its meat is well liked and its breeding qualities are said to be good. Special claims made for animals of this breed are that they have a bone quality which makes them excellent shippers; that they

cross well with other breeds, and while they are white they do not scald or blister by the sun as other white pigs are liable to do in the West.

The Victoria Swine Breeders' Association uses the following scale of points and description:

| | Points |
|---|---|
| *Color:* White, with occasional dark spots in the skin | 2. |
| *Head:* Small, broad, and face medium dished | 3. |
| *Ears:* Fine, pointing forward | 2. |
| *Jowl:* Medium in size and neat | 1. |
| *Neck:* Short, full and well arched | 3. |
| *Shoulders:* Broad and deep | 7. |
| *Girth around Heart:* | 6. |
| *Back:* Straight, broad and level | 12. |
| *Sides:* Deep and full | 6. |
| *Ribs:* Well sprung | 7. |
| *Loin:* Broad and strong | 12. |
| *Flank:* Well let down | 2. |
| *Hams:* Broad, full and deep, without loose fat | 12. |
| *Tail:* Medium fine and curled | 2. |
| *Legs:* Fine and straight | 3. |
| *Feet:* Small | 3. |
| *Hair:* Fine and silky, free from bristles | 3. |
| *Action:* Easy and graceful | 4. |
| *Symmetry:* Adaptation of the several parts to each other | 10. |
| Total | 100. |

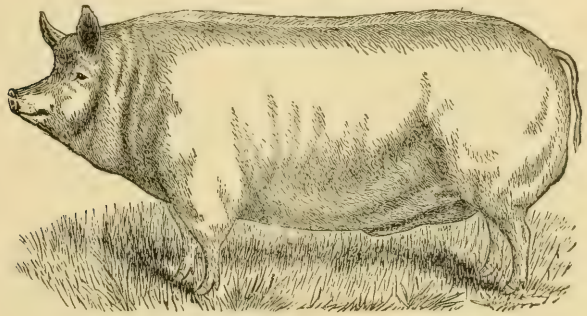
### ESSEX

The Essex, a small black hog, has been known in America since the early part of the nineteenth century, but has never secured a very wide popularity. It is more especially adapted to raising in a small way for family use than for commercial purposes. The Essex of the United States and the Small Black or Suffolk of England are said to be practically the same. They are good feeders, early maturers, and produce meat of excellent flavor, but with a large proportion of fat.

### CHESHIRES

The Cheshire originated in Jefferson county, New York, about the middle of the nineteenth century. It

has also been known as the Jefferson County hog, or Jefferson County White, and is supposed to be the result of crossing a Yorkshire boar upon native sows having considerable Suffolk blood. The Cheshire is always white, with a pinkish skin, and in conformation is not essentially different from the Englishman's Middle White or Yorkshire. The face, while dished, is only slightly so. The ears are small and fine, and although



CHESHIRE BOAR

pointing somewhat forward are quite erect. The body is of good length, with good hams and shoulders and a rather broad back, somewhat arched. Cheshire legs are a little too light in the bone, and in this respect need improvement. The breed may be ranked as either of medium or heavy weight, individuals being made to weigh up to 600 pounds dressed, if desired. It is favorably known for its fecundity and the quality of its flesh. The Cheshire, although of a good sort, is very seldom

seen west of New York and its popularity has never been more than local.

A scale of points adopted by the Cheshire Swine Breeders' Association reads thus:

| | Points |
|---|---|
| *Head:* Short to medium in length; short in proportion to length of body. | 8. |
| *Face:* Somewhat dished and wide between the eyes | 8. |
| *Jowl:* Medium in fullness | 3. |
| *Ears:* Small, fine, erect and in old animals slightly pointed forward | 5. |
| *Neck:* Short and broad | 3. |
| *Shoulders:* Broad, full and deep | 6. |
| *Girth around Heart:* | 8. |
| *Back:* Long, broad and straight nearly to root of tail | 10. |
| *Side:* Deep and full, nearly straight on bottom line | 7. |
| *Flank:* Well back and low down, making flank girth nearly equal to heart girth | 3. |
| *Hams:* Broad and nearly straight with back, and running well down towards hock | 10. |
| *Legs:* Small and slim, set well apart, supporting body well on toes | 10. |
| *Tail:* Small, slim and tapering | 3. |
| *Hair:* Fine; medium in thickness and quantity | 3 |
| *Color:* White. Colored hairs disqualify | 2. |
| *Skin:* Fine and pliable, small blue spots objectionable but allowable | 3. |
| *Symmetry:* Animal well proportioned, handsome and stylish | 8. |
| Total | 100. |

CHESHIRE SOW

### MISCELLANEOUS SORTS

Aside from the distinct breeds, a few miscellaneous sorts are known in America, but they are without standing. These are: The Razor-Back, as the wild or semi-wild hog of the more southern or Gulf states and Mexico

is called; the Guinea; the Mule-Foot or solid-hoofed; and the Cuino. Domesticated swine have been traced back in origin to the wild hog, and remarkable changes have been observed of the manner in which wild specimens kept in confinement will take on the appearance and flesh of those that are the product of man's improvement. On the other hand, improved varieties turned out to shift for themselves have assumed all the characteristics of wild hogs, although observations in New Zealand have shown that animals once domesticated do not revert to as wild or solitary a disposition as is noticeable in the undomesticated types. Experiments in confining wild animals have shown that advantages attained through years of domestication are valuable because they have been secured and made permanent by very slow processes, and that the opinion sometimes advanced that crosses with the Razor-Back or other untamed stock will give a much hardier and "cholera-proof" constitution is without substantial foundation.

### MULE-FOOT HOGS

The Mule-Foot or solid-hoofed hog is reared, but to an extent scarcely appreciable, in the southwestern part of the United States, and is said to be common in some portions of Old Mexico in considerable numbers. There are some in Texas, Louisiana and Arkansas, and a few have found their way to Missouri and Indiana. There was organized at Indianapolis, Indiana, in January, 1908, "The National Mule-Foot Hog Record Association," composed of Indiana breeders, which is to record and

publish pedigrees and promote the dissemination of these solid-hoofed swine, which are claimed by their admirers to be in all respects equal to those of other breeds, besides having a vitality that makes them strangers to ordinary diseases, and "cholera-proof"!

Hogs of this family are mainly black, with more or less white points or markings, have coats of soft hair, fairly gentle dispositions, fatten quite easily, and can be made to weigh at two years or more from 400 to 600 pounds, and sometimes heavier. As a matter of fact they have no particular merits not possessed by other breeds, but their having solid instead of cleft hoofs makes them, as freaks, objects of curiosity to most persons, and the type, regardless of merit, will not be without admirers for this one feature, if for no other. At the first auction sale of these hogs, in Johnson county, Indiana, in the autumn of 1908, twenty-three sows brought an average of $32.50 each and six boars $20.10 each. One sow sold for $60.

Many of these hogs have wattles on their lower jaws. These consist of a round or teatlike piece of skin or tissue hanging on each side of the lower jaw, covered with hair, and on a full-grown hog are from three to four inches long.

In southern Missouri and northern Arkansas these swine are designated as "Ozark hogs." Various statements of their origin are extant, but no one knows definitely about it, which is of little consequence, although they are well enough in their way.

### GUINEA HOGS

The so-called Guineas are a red or sandy kind of hog, known while slavery was in existence in the United States, and no doubt they were first imported here from the Guinea coast of western Africa in slave-trading ships. They are thought to have been brought to the United States soon after 1800, and perhaps had some influence in developing the present Duroc-Jerseys. The author has been unable to find any domesticated red hog in any country where the slave trade did not exist, but it is found in almost every country where the captured Guinea negro slaves were landed. In Texas a breed of black hogs partially of Essex blood is known as the Guinea-Essex. They are solid black and have no red or sandy color. A Portuguese hog was known over a number of eastern states for some years before the Civil war. They were first imported to Massachusetts for the Daniel Webster farm, but upon landing were sold to New York and Vermont farmers. These and the Jersey Red hogs were all of a red or sandy color.

### THE CUINO*

There exists in some sections of Old Mexico a type of "hog" represented as the product of crossing a ram with a sow, and the term "Cuino" has been applied to this rather violent combination. The ram used as a sire to produce the Cuino is kept with the hogs from the time he is weaned. A resident of Mexico has given the following description of the Cuino: "The sow used to produce the

* The origin of the Cuino, as given, is not vouched for by the author.

Cuino belongs to any race, but, as a rule, to the Razor-Back family, which is the more numerous. There is never any difficulty with her accepting the ram when breeding time comes. The progeny is a pig—unmistakably a pig—with the form and all the characteristics of the pig, but he is entirely different from his dam if she is a Razor-Back. He is round-ribbed and blocky, his short legs cannot take him far from his sty, and his snout is too short to root with. His head is not unlike that of the Berkshire. His body is covered with long, thick, curly hair, not soft enough to be called wool, but which, nevertheless, he takes from his sire. His color is black, white, black and white, brown and white. He is a good grazer and is mostly fed on grass, with one or two ears of corn a day, and on these he fattens quickly. The Cuino reproduces itself and is often crossed a second and third time with a ram. Be it what it may, the Cuino is the most popular breed of hogs in the state of Oaxaca, and became so on account of their propensity to fatten on little food."

### PECCARIES

Under the name of peccary are included two species of forest-dwelling mammals of the hog family native to America. They differ radically from the domesticated swine, particularly in having but 38 teeth, as against 44 in the domesticated breeds, and the hind feet being three-toed. In general appearance they somewhat resemble small hogs, except for very slender legs, entire absence of tail, and for their much elongated snouts.

On the rear extremity of the backs of both male and female is a gland which secretes a very fetid fluid. They are not esteemed for or much used as food. If taken young they are easily domesticated, but do not cross with the common hog. The females give birth to young but once a year, usually to one and sometimes to two. Of the two species the Collared peccary (*Dicotyles torquatus* or *Dicotyles tajacu*), presumably known to the Spanish speaking inhabitants of the southern part of the United States and Central and South America as "javelina," ranges from southwest Arkansas and Texas west possibly as far as California and south to Patagonia. They forage in couples or in small herds of eight or ten. The White-Lipped peccary (*D. labiatus*) associates in large herds, and its range is comparatively small, including only the region between British Honduras and Paraguay.

### WILD HOGS

In the delta of the Colorado river, not far from the borders of Arizona and California, are wild hogs described as "razor-backed, long-limbed, sharp-tusked, fast as horses, shifty as jackrabbits and when cornered, ferocious as tigers." Tusks of the old boars are spoken of as "scimitar-shaped, razor-sharp, needle-pointed and enormous, and driven by a sinewy neck will lay open anything softer than a plate of chrome steel." There are no great numbers of these swine, and they are gradually being killed off by parties of Mexican hunters who slaughter them for meat. It is tradition that they are

descendants of domestic hogs taken to the region in 1886, in connection with a colonization scheme which was abandoned, but there is a popular belief that an admixture with the peccary or javelina has had something to do with giving them "their suppleness, their murderous tusks and but slightly less deadly forehoofs."

Wild hogs, generally spoken of as Razor-Backs, are found to some extent in Arizona, New Mexico, and the swamps of Texas, Louisiana, Arkansas and Florida, but of a somewhat different type from the wild hogs of Europe. They are gradually disappearing as the country where they range becomes populated, the land cultivated and the merits of improved stock better appreciated.

### LINCOLNSHIRE CURLY COATED SWINE

In 1909 Prof. C. S. Plumb imported for the Ohio State University a small number of what are called Lincolnshire Curly Coated pigs, from Lincolnshire, England. Animals of this breed have a white skin and a very curly, thick coat of white hair, but dark spots sometimes occur on the skin. The head is short, rather straight, and the ears lop over and are a trifle thick. The back seems some wider and stronger than is usual in the British breeds, and perhaps with more ham and less length of leg. These Lincolnshires have been termed both a bacon and a general purpose breed.

"The Lincolnshire is said to be very hardy, and a good doer under ordinary circumstances, roughing it easily in England. The sows are prolific and have nice litters and are good mothers." The breed is entirely new to America, and its merits here are yet to be tested.

CHAPTER V.

# Practical Points in Breeding

Perhaps the best suggestion that can be offered the man who raises hogs is that he should strive for the golden mean, avoiding extremes in any phase of the business. There are many temptations to go too far, and success often comes from knowing when and where to stop. Corn is a wonderful feed, and in its territory swine raising is on a secure basis, but the farmer who relies too much on corn and neglects the properly associated feeds will force his hogs into the weak-footed brigade, exposed to the assaults of disease through lack of proper development. On the other hand, a man may go too far in seeking the adapted ration, as did the farmer who fed his hogs concentrated lye to soften and make digestible the grains in the hogs' stomachs; the grain was no doubt softened, but the hogs died before the beneficial effects, or rather action, of such a carefully adjusted diet could be ascertained. Caution tempered by common sense should be the general motto.

If the beginner will start with not more than two or three sows, in pig when purchased, he can acquire much valuable experience with even so small a number, while his risks will not be great. The next year he may add to the number of sows, secure a suitable boar, and by slow but careful increase in the number of sows bred

each year, if good management and freedom from disease prevail, should soon find himself with a profitable herd.

## SELECTION OF BREEDING STOCK

Many practical questions enter into the first selection of boars and brood sows, not the least of these being the facilities and pocketbook of the man who is doing the buying. The beginner in swine raising may learn much from books, papers and breeders' meetings regarding the ideal hog, only to find, after all is said and read, that financially he is in no position to stock up at prices he may regard as high, yet not too high. The great majority are so situated. While the author of this volume firmly believes in the advantages and importance of registered stock, he recognizes that most men who raise swine are not so equipped that they can apply the methods best suited for handling a $5,500 boar or a sow similarly related to the nobility. He has endeavored, therefore, to set forth the best methods that have come under his observation, without going far outside the range of the average man who raises hogs to sell for slaughter.

The hog has won his place in great part through the fact that he is profitable alike to rich and poor, and a man with limited resources may make more money with a like number of hogs, and often does, than the possessor of a plethoric bank account. A restricted area, makeshift shelter and the less expensive feeds, handled in a small way but to best advantage, may be utilized for the attainment of a much higher status.

Selection according to type is of greater importance than selection by breed, for the latter is controlled mainly by the owner's situation and personal tastes, but the type has to do with the constitution, capacity and general merit of the hog, and, whatever the breed, there are certain points that make for a good or a poor hog, as they may be found prevailing or lacking.

A rather short, broad, more or less concave face, wide between the eyes, terminated sometimes, but not always, by a somewhat upturned muzzle, is deemed extremely important for what it suggests with further reference to the individual possessing it. It says to the hog's owner, "This animal is of a quiet disposition, and has strong digestive and assimilative powers, likely to extract the most nutriment from the food consumed, and convert it into valuable product, with small probability of wasting much of it through restless energy."

The well-rounded and somewhat prominent jowl, along with the short head, suggests quick-feeding quality and early maturity in the animal managed for these objects.

A medium-sized, soft, silky ear, somewhat thin and inclined to droop, goes in most breeds with high quality and light offal, as large, heavy ears and tail, thick skin and coarse hair and bone go with flabbiness and heavy offal; while the erect, foxy, pointed ear, straight, almost convex face, and sharp, long nose generally advertise a too nervous activity, poor fattening qualities, and perhaps viciousness.

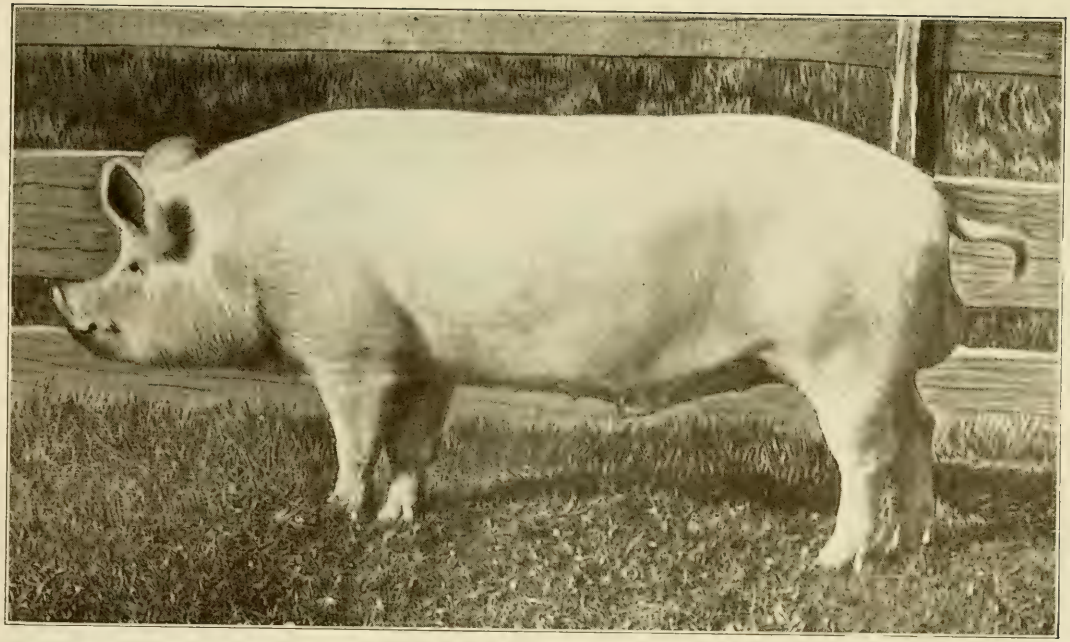
A deep chest, which is wide between the forelegs, indicates that the animal is probably of robust constitution, with plenty of lung room for deep breathing; it also signifies a hardiness that successfully resists or repels the many diseases which seem to constantly lie in wait for the defenseless pig.

A not too long, slightly arched back, broad by being well packed with muscle (lean meat) on each side of the spinal column, which constitutes the part known as tenderloin, tells of strength in various ways, as well as of added weight.

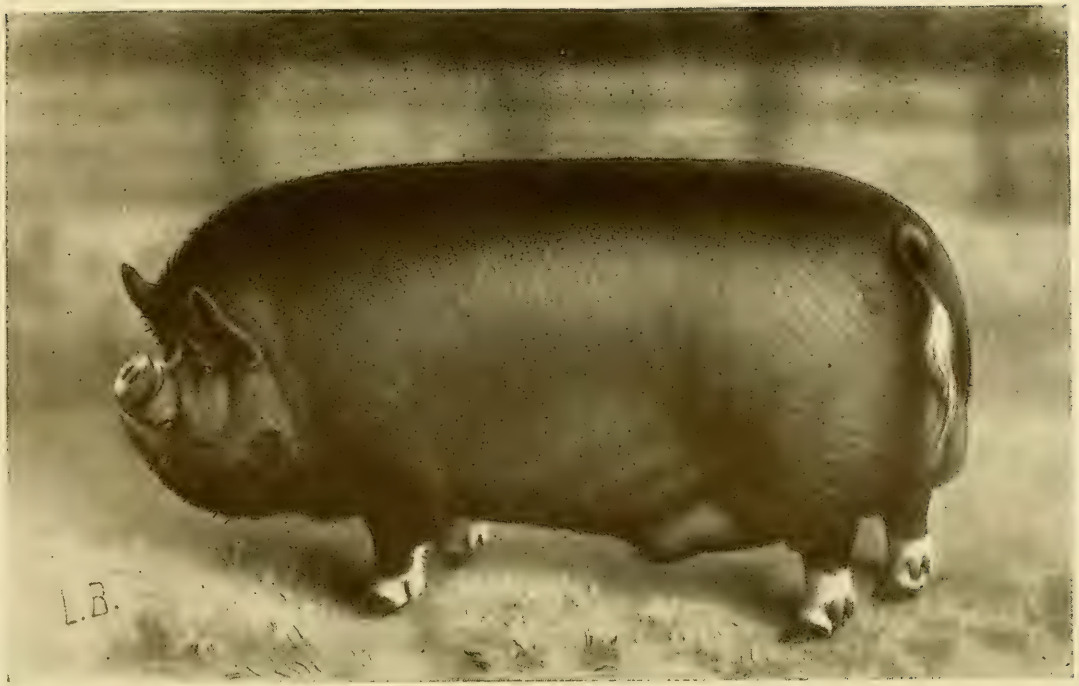
If the top of the rump is built backward quite level, without much slant, to the setting on of the tail, not too low down, and the thighs are fleshy, full and large, firm rather than flabby, and well meated in the twist, with the flesh spread thickly toward the hocks, it means a large ham; and it need not be said that the ham is a considerable proportion of the very highest priced meat in the carcass. This is an important consideration to grower and butcher.

Sides of considerable length and depth, with an even underline, mean a goodly weight of meat, which, if not extremely fat and thick, are the material for a high quality of bacon; while, if very fat, they make much of what is known as "side-meat," esteemed by those who do hard labor as their most economical and palatable animal food.

Rather short, stocky legs are likely to be found on the pig with the deep sides, and are much of an index to the animal's general character and constitution. They



**A NOTED YORKSHIRE BOAR**
The bacon hog breeder's ideal




**BERKSHIRE BOAR, LORD PREMIER'S RIVAL 92805**
Sold at auction for $3,200

should be neither too fine and small, nor too large and spongy, but amply strong for supporting the animal at any age or weight. The ankles should be strong, so that the hog stands firmly and walks squarely on short, broad feet, without difficulty and without signs of being in any wise crippled. Faulty breeding and a corn diet for many generations have tended to defective, sprawling feet, and weakness in the lower limbs of many of the otherwise almost perfect swine. These are defects which breeders should strive to overcome by selection, mating and properly balanced diet. Animals so vitally weak in one part are likely to have kindred weaknesses in other parts such as no careful breeder wishes to possess or propagate.

Abundant hair, lively and somewhat fine and soft, growing out of a pliable skin, which is neither thick nor papery, and free from mangy conditions, tells the story of robust health, vigor, thrift and active circulation.

The ideal hog should not be too sleepy and sluggish, nor, on the other hand, restless and uneasy. Free action and a bright, sprightly manner are signs of good digestion and good health. If he is a comfortable, good-natured, friendly creature, wide-awake, disposed to visit with his owner, instead of running away from him, and has the other points of excellence mentioned, he can scarcely fail to be a joy to his possessor and approximate, in the eyes of many, a thing of beauty.

Balanced breeding is as essential as balanced feeding: the burden of excellence should not be placed upon the

boar alone, nor solely upon the sow, and it is only by a combination of the merits from both parents that the best results are had. It is not good breeding when his sows have become so effeminate and so high-bred that the owner is led to think he must buy a coarse, rangy boar to correct, by what amounts to violence, the deficiencies which are the result of wrong methods. The boar and sow should complement each other, and, as a general rule, the sows should be roomy, broad and maternal in appearance, while the boar ought to be more compact, and well built, yet none the less robust, rugged, and masculine. The rule is a good one that what one parent lacks in desirable qualities should be conspicuous in the other, but it is a requirement the necessity for which should be prevented so far as possible, the better procedure being to prevent serious lack of quality, conformation, or stamina in either sires or dams.

Progress in breeding has not been without its development of bad tendencies. Probably the most noticeable retrogression in later years has been toward too weak bone and cartilage. The heavier types, or what are sometimes called the "lard hogs," often lack the firmness of bone and strong ligaments their weight requires. No one breed is by any means the sole sinner in this respect, nor is it a defect confined to the hog of pedigree. It is evident from the frequent complaints of "hogs breaking down;" and the inability of a hog to stand firmly up on his toes, with a pastern joint but slightly curved, tells the tale of insufficiency of hard, firm bone stayed by firm connecting tissues. The pasterns should be slightly

springy; not depressed so the dew claws tend to drop on the ground. It is highly important that deficiency in bone and ligament be avoided by the selection of breeding stock that will stand up well on its feet, and equally as urgent that the breeder should keep in mind the deteriorating effects of feeding corn exclusively, and guard against sacrificing proper framework because a carcass of fat may appear less expensive.

Breeding from immature animals is not to be commended. It has no particular effect upon early maturity, unless through the possible stunting of the pigs because of the fact that their dam has not obtained her own proper development. Mature parents will yield larger, healthier and more robust litters, in every way better equipped to bring the profit the owner is working for. During pregnancy the sow is compelled to do double duty in sustaining herself and building her young, and if she is forced to provide growth for herself as well as for a litter of pigs she cannot be expected to do full justice in either behalf, even if, as is frequently not the case, she is provided with proper care and food. A successful Illinois breeder with large experience has well said: "The common practice of each year selecting young gilts to breed and breeding them to young boars has done more to reduce stamina and prolificacy than any other one thing; besides, it reduces the size and number of pigs at birth. We have never discarded a sow that proved a good breeder until she was so old that she quit breeding. We have kept sows until ten and 12 years old, and one until she was 13. It does not

cost much to carry them over from the time they are through suckling until the next litter is farrowed."

Breeding should first of all make for stamina, no matter what type or color may have been the breeder's selection. Any tendencies which point to impairment of constitution are likely to be accentuated in the offspring, and, persisted in, will sooner or later bring a breeder to grief. Probably the greatest fault of improved swine breeding is the mating and striving for a too great refinement, especially by breeders of pure-breds, and indications of this should cause the breeder immediate concern.

This does not necessarily mean that Razor-Back or other uncivilized blood is required to restore or add vigor, or that new breeds are essential because, perchance, many hogs of noble lineage appear to have been too much pampered, or are delicate or effeminate. There is abundant corrective material in each of the well-recognized and established improved breeds, and the man who aspires to attain any high place as a breeder and looks for foundation stock from other sources is but throwing his time and his money away.

"If you want to get the largest size possible in your boar and sow," says a prominent and very successful hog raiser, "do not use them until well toward maturity, or at least until a year old. This will give a chance for large growth before they are put to breeding, and will, in the case of the sow, make her about 16 months old before she farrows. If well fed and properly cared for, she should weigh 400 pounds or more and farrow strong

pigs of good size. If the sow proves a good breeder and suckler, I would recommend raising two litters a year from her till she is too old to produce well. In our own business we are great believers in old breeding animals, and sometimes keep them till ten to 12 years old."

In many phases of swine husbandry the question of location or climate has an important bearing. Where mild weather is apt to be the rule in late fall and early spring, breeding for two litters a year will obviously be considered in a different light than in a section much farther north. The breeder in Canada or on the Atlantic coast will modify many matters regarding breed or feeds that are accepted gospel in the corn belt. Locally, the extent and kind of pasture at the breeder's disposal, like his other facilities and resources, will, to a greater or less extent, influence his practices.

Investigations show that the litters will average about an equal division of sexes at birth. The United States Department of Agriculture received reports in 1907 of the litters of 1,477 sows, in 24 states, which included the Berkshire, Poland-China, Duroc-Jersey, Chester White, Large Yorkshire, Hampshire, Tamworth and Ohio Improved Chester breeds. The average litter was about nine pigs to the sow, and of 13,285 pigs, 6,660 were boars and 6,625 sows. This is relatively 201 boar pigs to 200 sow pigs, or almost an equal number of each sex.

### INBREEDING

Much has been said and written against inbreeding, and it is a problem in dealing with which much judgment

and discrimination are necessary. Indiscriminate inbreeding is reprehensible in the extreme, and should be preached against in season and out of season, but judicious inbreeding has made possible the superior individuals, families and breeds now so common in all improved animal husbandry. Inbreeding in itself is not to be inveighed against so much as the mating of animals liable to reproduce undesirable qualities. A summing up, in a sentence, of what the experience of the years has demonstrated as to inbreeding would be this: Supervised by an artist, inbreeding is admirable; in the hands of a bungler, it may be worse than bad.

N. H. Gentry of Missouri, known everywhere as one of the most successful swine improvers and breeders in any country, says: "My experience in inbreeding is that by it we intensify what we have, let it be good or bad, let it be weak or strong in constitution. The theory advanced by the mass of people, to the effect that we diminish size and weaken constitution, is all wrong unless the strain we are inbreeding lacks size as a rule, or lacks constitution. Animals with plenty of size and a vigorous constitution can have these traits intensified as certainly as we can lessen them by inbreeding with strains lacking these essential traits. If we can intensify the one it seems to me as reasonable that we can the other; so a man's success in inbreeding will depend upon what he has to inbreed with. Rightly and intelligently done, I have never been able to detect any bad results whatever from inbreeding. It has always been strange to me that almost every person who has never given the subject any study

whatever has a decided notion that inbreeding is dangerous. I presume our fathers tell us this simply because their fathers told them so and their grandfathers before them, and not one in many thousands has ever given the matter any trial or serious thought. Even with a trial it does not follow that every case will be a success, any more than the mating of animals not related will be a success in every case. The animals mated, whether kin or not, must be suited to produce good results; that is, have no weakness in common, and as much good as possible."

A. J. Lovejoy of Illinois, a close and practical observer in the business of breeding the highest class of Berkshires, expresses this belief: "We are believers in quite close, even inbreeding. We find the greatest show animals closely inbred. Sires to half-sisters is the most common form of close breeding, though cousins, nephews and nieces, and even brothers and sisters, are bred together with great success. It of course requires good judgment in mating animals that are particularly strong in individual merit. Should each have a bad defect in any way, we would expect that to be more manifest in the offspring, and likewise the good points would be better; so if one mates equally good specimens the produce will be an improvement. There is no other sire of any breed so prepotent as an inbred sire. When we get to the point where we feel the need of outside blood we mate an imported sow with our best boar, and from this litter we select a boar to use on the get of his own sire from other sows in the herd; that is, we breed this boar on his own half-sisters."

Professor Eugene Davenport reaches the conclusion that "anyone who will take the trouble to study the pedigrees of famous families in almost any line of stock breeding will find that the foundation blood is most intensely bred. Indeed, the practical breeder working with material that is really of distinctive and peculiar merit comes soon to the point at which close breeding is inevitable, and he must face the issue sooner or later if he is to make any real use of his valuable creations. To breed them out is but to dissipate their excellence, and the only practical course is close breeding."

CHAPTER VI.

# The Boar: Selection and Management

Success with the boar involves careful and timely selection, and a management always influenced by the fact that the head of the herd, if incompetent, or ill-bred and ill-fed, can degrade herd standards even when mated with the best of sows, while, if he is what he should be, the produce of inferior sows will invariably be improved by his use. He is sire for the pigs of many dams, and his general influence is, therefore, much greater than that of any sow can possibly be.

It matters not how many sows a man has, or how much pains he may have taken that they be of the highest quality, if he permits this quality to be neutralized by the use of an inferior boar. However well the boar may look, if in breeding he is a mongrel—a cross of this, a little of that, and not much of anything in particular; or if individually he is well bred, but has been overworked, overfed, or not fed enough while young, or perhaps is of delicate constitution, he may, and likely will, beget an unthrifty, weedy progeny, inheriting largely of his weaknesses and want of character, with very little of the good that apparently was in him. By one or two seasons' use of such a sire it is possible to undo the improvement in a herd it may have cost years of painstaking effort to attain. Hence, in choosing, one of the first

and principal requisites is that he shall be well bred; not simply good individually, but a descendant of meritorious parents on the side of both sire and dam, in which possession of the most valuable qualities is known to be inherent. It is important to know well his ancestry, because his power of transmission and desirable breeding qualities cannot otherwise be prejudged with any degree of accuracy. The standard of quality maintained by his immediate ancestry is the safest suggestion of what he himself will do. If their ancestors, too, have clean records in this respect, and their descendants have equaled or improved upon them, that much is in favor of estimating the boar as a probably good sire. If, on the other hand, they have produced litters of varying and unprofitable types, mixed lots of pigs, without uniformity, unsatisfactory alike in appearance, in growth and in profit, it is indeed wisdom to avoid selecting a boar likely to transmit family tendencies of that kind.

The pedigree is simply a certificate of ancestry, and unless it shows good ancestry is of no more practical value than that much waste paper. It should back up the animal, but if the animal fails to back up the pedigree as well there is probably something wrong in one or the other, and "hands off" would be good advice.

### THE MATTER OF CHOICE

The average farmer cannot afford an extremely high-priced boar, and, while the boar that will bring $5,000 may, in the right place, pay a profit on the investment, the ordinary breeder is compelled to do the best he can

with the money at his command. Although the buyer of a boar may feel that his limit in price is restricted, he should be determined to secure the best his resources will permit, even though he makes somewhat of a sacrifice to do so. In any event, the animal that he selects should be pure-bred, of such breed as the owner may deem best, for if not pure he cannot be depended on to stamp his own qualities on his offspring, as only thoroughbreds do. The boar of mixed and unknown breeding is to be shunned as a delusion and a snare. If the Berkshire or a Berkshire cross is preferred, a registered Berkshire boar should be used. If the Poland-China seems most suitable, use a pure Poland-China boar; or if the Duroc-Jersey cross promises the best results, use a pure Duroc-Jersey boar. Do the same with one of any breed that may be preferred. To use a sire that is a mixture of several breeds, however meritorious or pure they may individually be, is likely to mean poor, uncertain and unsatisfactory progress.

There are certain attributes belonging to a good boar which should appeal alike to the man who can make but a small outlay and to him whose object is to get the best regardless of cost. The buyer should be familiar with these and should see them, as far as is possible, in the animal he selects. They will not all be prominent in one animal, but, so far as range of selection will permit, they ought to be characteristic in him, and are worth both time and effort, and perhaps some additional money, to secure. The breeder may find it profitable to keep in mind that it is not so much the extra $5 or $10 or $15 he may be

called upon to give for the right boar as it is the additional price his pigs will be intrinsically worth and will bring, and it is through them that the extra cost and more will be returned.

### MASCULINITY ESSENTIAL

Masculinity in the boar is a characteristic always to be sought. A strong development of the head, neck, shoulders, bones and organs of reproduction are very important, as they suggest three most essential qualities: Vigor, prepotency and constitution. Masculinity should be indicated by strength, vitality and stamina, but it need not, even in the remotest way, denote coarseness. A fine external form is the result of a superior internal organism. A masculine head, stout, well-crested neck, broad and deep chest, smooth but well-developed shoulders, wide and well-coupled, well-fleshed back, ribs well sprung, strong loins, large heart girth, deep sides, ready action, strong legs and ankles and upright feet are all useful points to carefully consider in the selection of a herd boar. A short, broad face, with round, heavy under jaw, and thick, short neck, indicate strong vitality and assimilating powers, two functions requisite in every first-class, meat-producing animal. Width between the forelegs and large girth immediately behind them denote room for large and active lungs, the very best foundation for any animal.

Ribs that are long and well sprung outward from the back show capacity of stomach. The broad loin and well-developed ham are signs of active kidneys. A clean,

fine and elastic skin, covered with soft, lively hair, free from bristles, denotes a healthy liver and freedom from internal fever. A fine muzzle and limbs, clean, small joints, and standing square upon the feet, denote substance, strength and firmness in the animal's framework; while the dished or concave face and slightly drooping ear are unerring signs of an easy keeper and a quiet, contented disposition. These are some of the features demanded in a good boar, and such an animal in perfect condition will not be sluggish and clumsy, but will have a lively, animated manner and move about freely and nimbly, unless kept in too close confinement on too much fattening or other unsuitable food. Each point of excellence should make for symmetry, and properly related parts give compact, desirable form. A boar highly developed in one part with another elsewhere noticeably weak is not to be taken in preference to one of all-around moderate excellence of development, except where such an undue development appears to be needed because of its lack in the sows. This is a point which should always command attention. What the sows lack or have too much of in bone or build or quality ought to be guarded against in the boar. Thus, if the sows are too refined and their development appears to have been overshot, there is an object in allowing somewhat of coarseness in the boar. This should be guarded against where possible, in selection of the sows, as well as the boar, by aiming toward a uniformity of type without extremes or weaknesses; but consideration

should be given to defects apparent in the sows when the boar is selected.

Strength of leg in bone, tendon, ligament and muscle is important, and the animal with weak pasterns should be avoided. The boar that cannot stand up squarely on his feet is likely to prove of unsatisfactory breeding service. Much is said in the farm papers about hogs "breaking down," a condition which may result from wrong feeding, but which, regardless of its first cause, no breeder wishes to perpetuate by weakly built sires or dams. Danger from this infirmity is not to be lost sight of. An effeminate frame, delicate features and legs and a tendency to walk upon the pastern bones stamp the boar as wrongly fed, overbred or of a faulty ancestry, accordingly weak in constitution, and likely to be a disappointing sire.

### SOME EXTERIOR INDICATIONS

As S. M. Shepard has well said in his excellent book, "The Hog in America," and also to the author, the skin, hair, eyes and tail are all outside sentinels which tell whether the internal organs are working properly. "If the eye is clear and bright, the hair smooth and lying close to the body, and the skin soft, elastic, moist or oily to the touch, and the tail carried in a curl, the internal organs are doing their duty; on the contrary, if the eye is red, watery or dull, the hair dry, harsh and standing up from the body, the skin harsh and dry, and the tail hanging straight and lifeless, there is something wrong inside,

and as these symptoms are more or less intense, they indicate acute or chronic weakness, and lack of constitution. Well may it therefore be said that *constitution is of the greatest importance.* There is always unity in animal nature. A fine external form is the result of superior internal organism. Then, in selecting breeding swine, select those which have broad, straight, or slightly arched backs, large, deep chests, full sides and flanks, good, tough, stout feet and legs, bright, lively eyes, smooth, soft and close-lying hair, and a soft, elastic skin. Such an animal will likely have a good constitution. On the other hand, avoid sunken and narrow backs, flat, narrow chests and sides, pinched flanks, weak, crooked or deformed legs and feet, harsh, dry hair, dull, red or watery eyes, and a harsh, dry skin."

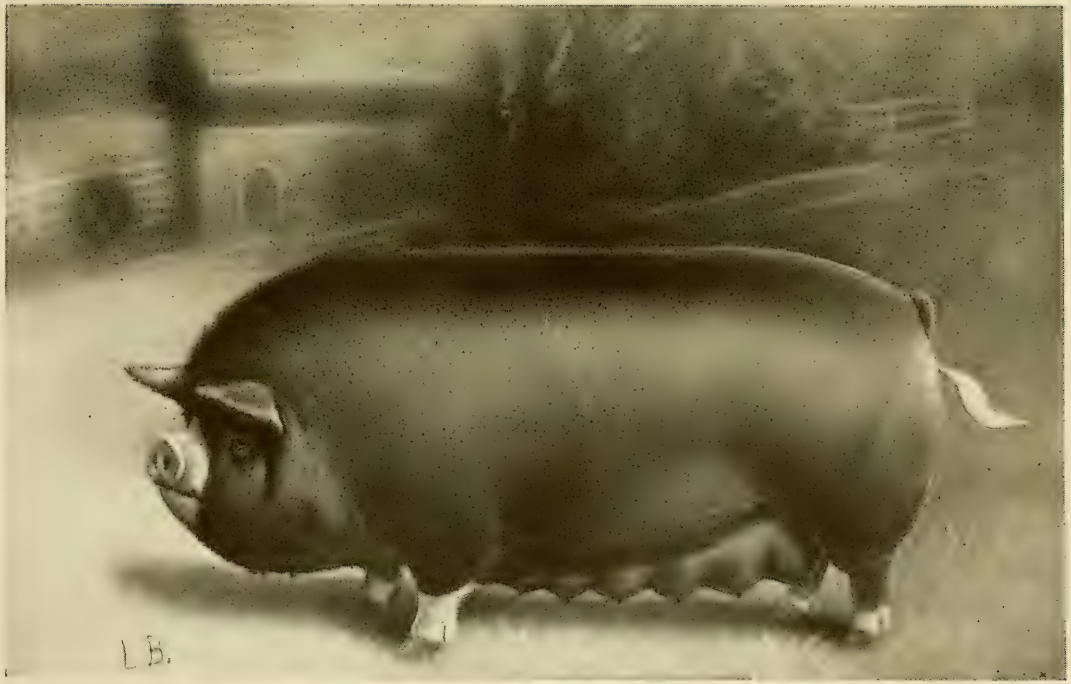
### A GOOD DISPOSITION VALUABLE

A boar's disposition has much to do with his work. There have been famous boars with ugly dispositions, and good animals are sometimes ill-behaved because of association with indifferent owners who lacked in patience and had bad tempers. These facts should be given due weight, yet it should be remembered that in disposition the hog that is wanted is one that comes near to have his back scratched. A friendly, manageable, quiet disposition is a great aid to profitable swine raising, while the boar of quarrelsome, fighting nature is a money loser. Much of this, too, is as applicable to the owner as to the animal. Fretfulness, natural at the breeding age, or in surroundings tending to promote it, should not be mis-

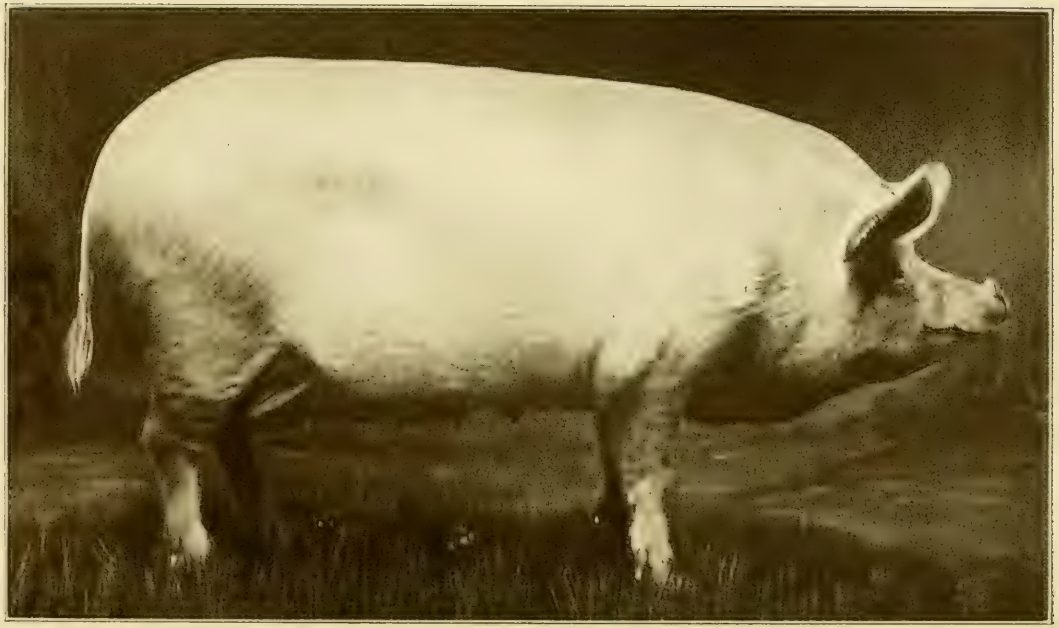
taken for a bad disposition. At certain periods the boar is naturally a restless animal, and then he requires more than the ordinarily judicious management, the lack of which may make him an intractable, uneasy or vicious creature, but in the mature animal this is likely to be developed one way or the other so that his disposition may be judged with measurable correctness.

### SELECT THE BOAR AT HIS HOME

The best place to select a boar is at his home on the farm, where he will be found in accustomed surroundings and in everyday dress. Here a far better estimate may be made of his merits and defects and his family characteristics than under the dress parade glare and manicuring of an exhibition, or the artificial conditions surrounding and in an auction sale ring. His disposition and that of his caretaker, which are of importance, may here be observed, and an idea gained of the methods and management in his bringing up. Not a few buyers are willing to pay a larger price for an animal in show condition, but this is not always wisdom. An abundance of fat may conceal serious defects which would be quickly noticeable in an animal in breeding condition. As a rule it will be found less expensive to put a hog in show condition, if that is desired, than to pay others for doing it. The average breeder, too, lacks the skill to safely reduce an overfed boar, pampered and fitted for the show circuit, to a condition and form for greatest usefulness in a herd, and attempt to do so may result only in impotence or inefficiency for the season, if not



**BERKSHIRE SOW, ARTFUL BELLE 30TH-64947**
At six years



A YORKSHIRE SOW

permanently, and perhaps the loss outright of the animal itself. At his home the boar's family characteristics and breeding traits may be better learned than in any other place, and the purchaser can better discover whether the animal selected comes, as he should, in a majority of cases, from a family or strain that is, as he himself should be, somewhat more compact that the females upon which he is to be used, or if he is otherwise suitable to correct in the offspring the deficiencies possessed by the sows.

After taking a boar to a new home it is generally preferable, at first, to follow, so far as may be practicable, any rational system of management and feeding to which he has been accustomed, until he shall have become acquainted with his new attendant and surroundings.

### CHOOSING BY PERSONAL INSPECTION

Whenever possible the breeder ought to inspect personally the animal he selects as his herd boar, but when he finds himself unable to do this and has no competent representative, he should endeavor to make the best selection possible by mail by detailing his needs, and the deficiencies of his sows. Ordering by mail should be considered a last resort, to be done only when the purchaser cannot buy near home, or for other good reasons is unable to give his personal attention to the matter. When that is the case the purchase should be made from a breeder known to be reputable, and the needs of the buyer and the price he figures on paying should be

definitely stated in the letter as the attitude of one who expects the best possible for his outlay. All men who have had much to do with the selling of pure-bred boars are familiar with the buyer who insists that "you must get him down as low as you can—he must be cheap, as I have written to a number of other breeders." A man of this stamp is likely to want a boar of almost impossible attainments for a very small sum of money. He is less likely to do well in his purchase than the man who will frankly state the type of boar he needs and the amount of money he can afford or intends to invest. The chances are, too, that the latter procedure will bring much the better treatment.

It is undeniable that many who pay a liberal price for a boar that suits them afterward treat him in such a way that they derive but small benefit from the investment. One of the two most common modes of mistreatment is to confine him in a close pen, where he is deprived of exercise and fed upon the richest and most fattening food the establishment affords, and lack of activity and virility are the results. The other mode is to turn him in with an unlimited number of sows, gilts and stock hogs to fight and fret and tease until he becomes the shabbiest, the most ungainly, unthrifty, discreditable hog on the place. Both of these extremes are to be avoided and a more rational method followed or the best results cannot be secured. While too close confinement is bad, it is not so bad as to allow a boar to roam at will among the other hogs of the farm, where he is as much out of place as a stallion would be turned loose with a herd of horses.

When a new boar is brought to strange surroundings or a new home the change should preferably be made some six or eight weeks before he is needed for service. If from a distance or by shipment he should be dipped, and isolated or quarantined for half of this period to guard against the possible introduction by him of any disease. No matter how little liability to disease may come from his former home there is still the chance that he may have acquired deadly germs in transit. Prevention is always safe.

If the trip has been a long or hard one he should be lightly fed at first, and any desirable changes from the feed to which he has been accustomed should be made gradually. Time is necessary in a majority of instances to get the boar into good breeding condition, which usually means, if he is from the shows or auctions, that he will need more muscular development and less fat. Exercise and flesh-forming foods should enter into his care at this period. Exercise is important to the boar when he is not in service and essential to develop his muscle and vigor.

### PRIZE-WINNING NOT PROOF OF EXCELLENCE

The fact that either a boar or sow has been awarded a prize, of whatever grade, at an exhibition, does not necessarily prove possession of unusual excellence, nor should such an award alone be accepted for a moment as proof of superiority unless the circumstances of its making and the extent and character of the competition met are carefully considered. The prize may have been unavoidably placed where it was because of little or no high-class

competition, or the person or committee making the award may have been incompetent, biased, or even corrupt, although it is the opinion of the author that very few mis-awards are due to sheer dishonesty on the judge's part. Again, whether a prize winner or not, an animal highly fitted with a view to its successful competition against others it is likely to encounter in the hotly contested show ring of any considerable latter-day exhibition, while possibly not injured for breeding, certainly has not been intrinsically benefited in any wise thereby, unless it be for the shambles. The fitting may reveal a perfection of individual quality that otherwise could be no more than suspected, but it adds nothing of value to, and in fact may detract much from, any improving qualities transmissible to offspring. Still again, an animal may possess an individual excellence that is beyond question (a freak or sport may have this), yet its good looks alone give no reliable assurance that its progeny will inherit the same characteristics. The show pig, champion though it be, is not perforce the best purchase or parent.

### THE PEDIGREE

As Doctor A. S. Alexander of the Wisconsin experiment station, discussing pedigree, says, it is a record showing the animals that have in succession entered into the breeding of the individual. "It shows, too, that he belongs to a distinct breed, possessing, therefore, the prepotency of that breed, and in addition to this possession it guarantees a certain degree of individual prepotency

dependent upon the excellence and known prepotency of the ancestors on each side of the pedigree. To insure both breed prepotency and individual prepotency the animal should have several recorded animals upon the dam's side, the more the better, and the more certain will be the good breeding qualifications of the pedigreed animal.

"The sires should be of equal merit, and the most important point is to see that they are of known purity of blood and individual excellence; also that upon neither side is there an objectionable outcross or the presence of a sire or dam noted for unsoundness or other objectionable trait, character or feature. Furthermore, the character of the man back of the pedigree should be taken into account. The pedigree is comparatively valueless unless the breeder and seller are noted for integrity; nor is a pedigree a sufficient criterion of merit or an apology for individual imperfection or unsoundness. The animal should be a good individual, and if, in addition, there is a long line of excellent ancestors upon both sides of his pedigree, there will be good reason to expect that he will, with considerable fidelity, transmit to his progeny the true characteristics of his breed, those of his family and those of his individuality.

"In some instances an animal with a long line of reputable ancestors is himself a comparatively poor individual, yet he may prove an impressive sire, and, on general principles, the somewhat indifferent individual that has a fine line of ancestors, as shown by his pedigree, is greatly to be preferred to a 'scrub,' grade or cross-bred animal for breeding purposes. We say this for the good

reason that his progeny will be quite likely to partake of the good qualities of the ancestry rather than the indifferent qualities of the individual. There are many exceptions to this rule, and experiment is, therefore, the sure way of proving the prepotency of the individual. It is always best, however, to choose a sire that has both excellent breeding and individual excellence of form and quality in every respect."

### AGE FOR SELECTION

It does not follow by any means that the handsomest pig will make the best boar, and selection at an early, immature age involves much guesswork, which is bad policy in any corner of the farm. Possibly the other fellow, who comes early, and, as it were, buys the pig in a poke, may get the best, but under the law of averages it is less expensive to pay the extra dollars for the animal more nearly matured and let the other fellow do the gambling. The boar's worth and possibilities may be sized up then with greater certainty and with a degree of knowledge not attainable when he is still at an immature age. If already tested he has then available proof of his breeding quality. At the same time it is desirable to make a selection and do the moving of a new boar long enough in advance to have him feel at home in his new quarters, and, when the breeder is well enough situated to permit his doing so, to test out his mating qualifications so that it may be known with greater certainty that he is in those respects all that should be expected. This, in many

cases, is not feasible, but at any rate the boar is not an animal to be purchased at the last minute before he is needed, and the buyer should allow himself time to be sure of a judicious selection.

For heading a farmer's herd it is much more desirable to choose a boar from a stock that has shown its practical worth in farm pork making than one from a so-called fashionable ancestry, and he should have been reared under about such conditions as will surround him in his new home.

Where selection of a young boar from a home litter is made he should be separated from his mates at or before he is five months of age. Many breeders favor allowing him the companionship of one or more male hogs of similar age, castrated or otherwise, in order gradually to accustom him to the changing situation; and for other reasons this may be excellent.

The boar of eight months or older will do better if kept by himself; at least, he should not be where sows or gilts may arouse him. He should be kept in a comfortable pen, with a lot or pasture adjoining, and supplied with a variety of nutritious food, which means something more than dry corn with an occasional drink of diluted dishwater. The permanent quarters should be provided with a view to furnishing sunlight, exercise, dry warmth and cleanliness. These should be so located that the sows may be conveniently brought to him for service. A large pen is not needed—ten feet square will do—but a yard and pasture should each be adjacent. The yard will be needed for service and for his exercise in the breeding

season, and the pasture, which may be an acre, or less, should afford him water, shade, grass, alfalfa, or other succulent food.

A pen or fence sufficiently high and strong to restrain the other hogs of the farm cannot be depended on to keep the boar in place, and, if opportunity offers, he may soon become extremely unruly; consequently, it is much the best to keep him from the first in an inclosure which will afford him no practice in the art of breaking out. A boar that has once learned a bad habit, especially that of breaking from his inclosure, will thereafter be a great deal more difficult to manage, and sometimes one which would otherwise have been entirely tractable is made difficult of restraint because the fence has been too weak, or in some other way he has been permitted to escape. If his quarters are sufficiently isolated from those of other hogs, especially sows and sow pigs—some of which are likely to be in heat most of the time—he will usually be quiet and gentle; in fact, a pretty well-behaved hog, though much depends upon his natural disposition and more upon the treatment given him. Aged boars are sometimes disposed to viciousness and to use their tusks, but even then they are no more dangerous than the gentlest bull or stallion may be, and, of course, neither is desirable or intended for a household pet or a dooryard ornament.

### AGE FOR SERVICE

As to the age at which the boar should commence service the best rule is to avoid service during imma-

turity. Immature sires cannot be expected to beget a vigorous progeny. Use before he is a year old should mainly be with a view of testing his ability, and such tests should be infrequent. He may sometimes be used to advantage on a few sows after eight or nine months old, but, as a rule, it is more profitable to defer service while the animal is attaining the best of his growth. At a year old reasonable service will do no harm, and, properly kept, he should be at his best as a sire from then to five years old, when he is fully developed and has every advantage over a partly grown pig; the finest, strongest litters are invariably obtained from large, old sows bred to matured boars.

The first service may require considerable patience. A young boar will sometimes refuse to give service at first, but it does not therefore follow that he will not be a useful animal. He may generally be expected to give better service in the second year than in the first.

One service to a sow is sufficient, and from it she will have as many and as good pigs as there would be if the boar was permitted to chase and worry her for three days and nights. The most experienced breeders agree in this, and will allow but a single service. Many breeders, however, do not seem to realize that double service to a sow is the equivalent of using a boar on two different sows, and not infrequently a breeder who would vigorously combat the idea of allowing two or more services in a day will himself leave a sow with a boar to be served five or six times. The sow should be brought to the boar's quarters, allowed one service and then removed. The

service should be a satisfactory one, for the sow may be a shy breeder. Service is generally considered preferable on the second day the sow is in heat.

### THRIFT AND FEED

The boar's condition should always be that of thrift and vigorous health, not too fat, nor yet so lean that as a barrow he would be considered unfit for pork. If too fat he will be clumsy, slow, and in no wise sure. Discretion must be used in the feeding of the boar, for carelessness in this respect may disqualify him for the season or even make him permanently impotent. It is possible to so poorly feed a boar that his progeny will be exactly the kind his owner does not want. His feed should be nourishing and cooling, and if corn is given it should be tempered with feeds which are somewhat laxative, and be used in moderation. When service is severe his exercise may be greatly lessened, and his proper feeding is the means of balancing this inequality.

Regarding feed for a young boar, N. H. Gentry says: "Corn, oats and wheat ground fine and mixed in a thick slop, with clover pasture, make a splendid ration. Oil meal tends, I think, to make a hog too soft. It would be difficult to surpass the ration of soaked shelled corn (shelled corn soaked in pure water thirty-six to seventy-two hours) and milk, together with clover pasture. I am a firm believer in the simple, natural foods. W. A. Harris used to say that he bred Shorthorns that thrived on the natural foods of the farm. I would not give much for a hog that would not do the same."

When not in service succulent feeds, such as pasture or green forage, should prevail, supplemented by shorts, middlings, bran, peas or other nitrogenous feed, with a little corn. In winter roots will prove beneficial, and may be used with bran, shorts and corn meal or similar feed. Cut clover hay, well cured, or alfalfa, is advantageous. With the boar, as with all other hogs, a variety of food is relished and responded to. With a range of grass he can better assimilate a ration of any kind of grain.

### TEMPORARY IMPOTENCY

In case a boar proves impotent, although previously a good breeder, he should be examined for a possible injury or some ailment which may interfere with copulation. Where nothing is found which calls for treatment he should be withdrawn from service, permitted opportunity for exercising freely, and be fed a light diet. Attention should be given to the condition of his bowels, and, if necessary, they should have proper regulation. A dose of nux vomica, pulverized dried sulphate of iron and pulverized gentian root, 15 grains of each, mixed with his feed twice a day, is recommended.

Another treatment consists in giving in the drinking water once a day a tablespoonful of hyposulphite of soda dissolved in a quart of water. A quart of boiled wheat mixed with two eggs may be put in with his feed for a few days.*

A boar found impotent should have at least a month's rest, preferably two months, with the run of a pasture.

*Veterinary Editor, Breeder's Gazette.

Even the use of the whip is advisable if necessary to make him exercise. The service following treatment will be experimental, and, if unsatisfactory, it is better not to take further risk with the animal unless he is of unusual value. At this time, as in the beginning, the fact should be taken into account that the condition of the sows may also have had a bearing on the failure.

Many farmers breed less than a dozen sows, on an average, at any one season of the year, and to keep a matured boar in the best condition is felt to be quite an expense by one man with so few sows. Where three or four swine raisers live in proximity to one another it is no doubt the best and cheapest plan for them jointly to own and use one strictly high-class boar, instead of each keeping wholly at his own expense one that "he thinks will do," although not so good as he would like and would afford if the first cost and subsequent expense and care were not so great. Properly managed, one boar would, in many cases, answer every purpose as well as half a dozen for that number of small farmers, and his cost and keep, if shared by all, would scarcely be felt, while at the same time the temptation to use some mongrel or immature pig would be removed, the boar would be better kept, and the rivalry naturally resulting would encourage each of the owners to keep a better grade of sows.

### PRACTICAL TESTIMONY

Practical testimony regarding selection and management is of special value when it comes from men of

known successful experience. The paragraphs that follow give a little such testimony:

"There is certainly no excuse now for anybody buying a grade boar," says Henry Wallace, editor of *Wallaces' Farmer*. "Comparatively few farmers do. Do not economize in buying the boar, provided he is a good individual and well bred. There are not enough good hogs to go around. A wise and judicious breeder and feeder is very apt to know what his stock is worth and demand it and get it. Therefore, do not let five or ten dollars stop you from buying the animal you want."

"A boar untried and out of condition is a risky chap," says L. N. Bonham, "that the prudent man will test before he risks him on his herd. I have found it a safe rule to hold onto the good sire until I have tested another. It is sometimes inconvenient to keep an old boar long enough to see what the young one will prove to be, but it is safest not to put all our eggs in one basket."

"I don't believe in using a boar too often," says N. H. Gentry. "I don't like to use him immediately after feeding. Sometimes we use a boar twice a day, and then probably have two or three or four days when we will not use him at all. We prefer to scatter these services along, but have, of course, no way of regulating the time when sows will come in heat. Sometimes we find ourselves with three or four in heat and must use a boar two or three times a day, but not very often. If I use a boar twice in a day I like to let him miss service afterward for a day or so. I think once a day is doing very well."

A correspondent of the *Breeder's Gazette* visited the herds of twenty-three prominent breeding farms, from

Lowell, Mass., to Edgar, Neb. His report showed that the most successful boars are treated with as considerate attention as might be given a valuable stallion or bull. "It will be seen," he summarized, "that the hogs that are achieving success as sires are not kept in a pen and fed corn and water. Too much attention cannot be given the boar, and it is not at all sufficient that he be fed liberally only when in service. His health and comfort should be looked after carefully throughout the year. If you have one not so worth looking after, dispose of him and get one that is, even if he costs a house and lot."

A. J. Lovejoy, who sold the boar Masterpiece 77000 for $2,500 in 1906, the highest recorded price for a Berkshire up to that time, said: "So far as handling Masterpiece or any other boar is concerned, we give him lots of exercise and good hearty feed, keep him in fair breeding condition and do not use him too much. Our manager of the hogs would only let Masterpiece to one sow a day for two successive days. Then he would have him rest a day and use him another two days. Every time he is used he walks forty rods from his home to the breeding house. The sow is taken from her mates the night before and put in a crate where she can't see other hogs. In the morning, before breakfast, the herdsman walks the boar down to the breeding house and lets him lie there until after breakfast. Then he uses him, and immediately puts the sow in a dark, quiet place until she is out of heat. He lets the boar lie for half an hour and then walks him back home. We give him his breakfast afterward. By having lots of exercise and not too many

services the boar is always on edge. We very seldom have to breed him to the same sow a second time."

### AGE FOR RETIREMENT

As long as the boar shows vigor and his get are satisfactory he may be profitably kept in the herd. When that time has passed he should be castrated, pastured through the summer and fattened in the fall. Such an animal is known to the trade as a "stag," and usually sells at a price much lower than a barrow of the same weight and apparent quality. If castrated early in the season and kept on grass during the summer the flesh, when he is made fat, will be far less rank than it would be otherwise. Kept with other hogs, if quarrelsome, there is danger that a stag may do them injury with his tusks, if he has them, hence it is desirable to fatten such a hog by himself. It is at this period that the old boar's true proportions will show themselves, as he will take on fat very rapidly and generally present a greatly improved appearance. When slaughtered, the strong taste that might otherwise appear in his meat may be avoided, it is said, by removing the sheath at once after killing and without waiting for dressing. In case the animal slaughtered is a boar the testicles should also be immediately removed.

### REMOVING THE TUSKS

A reader of the *Homestead* gives a practical method of removing tusks from a boar, reported in that paper as follows: "He prefers tying up by the upper jaw and putting a slipknot back of the upper tusks. The hog will pull

back and keep the rope tight; one man stands astride the hog and puts a hardwood stick about one and one-fourth inches thick in the boar's mouth; takes hold of both ends, pulls it back as far as he can and holds it there. Another man should then put some straw on the ground, get down on his knees, and, with a three-cornered file, file a good notch in each corner of the tusk; then put the point of an iron wedge in one of the notches and tap it with a hammer, when the tusk will break squarely off. He would then, with a flat file, smooth the stump down to the jaw. He thinks if this procedure is followed the hog will give thanks and say, 'You have done a good job and it did not hurt much.'"

### THE SIRE MORE THAN HALF THE HERD

In his valuable work, "Principles of Breeding," Prof. Eugene Davenport says: "It has become a proverb that the sire is half the herd. He is far more than that. He is half of the first generation, three-fourths of the next, seven-eighths of the third, and so on, until, if judicious selection be maintained for a few generations, the character of the herd will be fixed by the sire alone. This being true, the folly of maintaining a sire with but two or three high-class females is evident; he should have larger opportunity. All this means that, as a beginning, numbers are of more consequence relatively than quality on the side of the dam, and that if the breeder must choose between the two it is better to put a given amount of money into a good number of plain females than into a smaller number of high quality, but that in all cases the

sire should have quality and plenty of it, because of the principle here stated.

"In many lines of breeding, size in the sire is considered by many breeders as of first importance. This is against reason and biological principles. We need in the sire all the desirable characteristics possible, and these are most readily found in animals of medium, not extreme, size. It is comparatively easy to get size alone, and this can be gotten on the side of the dam. The swine herd must depend for uniformity largely upon the sire, and he should be freed as much as possible from the requirement of size.

"In the matter of prepotency, neither parent has any particular advantage over the other. But this refers to a single offspring, and is only a part of the question. The real difference is one of numbers. The sire may produce perhaps a hundred in a season, while the dam is limited to one individual or at most (among hogs) to two litters. For purely mathematical reasons, therefore, the female is of vastly less consequence in herd or breed improvement; indeed, wherever polygamous mating occurs. It is here a question of numbers and opportunity. As regards these, the upper limit of the male is very high and of the female very low, which fact teaches the necessity of extreme care in the selection of the sire, not so much for biological as for numerical reasons. The single female is, therefore, comparatively insignificant. Unless she be one of the few phenomenal breeders her individual power for good is exceedingly low, and the readiness of

many buyers to pay extreme prices for females, especially of cattle, is wholle unaccountable.

"It is never too early to seek a new head to an established herd. Proved sires are seldom for sale, and the only recourse for the breeder is to prove his own; indeed, what he needs is a sire that will produce well with his females.

"It takes much time and often many trials to find a worthy successor to the head of the herd. Putting it off too long, and a feeling of fancied security, are the two causes of leaving a herd without a head, and of the enforced evil practice of using an untried sire."

A useful fact to remember is, that regardless of his having or lacking a fancy head and ear, the really valuable parts of a hog are behind his ears. Another is that it requires unusual skill to take a pampered boar from the fairs, loaded with fat, and reduce him to a condition in which he will be most valuable for service. A young boar, thrifty and well conditioned, fresh from pasture, is the one, other things being equal, from which most satisfactory results can be expected.

## SUMMARY

By way of summary of the points enumerated in this chapter, it may be said that the best results will be obtained from a pure-bred boar that shows desirable characteristics, is masculine, is somewhat more compact than the females he is to be used upon, and strong in points in which they are deficient. He should be the best the buyer can purchase, and it is unwise to let a matter of a few

dollars govern in making a selection. He should be cared for apart from the other hogs, and be given plenty of exercise and nutritious rather than fattening foods. He should be naturally, and because of proper handling, an animal of quiet disposition and an easy breeder. Preferably his service should not begin in ordinary cases long before he is a year old, and they should be continued while he proves himself worthy. A matured boar should be able to serve 60 sows in a season, but where there are two or more services necessary in a day it is well to allow every second or third day for rest; more than two services a day, one in the morning and one in the afternoon, are not usually profitable. In general, the boar's condition should be thrifty, neither too fat nor by any means run down; and this applies as much out of the breeding season as during that time.

CHAPTER VII.

# The Sow: Selection and Management

The breeder's judgment may possibly yield him greatest profit through his judicious selection of a boar, but skill in handling and management may be demonstrated to a greater extent with the brood sow. His intelligence—not to say genius—is tested not merely in selection and mating, but even more in feeding and care during pregnancy and at and after farrowing. In all this the sow is not alone the object of concern; the life and development of the pigs, and the returns in consequence, good or bad, are largely dependent on the breeder's skill in selecting the sow and in her proper treatment throughout her career, and especially from mating to the time of weaning her pigs.

In managing the brood sow a breeder is dealing with nature, and so far as he possesses knowledge and ability his methods should be in compliance with nature's laws. It does not follow that his work must be crude or conflict with science, for, on the contrary, it is his business to apply the laws of nature under the most favorable conditions he is able to command. Neither is it necessarily to be inferred that elaborate shelter or other expensive equipment and thousand-dollar stock are essential. A breeder may begin his enterprise in a very modest way, and yet by good management achieve a foremost place

among his contemporaries. In fact, most of the top notch swine breeders began in a small way.

### RETAIN THE WORTHY SOW

A foundation herd ordinarily will be started with young sows, and, whether they possess the most aristocratic blood or are a "poor man's" pigs, those which prove worthy should be retained as long as they are satisfactory producers. Many will sell a young sow which has produced less than the most profitable litter of pigs at her first farrowing without really having given her opportunity to show her capabilities; they will repeat this practice, and cheat themselves in so doing. A sow's reproductive ability should increase each year to her maturity, and at that period she may have not only large litters, but such as will prove superior in both growth and quality. As a mother a sow is called upon to furnish double power—for her own sustenance and for giving a family of pigs a start in life. If she has not reached an age where the demands of her own structural growth are but moderate it follows that bone-making and muscle-building foods which ought to go into pig manufacture must be diverted, at least in some measure, to the sow. The constitution and size of her pigs will be inferior, in consequence, to what they might otherwise prove. This plan, if followed, must eventually give the owner an unsatisfactory herd, and in time he becomes convinced that the breed is wrong, and endeavors to regain lost ground by changing breeds, or by cross-breeding. Undesirable traits once established are difficult to

eradicate, and it is far better to avoid them in the beginning. For that reason it is sane procedure to retain the tried and true sow until she shows herself too clumsy and lubberly to make a good mother, or for some other decided reason should yield her place to a better animal.

Progress in swine improvement, especially in the corn belt of the United States, has made it easy for the man of small means to buy good sows, even if he feels that he cannot afford pure-bred stock. Good blood is far more widely distributed than formerly, and the buyer can much more readily procure a high class of foundation stock than was the case some decades earlier. Where possible it is preferable to start with pure-breds, but when this is not feasible the purchaser should be alert to secure sows of such high quality as he may, guarding against defects in their offspring by the use of none but high class pure-bred boars.

### SELECTION

Even though it may involve some inconvenience, it is by far the best plan to make a personal selection, and to do this at the farm of their owner. There they may be seen in their everyday life and form; opportunity is afforded to study their family characteristics and details of their feeding and management, which often may be wisely continued by the new owner. If the sows are purchased from a man who has a reputation for fair dealing and for maintaining a high standard of excellence among his stock, the beginner in swine husbandry should be able to gather from his experience much that

is of value. The chances are in favor of finding such a man not far from home. Buying unseen sows or other breeding stock by mail is, in nine cases out of ten, of doubtful advisability.

### A GOOD BROOD SOW

A sow that is motherly, a generous milker, with a gentle, quiet disposition, and prolific in farrowing healthy, quick-growing pigs, is well selected, and a treasure which should not be discarded until her usefulness has been outlived. A good brood sow is a roomy animal, preferably with a long, deep body and well-developed pelvic region. The head and throat should be smooth and trim and the forehead broad. The shoulders should be broad and smooth, and the heart girth large, as when this is lacking the vital organs will probably not have the strength they should and would possess with more room. Some authorities now question the old theory that the female parent influences the offspring's heart, lungs and other vital organs, while the sire dominates in the make-up of the frame and general external structure, but so far nothing conclusive has been offered to disprove this and it is worthy of acceptance until a better is given a positively proved position. The sow's legs should be fairly short and straight, noticeably strong and serviceable, yet without coarseness of bone.

Such desirable qualifications as deep sides, ribs well sprung out from a wide, well-fleshed, slightly arched back and well-finished rump and hams, must not be lost sight of. These characteristics, in whole or in part, along

with the milk-giving qualities, are too often underestimated by the average breeder, who frequently pays too great attention instead to beauty, refinement and show appearance. A sow known to be a good suckler is of double worth, or better, as compared with a scant milker. Breeders have frequently noticed that a sow with poor milking qualities is liable to have small litters; on the other hand, one of large milking capacity is likely to have not only more pigs, but will do so much better by them that they develop faster and more profitably than those of smaller litters.

Weak or sagging backs in either sows or boars are to be shunned. An observant writer has said: "A weak or sagged-backed hog means a poorly muscled hog (it is muscle that we want in a hog), and it often means a hog that has long pasterns, and is down on its legs—a hog that can't handle itself and that soon gets helpless and of little account. There are in general two types of the weak-backed hog: The one that is high on the shoulder and sags just back of it, and the one that is high on the hip and slopes down to the shoulder. The latter type is usually associated with short, steep hams, but the former is the more objectionable since it signifies the small heart girth and diminished chest capacity. Either is bad enough and results from the same cause, namely, poor muscles. The muscles running diagonally across the ribs and vertebræ sustain and strengthen the back, and where they are weak or lacking there can be no strength.

"The type of back to be sought is the one that is arched slightly in the middle, with a slight and gradual slope toward either extremity. Such a back means strength and power for the hog and money for the grower.

"There is nothing more 'demoralizing' to a herd than to get some of these sagged-back animals into it, and the greatest care possible should be exercised to keep clear of them. No matter how broad a boar may be or how desirable in other respects, he should be strictly avoided if he has a poor back, and the same is true of the brood sow."

### THE FOUNDATION HERD

Sows selected for a foundation herd should be of uniform type; not uniform simply by accident, but because uniformity of a good kind is a characteristic of the stock from which they are selected. They should be about the same age, and in pig. Purchase of sows already in pig will save to beginners a considerable outlay at the start. The owner should know the breeding qualities of his sows before selecting a boar, and the most direct method of obtaining this knowledge is by previously having litters from them.

Selection should be with a view to making the sows' feeding and care as uniform as possible, and to avoiding litters of pigs of mixed or varying types. These results may best be secured with sows alike in type, and of the same age, which should be in the neighborhood of a year when selected. If for the foundation of a herd of pure-breds they should come from some well-rated, established breeder. Uniform quality should

dominate in the selection, and in the herd from which the selection is made, and limited resources should never influence the buyer to neglect quality in favor of numbers. A large number is not necessary. Four or five sows should be ample for starting an ordinary herd; but it is far better to begin with three good ones, or even one, than with six such as will place the breeder on a low level in his business. Quality must be insisted upon and adhered to from the outset, but it does not mean over-refinement. A sow that is delicate or too finely bred will transmit delicate constitutions to her offspring, which, too, will probably be few in numbers.

Better results will accrue from selecting pure-bred sows from a single herd, because uniformity in type and handling methods are thereby more likely to be attainable. Hereditary influences and breeding standards will prove more satisfactory if the buyer has been judicious in selecting from a herd and a breeder with known high standards. The grandsires and granddams should be looked up, as well as the sires and dams, and their conformation and breeding performances studied.

### BEGIN WITH A SMALL NUMBER

Whether he purchases grades or pure-breds the novice will make the best beginning with no more than four or five sows. If in pig they will soon give him the practical experience out of which he will absorb more knowledge than he can possibly obtain by any other means. While he ought to invest in the best quality his money will buy, he should not so strain his resources

that in case unforeseen misfortune overtakes him he will be left unable to gird up and make another trial.

Serenity, undisturbed by fretful restlessness, should be characteristic in a good sow. Any breeder of experience will know just what is meant when it is said that a sow is "motherly," but the exact meaning is difficult to set down in words. This maternal manifestation has an important bearing on success with a litter, and the dam's promise in this regard should have weight in the purchase. In making a selection the teats should be examined to discover that there are a dozen, well formed, not too small or obscure, and giving indications of supplying abundant milk.

Where it is found desirable to select sows from different herds greater care is essential to prevent introduction of disease than would be necessary if they came from a single farm known to be free from disease. In the former case, or if they have been shipped a considerable distance, it is advisable to keep them isolated from each other, if possible, for a period of three or four weeks, or until there is no danger of the introduction of disease by any sow. In any event it is well to have them dipped or sprayed upon their arrival. Practical suggestions regarding quarantining and dipping may be found in a succeeding chapter relating to that subject. If facilities at hand do not permit using all necessary precautions the buyer will find it safer to make his selection from a nearby herd, where he may be certain that his sows are purchased free from both disease and vermin.

So far as may be feasible, the methods of feeding to which the sows have been accustomed should be followed after their arrival at the buyer's home. Sudden changes of feeds should be avoided, and for a few days the diet should be light.

In selecting gilts from the home herd for breeding consideration should be given to the fact that the most promising pigs at six or eight weeks may fall far short of being so promising at six or eight months; therefore it is better to defer selection until they have attained considerable growth. Then they will exhibit prominently and in a permanent way the possession or lack of certain characteristics which a good brood sow should have, and the breeder will be enabled to form a judgment more nearly correct as to what they will be at maturity.

### PROPER TIME TO BREED

Well-kept sows will, at times, come in heat when not more than three months old; but in all such cases care should be exercised that they are kept out of reach of any boar pigs. Eight months old is as young as it is judicious or proper to breed a sow, and ten months or more is preferable. If nature is called upon to perfect the undeveloped mother and to promote the growth of the young at the same time the inevitable result is that both are losers. The mother herself will never be able to recover from an undue and improper division and deficit in nature's work. This warning has already been given in this chapter, but the truth is of enough

importance to justify repetition. Pigs from large, old sows will be more in number and frequently double the size at a month old of those from the young sows, and with equal care they will usually be much the heavier when nine or twelve months old.

The Wisconsin station has made interesting tests to prove relative sizes and weights in litters from young and old sows, with astonishing results. In these tests sows weighing an average of 482 pounds at farrowing time produced an average of 9.2 pigs per litter, with a weight per litter of 27 pounds. From sows weighing 307 pounds the average number in the litter was 6.7 pigs, and the weight of the litter was 16 pounds. Where the average weight per sow was 238 pounds the average number in a litter was 5.5 pigs and the average weight of a litter 14 pounds. Sows between the ages of four and five years averaged nine pigs to a litter and a weight per litter of 26 pounds; sows between two and three years old had an average litter of 7.5 pigs, and a litter averaged 19.7 pounds in weight, and sows a year old produced litters of 7.8 pigs, with an average weight of 14.2 pounds per litter. The station report on the tests says: "It is very evident that the older and larger sows are much better mothers than the younger and smaller ones, and that the common practice of many farmers in disposing of their old brood sows each year and reserving young and immature animals for breeding purposes is not to be commended. Our farrowing records for several years, where each litter was weighed at birth, as well as the practices of leading breeders, bear

out the statement that sows from three to five and even six years of age are much more profitable and satisfactory as breeders than sows one and two years old."

The profitable period for retaining a good brood sow in the herd will depend almost entirely upon the sow herself. She deserves her place as long as she can hold it. It will not profit the breeder to allot her for fattening so long as she evinces a motherly, kindly disposition and shows ability to produce and suckle generously litters of six or more healthy pigs. Some will be valuable after five years of maternity, while others will become clumsy and careless or vicious before that time. The experienced breeder holds fast to his best and tried animals, and it is through them that he makes and maintains the reputation of his herd and himself.

### CONDITION AT BREEDING

Usually, when not with pig or suckling, a sow will be in heat about three days out of 21, or once in three weeks. When she is to be bred she should be free from fever, and her system cooled and cleansed by a variety of non-heat-producing foods and loosening slops. A healthy sow is the better able to produce a healthy litter. From the time she is chosen as a breeder methods of feeding can be made to have a large influence in attaining desired results. During the growing period and in pregnancy her needs are for nitrogenous or protein-furnishing rations, such as barley, oats, bran, and the leguminous feeds—clover, alfalfa, beans and peas. Field roots, such as sugar-beets, rutabagas, mangels and artichokes,

A SMALL YORKSHIRE SOW AND LITTER

MAKING HOGS OF THEMSELVES

also plenty of pumpkins, are valuable adjuncts. Frequently it is convenient and inexpensive to feed raw potatoes, and they have a value in affording succulence and variety, but as a principal diet for any considerable length of time they are not at all to be recommended. The especial need is material for bone and muscle-forming. Fat for the pigs is not needed until a later time. Very much corn is not desirable feed for any breeding animal. Many valuable sows have been destroyed for breeding purposes by overfeeding on corn or corn meal.

In the corn belt, however, most farmers find their abundant and inexpensive corn a feed which cannot be avoided or ignored, nor should it be; but while its use need not by any means be omitted, it should be but moderate, and as a part of a reasonably balanced ration. Sows kept for breeding should not herd with fattening hogs kept on corn, but be in pasture and given a supply of slop, such as equal parts of shorts, corn meal and wheat bran. Feeds which furnish considerable bulk are preferable, and those tending to prevent constipation are important.

At the time of service the sow should be in what may best be described as "good" condition, not too fat or in exhibition form, nor, on the other hand, too thin. She ought to be hearty in every way and a greedy feeder; she is then entering upon the most important work of her career, and ought to be "fit." As winter approaches the sows should have shelter adequate for any protection that the climate may make necessary. Whether this shelter be of straw and poles or of tight roofing it

should protect against a damp bed. Dry quarters and bedding are always the right of the mother sow, and will save many pigs.

### INFLUENCE OF DAM ON LITTER

Probably a majority do not realize as fully as they need to what great influence the feed of the dam may exert upon the offspring; that some kinds are required to make bone and that other kinds go chiefly to the making of fat. If the bone-forming feeds alone are given to the mother there will be a normal and sometimes an abnormal development of frame, but the offspring will be in poor flesh when dropped. If only fat-forming feeds are given, the offspring will be fat and glossy, but deficient in bone structure. If the breeder feeds his sows on corn and water, they will probably have a small number of pigs, which may be fleshy but lacking in size, and they will rarely be matured at any great profit. If he uses liberally feed containing protein and phosphorus, he will obtain pigs with proper frames to begin with, and that will yield a profit when ready for the market. The fact that a pig at birth is large and lean and seems loosely hinged together is no proof that it will not in good time be growthy and abundantly plump.

Bearing on this, an Iowa farmer of several years' experience reports a test he made of mixed feeds compared with corn alone, which was very interesting in its outcome, and in substance was as follows: For three months prior to farrowing he kept all the sows on the same rations. One pen received nothing but corn and

water, another received a ration of 2 parts corn, 1 part wheat bran and 2 parts chopped clover hay. These parts were determined by measure and the clover was steeped in a little water for half an hour before being mixed with the shelled corn and bran. At farrowing time each sow which had been fed the corn dropped five pigs, three of which were fat and chubby and the other two runts. The other sows averaged eight pigs each and there were only two runts in a herd of 28. The 26 were as nearly perfect specimens of their breeds as he ever saw, and were sold at eight months, averaging 278 pounds each. The price for which they were sold represented a profit of nearly 47 per cent after counting in a reasonable amount for labor and a good price for all feed given them. The six pigs from the corn-fed sows were sold at the same age, averaging 185 pounds each, and the farmer believes he lost money on them. All the pigs were fed and reared on practically the same rations.

### BROOD SOWS AFTER CATTLE

Many farmers are so situated that they find it most convenient to allow their brood sows to run in corrals with their fattening cattle, although this has numerous disadvantages. The cattle are likely to horn, trample, or otherwise injure the sows. When allowed with the cattle they should be given separate quarters at night, outside the feed-lot, and not restricted to the food they will gather up after the cattle. Before turning out with the cattle in the morning it is advisable to give them a

ration of muscle-making and more laxative food; not too much, as it will tend to make them lazier, with a greater probability of their getting in the way of the cattle and also of neglecting the exercise which is one of the benefits from allowing sows to work over the droppings of cattle fed on grain.

Whether or not a sow is safely in pig will be known usually about 20 or 21 days after coupling. A careful record should be kept of the date of coupling, so that the probable time of farrowing may be known. The period of gestation is about 112 days from the date of service. Young sows are likely to carry their first litters for a slightly shorter period, not infrequently farrowing in 106 or 108 days, while old sows may take a longer time, extending to possibly 115 days. Instances are exceptional when any variation either way exceeds a week from the 112th day. The table on page 140, taking the left-hand date for the time of coupling, will show by the right-hand date in the same column the time when farrowing is likely to occur.

### TIME FOR FARROWING

Throughout most of the corn belt of the United States the main crop of pigs should come in the warm days of April, and that this may be so, sows should be bred as near the middle of December as possible. Where the breeder's facilities will afford the requisite care and warmth and the latitude is not too far north it may be safe to have the pigs come in March. As a general rule in the northern states a sow should not have pigs in

the spring before late March, nor later in the fall than October. A sow that has been wintered properly, and has had the right kind of feed, with plenty of exercise and sunshine, should do well with a March litter and be prepared to farrow a good litter again in the autumn. Whether or not this is advisable, however, will depend, in great part, on how well the owner is situated and how well inclined to give the needed care to the sow and her pigs. Both early spring litters and those of the early fall will do the best and pay the best on an average. Care of the pigs in the mild season is not so difficult,

TABLE SHOWING PERIOD OF GESTATION.

| Jan.... Apr... | Feb..... May... | Mar..... June .. | Apr..... July..... | May..... Aug.... | June .. Sept..... | July..... Oct .... | Aug..... Nov..... | Sept.... Dec..... | Oct..... Jan..... | Nov... Feb..... | Dec..... Mar... |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1..22 | 1..23 | 1..20 | 1..21 | 1..20 | 1..20 | 1..20 | 1..20 | 1..21 | 1..20 | 1..20 | 1..22 |
| 2..23 | 2..24 | 2..21 | 2..22 | 2..21 | 2..21 | 2..21 | 2..21 | 2..22 | 2..21 | 2..21 | 2..23 |
| 3..24 | 3..25 | 3..22 | 3..23 | 3..22 | 3..22 | 3..22 | 3..22 | 3..23 | 3..22 | 3..22 | 3..24 |
| 4..25 | 4..26 | 4..23 | 4..24 | 4..23 | 4..23 | 4..23 | 4..23 | 4..24 | 4..23 | 4..23 | 4..25 |
| 5..26 | 5..27 | 5..24 | 5..25 | 5..24 | 5..24 | 5..24 | 5..24 | 5..25 | 5..24 | 5..24 | 5..26 |
| 6..27 | 6..28 | 6..25 | 6..26 | 6..25 | 6..25 | 6..25 | 6..25 | 6..26 | 6..25 | 6..25 | 6..27 |
| 7..28 | 7..29 | 7..26 | 7..27 | 7..26 | 7..26 | 7..26 | 7..26 | 7..27 | 7..26 | 7..26 | 7..28 |
| 8..29 | 8..30 | 8..27 | 8..28 | 8..27 | 8..27 | 8..27 | 8..27 | 8..28 | 8..27 | 8..27 | 8..29 |
| 9..30 | 9..31 | 9..28 | 9..29 | 9..28 | 9..28 | 9..28 | 9..28 | 9..29 | 9..28 | 9..28 | 9..30 |
| May | June | 10..29 | 10..30 | 10..29 | 10..29 | 10..29 | 10..29 | 10..30 | 10..29 | Mar. | 10..31 |
| 10.. 1 | 10.. 1 | 11..30 | 11..31 | 11..30 | 11..30 | 11..30 | 11..30 | 11..31 | 11..30 | 10.. 1 | Apr. |
| 11.. 2 | 11.. 2 | July | Aug. | 12..31 | Oct. | 12..31 | Dec. | Jan. | 12..31 | 11.. 2 | 11.. 1 |
| 12.. 3 | 12.. 3 | 12.. 1 | 12 . 1 | Sept | 12.. 1 | Nov. | 12.. 1 | 12 . 1 | Feb. | 12.. 3 | 12.. 2 |
| 13.. 4 | 13.. 4 | 13.. 2 | 13.. 2 | 13.. 1 | 13.. 2 | 13.. 1 | 13.. 2 | 13.. 2 | 13.. 1 | 13.. 4 | 13.. 3 |
| 14.. 5 | 14.. 5 | 14.. 3 | 14.. 3 | 14.. 2 | 14.. 3 | 14.. 2 | 14.. 3 | 14.. 3 | 14.. 2 | 14 . 5 | 14.. 4 |
| 15.. 6 | 15.. 6 | 15.. 4 | 15.. 4 | 15.. 3 | 15.. 4 | 15.. 3 | 15.. 4 | 15 . 4 | 15.. 3 | 15.. 6 | 15.. 5 |
| 16.. 7 | 16.. 7 | 16.. 5 | 16.. 5 | 16.. 4 | 16.. 5 | 16.. 4 | 16.. 5 | 16.. 5 | 16.. 4 | 16.. 7 | 16.. 6 |
| 17.. 8 | 17.. 8 | 17.. 6 | 17.. 6 | 17.. 5 | 17.. 6 | 17.. 5 | 17.. 6 | 17 . 6 | 17.. 5 | 17 . 8 | 17.. 7 |
| 18.. 9 | 18.. 9 | 18.. 7 | 18.. 7 | 18.. 6 | 18.. 7 | 18.. 6 | 18.. 7 | 18 . 7 | 18 . 6 | 18.. 9 | 18.. 8 |
| 19..10 | 19..10 | 19.. 8 | 19.. 8 | 19.. 7 | 19.. 8 | 19 . 7 | 19.. 8 | 19.. 8 | 19 7 | 19 10 | 19.. 9 |
| 20..11 | 20..11 | 20.. 9 | 20.. 9 | 20.. 8 | 20.. 9 | 20.. 8 | 20.. 9 | 20.. 9 | 20 . 8 | 20 11 | 20..10 |
| 21..12 | 21..12 | 21..10 | 21..10 | 21 . 9 | 21 .10 | 21.. 9 | 21..10 | 21 10 | 21 9 | 21 12 | 21..11 |
| 22..13 | 22..13 | 22..11 | 22..11 | 22..10 | 22..11 | 22..10 | 22 11 | 22..11 | 22 10 | 22..13 | 22..12 |
| 23..14 | 23..14 | 23..12 | 23..12 | 23..11 | 23 .12 | 23..11 | 23..12 | 23 12 | 23 11 | 23 14 | 23..13 |
| 24..15 | 24..15 | 24..13 | 24..13 | 24..12 | 24..13 | 24..12 | 24..13 | 24 13 | 24 12 | 24..15 | 24..14 |
| 25..16 | 25..16 | 25..14 | 25..14 | 25..13 | 25..14 | 25..13 | 25 .14 | 25 14 | 25 13 | 25..16 | 25..15 |
| 26..17 | 26..17 | 26..15 | 26..15 | 26..14 | 26..15 | 26 14 | 26 15 | 26 15 | 26 14 | 26..17 | 26..16 |
| 27..18 | 27..18 | 27..16 | 27..16 | 27..15 | 27..16 | 27..15 | 27 16 | 27 16 | 27 15 | 27..18 | 27..17 |
| 28..19 | 28..19 | 28..17 | 28..17 | 28..16 | 28..17 | 28 16 | 28 17 | 28..17 | 28 16 | 28 19 | 28..18 |
| 29..20 | 29..20 | 29..18 | 29..18 | 29..17 | 29..18 | 29..17 | 29..18 | 29..18 | 29..17 | 29..20 | 29..19 |
| 30..21 | ..... | 30..19 | 30..19 | 30..18 | 30..19 | 30..18 | 30..19 | 30..19 | 30..18 | 30..21 | 30..20 |
| 31..22 | ..... | 31..20 | ..... | 31..19 | ..... | 31..19 | 31..20 | ..... | 31..19 | ..... | 31..21 |

and they are then putting on their most inexpensive growth at a time and age, too, when they are least subject to ailments and accidents. The chances for profitably rearing two crops of pigs from a sow annually are undoubtedly far better in regions of mild climate and short winters than where the winters are long and rigorous.

### CARE IN WINTER

In the winter when pasture is not available the brood sows will call for greatest attention, and substitutes for green feed will be important. Roots, cabbage, silage, pumpkins, sorghum, and clover or alfalfa hay come within this classification. Roots offer considerable succulence, so much so that their laxative effect must not be allowed to bring about undue action of the bowels. Roots may be given without cutting, or they may be chopped and mixed with the grain ration. In the vicinity of a beet-sugar factory beet pulp may usually be obtained at a small cost. Bulk may also be supplied with clover or alfalfa hay, sheaf oats, sorghum cane or similar ration. A correspondent of the *Prairie Farmer* reports the profitable use of steamed hay, cut to one-half or three-fourths of an inch long and mixed with ground feed. He gives the following: "Take early cut, carefully cured hay—any kind will do, but alfalfa or clover is best—cut it up one-half or three-fourths of an inch in length, put it in a barrel, box, or something you can cover up, mix with it any kind of ground feed —bran, middlings, ground oats, or rye. Vary the

quantity of grain as you see is needful to keep the stock thriving. Steam the whole, if you have the apparatus, until it is soft; but if you have no steaming fixtures and are on good terms with your wife, as you ought to be, she will let you boil water on the kitchen stove. Pour enough boiling water on the cut hay and grain to thoroughly wet it. Cover and let it stand from morning to night, and it will be ready for use. I would have the sows get a large part of their nutriment out of the hay, just as I would out of grass if they were on pasture in the summer."

Plenty of exercise is important for the pregnant sow; it should be insisted upon, and provided in the way the breeder finds best adapted to his situation. A large pasture is not always available, but the breeder may secure results by arranging the house at one end of the hog lot and the feeding floor at the other end, or by giving the sows water in such a way that to procure it they will be compelled to walk some distance a number of times each day.

### THE SOW'S HOUSING

The results which may be achieved through the brood sows certainly entitle them to as good sleeping quarters as are given the horses or cows. These quarters should be warm, comfortable, ventilated, protected from dampness, and so arranged that they may have plenty of sunlight, the best of disinfectants. It need not be expensive to furnish these. A floor other than earth is not a necessity where the earth can be kept dry and hard and

without the formation of a dust bed or trough. If the floor and bedding are dank and the place gloomy the pigs will suffer. Cold drafts from above, below or round about, and dampness, bring with them various and fatal afflictions which should be guarded against. The bedding should be changed at least once a week, and oftener when damp or soiled. For the farrowing pen cement and stone floors have their advocates, and such floors have the advantage of greater permanency, but earth or wood can be made satisfactory.

As a rule the brood sow should be separated from other hogs two weeks or ten days before the time of farrowing, and placed in a sheltered, sunny pen or other separate inclosure. She will then need less exercise, but should have the best possible attention as to feeding. A slightly less amount of feed will be needed, especially for a few days before farrowing, when the breeder's effort should be to aid the sow in maintaining the best possible condition of health, and in accomplishing this he should be careful not to go too far either one way or the other. It is not difficult to see how he might become too careless or negligent, but at the same time it should be remembered that he may show himself so over-solicitous and interfere so much as to do harm. The state of the weather and the time of the year will have considerable to do with the need for his services at farrowing, and the temperament of the sow should as well be taken into consideration. She should have become accustomed beforehand to regard the man who comes about the lot or pen as her friend, but even then

some sows will show plainly that they wish to be left alone, as is natural, and generally is best, if the weather is not severe and the presence of an attendant is not necessary to take care that by neglect the pigs do not become chilled or perish of cold.

If the sow is of the ill-natured kind that positively resents the presence of a herdsman she should be bred so she can deliver her pigs in weather that will permit her to be isolated or to make her nest in the orchard or woods. In an extreme case of this sort such an animal should be early slated for the fattening pen. A young sow bringing her first litter will probably evince more nervousness than an older animal. If she has been petted or kindly treated she will allow an attendant to remove the pigs from the nest as fast as they appear, thereby saving some that might otherwise be crushed or trampled to death.

The sow's bedding should not be great in quantity; enough only to insure a clean and dry nest. In moderate weather, if in a house with a plank flooring, little bedding will be needed, but in cold weather, where the shelter does not thoroughly protect, more will, of course, be necessary. Care should be taken, however, to make the place of farrowing so comfortable and sheltered that a great nest will not be necessary to prevent the pigs from being chilled. If the nest is so situated that the sun can warm it during a portion of the day it is very comforting and helpful. Many fine pigs, sometimes whole litters, have been lost by permitting a nest too deep, forming a sort of pit in which the pigs gravitated, to be smothered

or crushed. Straw, chaff, hay, shavings and leaves are usable for nests. Long hay or straw, such as rye straw, for example, while under most circumstances better than none, are far from being the best bedding for a farrowing sow on account of the little pigs' liability to become entangled or lost in it. As a matter of fact, nobody has yet invented or knows of a better bedding material than the leaves and grass which a sow will collect and make a nest of if allowed the run of a woods pasture at farrowing time.

Little pigs may also be kept from danger of crushing by the mother with a fender made of a scantling, rail or pole securely fastened, say eight inches from the wall, and the same distance from the floor. The pigs will quickly learn the protection afforded by this device when the sow lies down. Some breeders advocate a farrowing pen not large enough for the sow to turn around in, and with walls open eight inches from the floor so the pigs may run in and out. A pen of this sort may be made by confining the sow at one end of her regular pen with boards so nailed that she will be unable to turn around.

### BIRTH OF THE PIGS

Where parturition is prolonged or difficult the herdsman's assistance may be needed, and he should aim to be within call. A distended udder, enlarged vulva and relaxation of muscles on each side of the tail may be taken as indications of the nearness of parturition. When the udder becomes heated and milk may be drawn from the teats the pigs may be expected within 12 hours,

except in the case of a sow's first litter. For several hours before farrowing the sow will be restless and display much industry in gathering straw or other material and making it into a nest, in which finally she will as nearly as possible bury herself.

In warm weather the pigs will of their own accord usually find their way at once to the teats and begin nursing, but when the weather is extremely cold and raw the pigs may lose their way, go in the wrong direction, become entangled and benumbed, fail to find their proper place and teats, and perish. The pig that is safely born, and within three minutes gets a firm hold of a teat full of milk, as was intended, has his chances for a career of usefulness greatly enhanced. If a warmed house is not used it will be well to have a basket or barrel, in the bottom of which are heated bricks, these being covered with straw, while a sack or blanket is thrown over the top to prevent loss of heat. As the pigs come they may be wiped dry and placed in the basket or barrel for the time being, and they will be dry and warm when given the teats. If the weather is not extremely frosty a blanket thrown over the sow until she is through farrowing may suffice.

Of all the means of successfully warming a chilled pig and restoring his interest in things earthly, probably there is nothing better than a pail or other vessel of water heated to about 95 to 98 degrees F., in which his body and limbs can be submerged for 10 to 20 minutes. In many instances it will well-nigh revive the dead. If after this hot bath Mr. Pig is dried and placed where he

can suck a well-filled teat his outlook on the future will be much improved.

"If by any means the little pigs get a chill, and turn cold, limp and damp," says Sanders Spencer, an English authority, "a teaspoonful of gin will help to revive them, and a suck at the teat will complete the cure if the weather is not very severe. An attendant who has had much experience will at once know when this is the case by the peculiar cry which a chilled pig invariably gives in the stage before it becomes quite helpless and semi-unconscious. Should the act of parturition be a very protracted one, it is advisable, in very cold weather especially, to place those pigs which are dry to the teat, lest the long-continued deprivation of their natural food should result in their becoming chilled and troublesome to get to suck. At times the pigs will appear to have but little life in them when they are a long time coming into the world; the attendant should then open the pig's mouth and blow lustily down its throat, so that the lungs become expanded, when the youthful grunter will quickly recover."

When sows are nervous and unquiet in farrowing it will be necessary to keep the pigs away from the teats until farrowing is over, unless, as stated, the weather is severe and the labor unduly prolonged. Waiting for a little time will not cause the pigs to suffer, provided they are dry and warm. When given the teats the breeder should see that each pig receives its fair chance. If a stronger pig makes a choice of a teat at which one less vigorous is obtaining milk the latter should be given an unused teat, as the pigs will generally continue to use

the teats they at first select. The stronger pigs are also given to taking extra pulls at the teats belonging to their less robust mates when chance offers. It is sometimes difficult to manage at all satisfactorily the pasturing of several sows with pigs in the same field, on account of the larger pigs robbing the smaller ones of other sows of their share of milk, causing them to become stunted and uneven in size. When too much of this is found going on the only remedy is to separate them.

### ASSISTANCE AT FARROWING

The breeder's judgment will generally tell him what assistance the sow may require, if any, in farrowing. If a crosswise presentation occurs, the pig should be pressed carefully into the womb, and where the sow has difficulty in bringing the pig forward it may be necessary to assist her. This may be done with the hands or by use of the pig forceps sold on the market.

"Have your pigs come about the same time," says John Cownie, the prominent and successful Iowa breeder, "within a week or two, so that they will all be of one age and one size. That is one great secret of successful swine raising. It will save a great deal of difficulty at farrowing. I used to have much trouble at farrowing time by losing sows. One year I lost 15 that could not give birth to their pigs. At that time I didn't know what was the matter. Now I know all about it. That may be saying a great deal. But I never lose a sow now in farrowing—not one. There is no grain more fat-producing than corn. We fed our young hogs altogether too much

corn. Those sows died because they had been fed too much corn, and their pigs were too large and fat, and the sows could not give birth to them. I had fed corn, as my neighbors had done; now I feed scarcely an ear to my brood sows. They are not fed a great deal, and there is no trouble in farrowing; I haven't lost a sow for a dozen years. I feed so as to make bone and muscle. I am not feeding the sow then; I am feeding the embryo pig, and what I want in that pig is bone and muscle."

### SOWS EATING THEIR PIGS

A disposition by the sow to eat her pigs may be the result of a number of causes, and not all of them naturally the fault of the sow. The erroneous opinion sometimes prevails that the sow is the only farm animal which molests her young at time of parturition, yet mares have been known to kick and bite their foals, cows to gore their calves, and sheep to butt their lambs to death. With the sow the desire to eat the pigs may arise from the failure to promptly remove the afterbirth. When this is passed it should be immediately removed and buried or burned. If left where the sow can scent it she is more than likely, especially if a young sow, to devour it, and, as the scent of the newly born pigs is similar some of them may also be eaten. If the sow has not been properly fed during pregnancy or has lacked exercise her labor will be more difficult, especially if she is constipated, and in her distress she may attack her young. If she has lacked growth-producing and bone-making feed a taste for blood may seem to possess her. A sow

that has had the run of a good clover field or other pasture in summer, or is given salt, charcoal, or other similar condiments in winter, where a nutritious, succulent diet is not available, is less liable to evince a cannibalistic tendency. It is said that the wild sow, so far as is known, never devours her young.

When rational preventive measures have not been used and the sow begins to attack her pigs the following treatment, proposed in the *National Stockman,* may be given: "Give her pork enough to satisfy her, and salt pork is better than fresh, as it will take less. The salt is laxative and will cause her to drink more water, which will tend to allay the fever. Cut thin slices of pork and begin feeding them to her one at a time until she will eat no more, and she will let the pigs alone afterward."

### FEEDING AFTER FARROWING

If a sow has been fed so that she will have enough milk for her pigs they are in less danger of being injured or killed, as they will satisfy themselves and lie down quietly together to sleep, while the pigs of a sow scant of milk will be hungry and constantly working at her, and by their restlessness subjecting themselves to danger in various ways. A sow properly fed at time of pigging will likewise usually lie far more quietly and will endanger her pigs less by frequent getting up and down. This, again, does not mean hearty feeding. Usually for the first 24 hours after farrowing no feed should be given, nor, as a rule, is it wanted, but the sow should be provided with lukewarm (never very cold) water.

Her feverish condition will cause thirst, notwithstanding the fact that she may have an abundance of sloppy food, which will not prevent her needing water. In case the sow shows signs of wanting to eat in the first 24 hours after farrowing she may be given a little thin slop or gruel of shorts and bran or of oatmeal, warmed, if in cold weather. The feed for the following four or five days should be light, mainly a thin slop—oats, shorts, bran, but no corn. Some clover or alfalfa hay at this time may be relished. The sow should be gradually brought to full feed, taking a week to ten days to accomplish this. The third day after farrowing is frequently a critical period, and until that time is past her appetite should be watched carefully, and she should be supplied with but a light ration. The water supply in reach should not be stinted.

For the first weeks of a pig's life the mother's milk is its drink as well as food, and, therefore, in caring for suckling sows it should be the aim to so feed them that milk of only medium richness will be furnished instead of a limited supply of that which is extremely rich, the latter being less healthful and more liable to cause thumps, scours and unsatisfactory growth. It is only a law of nature that pigs should make more economical gains through the milk of the dams than in any other way, and it is also true that the sow will furnish nourishment for her young at less cost for the raw material than any other animal on the farm. A sow's milk is rich in solid matter, which amounts to 17 to 20 per cent. On a comparative basis of 1,000 pounds live weight a cow

giving 3 gallons of milk a day will give in the milk 1 pound of fat and .77 pound of protein daily, while a sow's milk will yield 1.26 pounds of fat and 1.1 pounds of protein a day on an average. In composition sow's milk in comparison with cow's milk is very high in total fats as well as solids. Analyses made by Professor F. W. Woll at the Wisconsin experiment station give the following comparison between sow's milk and cow's milk:

| | Total solids | Fat | Casein and albumen | Milk sugar | Ash | Specific gravity |
|---|---|---|---|---|---|---|
| Sow's milk..... | 19.49 | 6.89 | 6.06 | 5.64 | .98 | 1.0412 |
| Cow's milk ..... | 13.47 | 4.14 | 3.20 | 5.43 | .70 | 1.0316 |
| Difference..... | 7.02 | 2.75 | 2.86 | .21 | .28 | .0096 |

From observations by Professor Henry as to the yield and composition of sow's milk, it seems that in proportion to their weight sows yield as large a quantity of milk solids daily as a good cow. The average daily production of milk solids per sow appeared to be about 1 pound, or 4 pounds for four sows, the equivalent of the solids in over 30 pounds of cow's milk of average quality. It follows, therefore, that the demands upon the food for milk formation are proportionately as heavy with swine as with cows, and consequently the ration should be one that will stimulate and sustain abundant milk secretion. Such feeding is not only necessary, but economical, "for," says W. H. Jordan, in "Feeding of Farm Animals," "independent experiments indicate that the food

cost of the growth of pigs before weaning is no greater than it is after weaning."

The practical farm fact to be gained from the chemist's showing is that the sow needs food which will aid her in manufacturing nourishment for the pigs, made up in about the foregoing proportion and furnishing sufficient protein and enough, but not too much, fat. The nutritive ratio—that is, the ratio of digestible protein to digestible carbohydrates—should be preferably 1:5 or 1:6. In corn it is 1:9.7; in barley, 1:7.9; in oats, 1:6.2; in clover and alfalfa it is practically the desired ratio.

For making an ample supply of healthful milk, wheat bran, shorts and skim milk mixed are excellent, and no careful breeder anxious to do the best by his pigs should neglect to have in so far as he may a supply to use when his sows are suckling. Extremely favorable results are secured by feeding chopped (coarsely ground) rye, with half its weight in wheat bran added, soaked from 24 to 36 hours, but not allowed to become more than slightly sour before feeding. This makes a most palatable, nutritious mess for the sow, and her pigs soon learn to eat greedily of it, to their great advantage.

### INJURIES TO THE SOW'S UDDER

When the sow carries her pigs longer than the usual period, or otherwise, their teeth sometimes attain an unusual development, and on account of their length and sharpness injure the sow's tender and swollen udder. In consequence the sow's suffering may cause her to withhold her milk, and she may be so disturbed as to injure her pigs. In cases of this kind the pig should be

taken under the arm and the mouth held open with one hand while the faulty teeth are broken off with small pincers. If the pig's objections disturb the sow it will be better to do the work out of her hearing. When this treatment is needed it should be promptly applied, as it may save the lives of the pigs and prevent inflammation of the sow's udder. If the sow is ugly toward her pigs the chances are, unless she is constipated, that her bad temper is caused by the sharp teeth of the pigs. In case the udder becomes swollen and hard, water as hot as may be borne, in which a little salt has been dissolved, may be applied, and is excellent. Apply this until the udder is softened, and then rub with warmed lard and turpentine in equal parts. This treatment is also good for an enlarged teat.

The condition of the weather will govern the length of time it will be necessary to keep the sow in close quarters, but she should not be denied access to the open air. Pigs should not be allowed out in a cold rain or where they will receive the shock of cold winds. Where they can do so without danger they should be out in the sun within 24 hours after birth, and after that the best practice is to let them run in and out at will. Neither the sow nor very young pigs should be permitted to run in pasture early in the morning if the grass is tall and wet with rain or heavy dew.

### CHOLERA AND BROOD SOWS

Cholera will leave some brood sows that recover from its attack so that they are thereafter apparently immune

and as valuable for breeding as before. Others will recover from the disease, but never again be good breeders. This immunity after an attack of cholera is not transmitted to their progeny. James Riley, the veteran Indiana breeder, said, after a quarter-century of experience with cholera: "I regard a sow that has had the disease and fully recovered, if it has left her a breeder, as very valuable. I think sows should not be bred for at least two months after fully recovering. At least 75 per cent of our sows that had the disease proved to be breeders. It affected mature sows less than younger ones. Those that have great constitutional vigor are able to resist the disease. Sows that have resisted and recovered will frequently breed stronger and more vigorous pigs."

### IMPORTANCE OF EXERCISE

How to insure a sow's taking sufficient exercise when snow covers the ground is something of a problem, but inasmuch as she will be less inclined to take exercise at that time efforts should be the greater to see that she has enough to keep her in good condition. Left to herself the sow may do little more than go out to eat and drink, returning as quickly as possible to her quarters. James Atkinson, editor of the *Homestead*, and a practical swine grower, makes the following suggestion: "No greater mistake can be made than to let sows have their own way in this. It matters not what area they have access to they will seldom strike out and make paths in deep snow, and because of this we have found it an excellent

practice to run some kind of a sled around and through the pastures, making a clearly defined path. We know of one instance where a successful swine raiser runs the King road drag around a ten-acre field. Instead of feeding the swine in one place he scatters dry shelled corn and oats around this pathway, with the result that the sows spend almost the entire day picking up this grain. It requires a little more feed to answer the purpose when so much exercise is taken, but the practice is one to be highly commended."

Experienced farmers testify that no other work in winter will yield any better results than that which ought to be given to furnishing the brood sows exercise, pure air and proper feed and watering. While the sows are away from the quarters conditions will be bettered if the beds are stirred out and exposed to the fresh air. It is probably unnecessary to say that the remarks here or elsewhere in this volume about severe cold and snow are without application to those vast sections of the country where cold and snow are unknown.

### BARREN SOWS

A sow is more liable to become barren because of overfeeding and by reason of being too fat than from any other cause; this may bring about a sluggish or non-acting condition of the ovaries or a closing of some of the passages by an excess of fat. In such a case the proper remedy is to get her back to suitable condition. For a sow that has failed to come to heat the *Breeder's Gazette* suggests the following treatment: "Give a full

dose of epsom salts to move the bowels thoroughly. Afterward give all the exercise possible and cut down her feed so that she will lose flesh. For ten days give her five grains of iodide of potash night and morning. Stop for a few days if it makes her sick. Repeat in two weeks. Keep the boar away from her for a month, then put him in a pen next to her where he can smell her through a slat partition. This may help to bring her around. If not, she should be fattened and killed, as barrenness is often incurable."

### ABORTION

Abortion in sows is not as likely to be infectious as is the case in other animals. In a case of abortion, however, it is good policy to separate the sow from the rest of the herd, as it may be an infectious case, and, if so, the pen should be disinfected and the dead pigs and afterbirth well buried or burned. Infectious abortion does not usually show as marked symptoms as sporadic abortion, which is generally due to accident, although it may come about through bad feed, chilling or disease. Precaution should be taken with pregnant sows to prevent accidents, such as fright by dogs or other animals, kicks, blows, or any rough handling.

The symptoms of abortion depend somewhat upon the stage of pregnancy. Sickness, shivering and indications of pain in the abdomen are some of the symptoms. The sow will usually make a nest, as for farrowing, if not too ill to do so. When abortion occurs the sow should be made as quiet and comfortable as possible. Dr. Robert A. Craig recommends giving tincture of opium

in teaspoonful doses every few hours to quiet the sow. Abortion may be followed by a discharge from the affected parts. This should have local treatment, and the sow should be kept from the rest of the herd and not bred until any such discharge has been entirely cured.

The sow, in most cases, will take the boar from the second to the fourth day after farrowing, but mating at this time would seem a violation of nature's law, for the mother should have her energies diverted to the production of milk for the nursing litter and for sustaining her own strength. She should not have service until the first heat after weaning her litter. Then she should be so fed and cared for as to gain something in flesh every day and yet not become loaded with internal fat from too much heating and concentrated food. If treated in a friendly way she will be friendly and well disposed, and ordinarily come as near paying richly for all she gets as any animal kept on the farm.

In considering the efficiency of brood sows, Henry Wallace gives the following advice: "Go over those that have had pigs the present year and ask them the following questions: How many pigs did you have this year? Were they even in size and form? Were they all good ones, or did you have two or three choice pigs and were the rest quite inferior? How did you take care of these pigs? Are you a good suckler? Are you good natured? Are you a good mother, or are you one of the nervous, fidgety kind, always worrying and fretting for fear somebody will hurt you and your precious piglets? If the brood sow on being properly interrogated, cannot give satisfactory answers to these

questions it is not worth while to scold her or give her a moral lecture. Just turn her into the fattening pen; for there is where she belongs."

### DIFFICULT PARTURITION

Of this Dr. W. B. Niles of the Iowa experiment station, says: "The first indications of farrowing should be noted and the sow then carefully watched (but without disturbing her), so that in case of difficult birth the necessary assistance can be given at once. Early help often saves the pigs, and almost always the sow. Delay is fatal to the mother and often to the litter as well. An examination usually shows the difficulty due to an unusually large pig or to one in an abnormal position. Slight traction, while the obstructing pig is alive and labor pains strong, will generally insure delivery, but if assistance is delayed several hours the labor pains become weak, the pigs die and swell to two or three times the natural size, making delivery impossible. In some instances the services of a veterinarian can be secured, but often unless the owner is prepared to deal with these cases himself loss will ensue. Often the removal of the obstructing pig will be followed by the natural birth of the remainder, but at other times every pig must be sought and removed, frequently with the utmost difficulty.

"The delivery of the obstructing pig requires careful, quiet manipulation, the sow being disturbed as little as possible. Many patterns of 'pig forceps' are on the market, but I have found none superior or equal to a simple

wire hook. This, in the hands of a careful operator, is a most efficient instrument. It can be quickly made from a piece of fence wire, but it is better to make two or three at leisure and have them on hand ready for use. A No. 9 or No. 10 steel wire is preferred. From half to three-fourths of an inch is bent at a right angle to constitute the hook, and the end sharpened. The handle part may be a foot or more in length, with the end bent at right angles or in the form of a circle, so that a secure hold may be had. The hook, by using the fingers as a guide, is inserted into the space between the bones of the lower jaw (either from within the mouth or from below) or into the socket of the eye. In case considerable traction is necessary two hooks should be inserted at different points and both drawn on at once. This lessens the danger of their tearing out. Traction upon the hooks should be made coincident with the labor pains, the operator holding what has been gained until the next pain occurs.

"If the assistance be given early the pig is usually secured alive and appears none the worse for having been brought into the world this way. In this, as in other lines of hog work, perseverance is the key to success, and the operator should not be discouraged if at first no progress is made. By the use of the hook and finger the writer was able to extract a litter from one of his own sows when the pigs had to be first sought after and brought back into the pelvis. To illustrate the necessity for early attention, another case from the herd may be mentioned: A young sow observed making preparations for farrowing was watched, and after a long time,

no headway being made, an examination revealed the presence of an unusually large pig, presenting posterior limbs first and blocking the passage. Traction on the hind limbs removed a live pig. In a short time the same operation was repeated, and so on until delivery was complete. A fine litter of large pigs was secured, and both mother and offspring did well. Long delay would have resulted in the loss of all, and neglect, even for a short time, would have been fatal to the pigs. The prevailing tendency to wait and see if the sow will not finally farrow without assistance yearly results in the loss of many sows which a little early attention would save. Neglect in separating the sow from her mates in good time is also a fruitful source of loss in some herds.

"Following farrowing the quarters should be kept free from filth of all kinds. By keeping the pens clean much of the ulcerating sore mouths of the young and ulcerating sore teats of the mother will be avoided. While the sore mouth does not always result from filthy quarters it is very apt to do so. Could the sow always be kept in a clean pen or yard the ulcerated teats which often ruin her as a future breeder would not occur."

### EXAMPLES OF GREAT PROLIFICACY

The statements following this paragraph, representing various breeds and localities, are collated from reports that have come under the author's observation, showing the wonderful prolificacy of some sows. They are not, however, given as suggesting that he believes such large litters as are reported are to be coveted by any

farmer or breeder, except as they may be a valuable indication to customers that his hogs are of prolific strains rather than the opposite, which is not infrequent in herds of pure-breds. In his judgment a sow that successively gives birth to litters of eight or nine, or even seven uniform, vigorous pigs and brings them to the weaning age well nourished, growthy and robust, meets all reasonable requirements as a mother and far exceeds the average. In theory the extra large litters may be more than ordinarily profitable, but in everyday practice and in the long run not one man in a hundred finds them so.

O. B. Johnson of Hendricks county, Indiana, owned a sow that within seven months had 40 pigs. In the first litter there were 19, and in the next 21.

W. P. Hollenbeck of Schoharie county, New York, had a sow that in a little more than two years farrowed 78 pigs, in five consecutive litters, of 14, 17, 14, 15 and 18 respectively.

A Cheshire sow belonging to E. C. Carpenter of Berkshire county, Massachusetts, when 25½ months old, had given birth to 61 pigs in four litters, numbering 15, 14, 15 and 17 respectively.

Walter Bros. of Warren county, Ohio, owned a Duroc-Jersey sow that farrowed 14, 10 and 18 pigs, or a total of 42 in less than one year.

H. L. Ives of Barton county, Kansas, had a Duroc-Jersey that farrowed 13 pigs; then a second litter of 12, and a third litter of 20, or a total of 45 pigs in 11 months and five days. When this was all done she was but 23 months and ten days old. From the three litters she

raised 12, seven and nine pigs respectively, or a total of 28.

A Dexter, Minnesota, man reports to the *Homestead* that a sow of his between April 12, 1907, and April 16, 1908, had litters of 19, 14 and 15, or 48 living pigs.

J. S. Buck of Washington county, Arkansas, reports himself the owner of a "full-blooded scrub" sow 19 years old that raised 216 pigs—"generally six and never more than nine at one litter."

Charles Price of Meade county, Kentucky, reported to the *Farmers' Home Journal* an "O. I. C." sow owned by him as having three successive litters of 17 pigs each and a later one of 16 pigs. These were sired by Duroc-Jersey and Poland-China boars, but none of the pigs were other than "snow white."

George G. Barnes of Columbiana county, Ohio, had from a sow, between January, 1902, and October, 1903, four litters, aggregating 72 pigs. The first litter consisted of 18, the second 21, the third 19, and the fourth 14.

Jacob McCready of New Brunswick owned a 3½-year-old sow that produced 19 pigs in September and 15 more the following March. The grandmother of this sow had farrowed 100 pigs when four years old.

J. W. Yale of Connecticut owned a sow having 21 pigs in the spring and 15 the next fall.

Philip Crewell of Lewis county, New York, had from a sow 139 pigs at nine farrowings, or an average of almost 15½ pigs per litter.

I. N. Barker of Boone county, Indiana, owned a registered Berkshire sow that gave a litter of 14 pigs which weighed 47 pounds when 24 hours old.

A Chester White sow belonging to J. C. Kay of Adams county, Nebraska, farrowed litters of 14, 16 and 17 pigs, or a total of 47 in eight days less than a year.

J. F. Landers of Orange county, Vermont, owned a sow that farrowed 23 pigs, and his neighbor had a sow that raised 60 pigs out of six litters.

C. H. Huddleston of Indiana reared and sold, at pork prices, from a Poland-China sow in five years 79 pigs for $1073.31, and three others unsold made an aggregate of 82 head.

George M. Kellam of Shawnee county, Kansas, raised from a cross-bred Berkshire-Poland-China sow two litters per year for 14 years. After raising two litters of 8 and 6 pigs respectively, in her fourteenth year she was sold to the butcher when 15 years old.

Taylor Bros. of Lynchburg, Tennessee, in answer to inquiries from the *National Stockman* stated that a Berkshire sow, that died November, 1897, was owned in their family between 32 and 34 years, "and in that time had raised about 900 fine, thrifty pigs, from which money enough was realized to buy a good farm."

### FECUNDITY OF TWO BREEDS COMPARED

In Circular 95 of the Bureau of Animal Industry, Rommel has compiled from records of the Poland-China and Duroc-Jersey associations a fund of figures showing the fecundity of such a great number of sows of these breeds as to make their summing up thoroughly representative. Observations of 14,703 Poland-China litters in the five years, 1882-86, inclusive, disclosed an average of 7.04 pigs per litter. Observations of 39,812 litters

of the same breed in the years 1898-1902, showed an average of 7.52 pigs. This was an increase in the later five years of .48, or nearly one-half pig per litter, a percentage of 6.81.

From 1893 to 1897, inclusive, 3,762 Duroc-Jersey sows averaged 9.22 pigs each. From 1898 to 1902, inclusive, 17,890 Duroc-Jersey sows averaged 9.27 pigs each, or an increase of .054 per cent. Of the more than 76,000 sows of both breeds reported as under observation one Poland-China farrowed 20 pigs and two Duroc-Jerseys a like number.

Rommel observes that while the Poland-China increase in the later period is not extraordinary, "an undoubted increase is evident, and the conclusion is inevitable that, contrary to popular opinion, the sows of the Poland-China breed have increased in fecundity during the last 20 years." Also of the Duroc-Jersey statistics, "the figures have little, if any, value as showing increase or decrease in fecundity; they are valuable as giving a correct idea of the fecundity of the breed as a whole. Compared with those of the Poland-China breed, these results confirm common observation; viz., that Duroc-Jersey sows are more prolific than Poland-Chinas."

### AGED SOWS THE BEST FOR BREEDING

An investigation at the Iowa experiment station to discover the influence of the age of sows upon their prolificacy and the weight and growth of the pigs they produced gave some interesting results. It was found, for example, that fifteen sows bred at eight or nine months, averaged seven and two-thirds pigs per litter, while 14

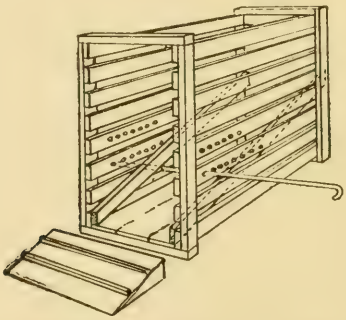
sows about 24 months old averaged nine and six-tenths pigs per litter, and aged sows averaged ten and six-tenths per litter. Pigs from the younger sows weighed on an average 2.39 pounds per pig; from the two-year-old sows 2.63, and from the aged sows 2.61 pounds. When about six weeks old the pigs from the young sows made an average daily gain of .32 pounds, while the pigs from the two-year-old sows gained .40 pounds. No data is given on the gain of the pigs from the aged sows.

Stated in another way it was found that the two-year-old sows farrowed 24 per cent more pigs than the young sows, while the old sows farrowed 30 per cent more. The weight of the pigs from the two-year-old sows was nine per cent larger than that of the young sows, while the pigs from the old sows were 12 per cent larger than from the young sows. The pigs from the two-year-old sows made a more rapid gain than those from the young sows, amounting to 26 per cent. In each instance the older sows farrowed more pigs per litter, heavier pigs at birth, and their pigs made the most rapid growth after birth.

### A BREEDING CRATE

Where large heavy boars are to be bred to small sows or small or short-legged boars to large sows what is known as a breeding crate is extremely useful and almost a necessity for insuring a successful service. This crate is a simple affair. The accompanying illustration shows how it looks. It is a stout frame made of, say, 2x4-inch scantlings, closed in front and open behind, with a bar adjusted to slip behind the sow above the hocks, and a 2x4-inch strip attached to the forward end

of the crate on either side at about where the sow's head comes, and extending to the rear and bottom where it is fastened. These strips are for the boar's forward feet to rest upon and hold his weight off the sow. A very good size for such a crate is 5½ or 6 feet in length, 2 feet 4 inches inside width, and 3 feet high. Cleats can be nailed crosswise of the crate floor to prevent the sow's slipping. When necessary, in breeding a small boar to a large sow, a raised platform for his hind feet, such as the illustration shows, can be provided.



A PRACTICAL BREEDING CRATE

CHAPTER VIII.

# Pigs. Weaning and Growth

A hog is half made when past the weaning period without a stunt or kink in its growth. Every check or halt in prosperity through its first two months is more expensive than at any later period. Too much rich, feverish milk of the dam, causing thumps or other ailment, may leave harmful results, perhaps as much so as scant feeding or other neglect of the sow. More injury may be done to a pig's growth in two or three days than can be repaired in a month, even if he is made the subject of special care, which, where many are raised, is not the rule nor easily practicable. "Good luck" with pigs calls for attention, and that not occasional, but frequent and regular.

### WEANING THE PIGS

From the first week after farrowing until weaning time the sow will be little else than a milk machine, and to be a high-power machine in perfect operation she must have proper care. Nothing else is so well calculated to make pigs grow as a bountiful supply of wholesome sow's milk, and the pigs that have plenty of other feed with the milk of a well-slopped sow for eight weeks will ordinarily have much the start of those weaned at five or six weeks, no matter how much food and attention the earlier weaned pigs may have had. At eight or

nine weeks old most pigs are, or rather should be, fit to take away from the sow; some litters are individually older at seven weeks than others at ten, and better fitted for weaning. Sometimes it is necessary to wean when the pigs are five or six weeks old, and in other cases it may be advisable to wait until the pigs are ten weeks or even older. In the corn belt the period will generally average longer than in New England. Breeders who wean at early ages generally do so in order to more profitably raise two litters a year.

Provided with and taught to eat suitable feed some weeks beforehand pigs are not noticeably checked in their growth by weaning, but those that have been dependent mainly upon the mother's milk, when abruptly taken away from it, frequently seem to have their growth partially suspended for weeks. Many breeders successfully let the sow wean her pigs, as she will in time, and the change is so gradual that no pause in growth indicates when the milk diet ceased. A modified application of this, in which the pigs are separated from the sow at an age suiting their feeding and the convenience of the breeder, will not infrequently be found advisable, but by no means should the pigs be allowed to remain with a sow until she is virtually devoured by them as is sometimes done.

It is not a good plan to take all the pigs from the sow, unless one or two of them can be turned with her some hours after, to draw the milk she will have at that time, and again, say after a lapse of 24 hours. The preferred way is to leave about two of the smallest with her for several days, and after that leave only one for

two or three days more, by which time the flow of milk will have been so gradually diminished that no injury will result to the sow by keeping them entirely away from her. This extra supply of milk helps also to push the smaller pigs along in growth and put them more nearly on an equality in size with their thriftier mates.

### THE PIGS' TROUGH AND FEEDING

By the time the pigs are three weeks old they are likely to show some appetite for other food than the sow's milk by trying the mother's feed, nipping at grass and making an occasional effort at rooting. At this period a small trough should be placed in a part of the pen or lot inaccessible to the sow, but easily reached by the pigs, and into this about three or four times a day, for several days, a little sweet milk can be poured—whatever they will drink up clean, but not more, increasing the quantity as they grow older; then some shelled corn, soaked in pure water 24 hours or longer, should be given, and corn meal mush, scalded bran with shorts, and other nourishing food to make a healthful variety. The bran and shorts, scalded and made into a thin gruel, may be given at first in place of the skim milk. The pig's capacity is small, and he will require frequent feedings with fresh feed easy of digestion. Feed should never be permitted to remain in the troughs until stale, and the troughs should be kept clean. The little pigs will quickly learn what the troughs are for, and will utilize their contents more frequently as they increase in age. As weaning time approaches the sow's feed may gradually be changed to a sort that will make

less milk until she is dry. The dry sows should properly have a pasture of their own, and their feeding should be moderate, and of a growth-making rather than fat-forming character until they are again in pig.

Following their weaning the proper policy is to feed the pigs for growth rather than fat, yet if at the age of eight weeks they are not plump and sleek it is pretty strong evidence that some of the conditions have been unfavorable. They should be thrifty, but not overfat, and have opportunity for plenty of exercise and sunshine, which are useful preventives of thumps and scours, both after and before weaning.

Where, to save them, it is found necessary to raise pigs by hand, and a bottle and nipple are not in ready reach, an old-fashioned substitute for the mother is a shallow tin dish with a piece of cloth drawn tightly through a hole in the bottom. The cloth should extend about an inch both above and below the bottom of the pan. When the pan is filled with warm, sweet milk and the upper end of the cloth is placed in the pig's mouth he will not be at a loss to locate the nourishment. The children will be glad to see that the pig's "pan mother" is ready at the proper times.

### DRY, WARM QUARTERS

It should not be forgotten that for swine, as for all other stock, warmth is to a certain extent equivalent to food, for which reason comfortable surroundings have a money value, the protected animals not only requiring less food, but growing faster than their less favored relatives. A dry, warm sleeping place means

IN THE RAPE PASTURE

A Two-Months-Old Rape Plant

something more than much bedding. If too much bedding is provided the natural tendency is to allow it to remain longer in use than a smaller quantity would be, and it becomes damp and filthy. With fall pigs particularly there is danger in such cases of cough or other ailments that are a check to thrift. A moderate quantity of bedding, changed so that the bed is always dry and decently clean, is far better than a large quantity.

Damp beds and pens are a tax not only on the vitality of the pigs, but on the feed bin, and afford the conditions under which disease germs multiply. The preventive is abundant sunshine. One writer has said that swine breeders and feeders spend money enough for disinfectants and cholera cures to pay the interest on the national debt, "and likely the men who are spending the most money for loud-smelling disinfectants are the ones who fail to appreciate nature's best gift to man—sunshine. It is the source of life to vegetable and animal. The wood and coal we feed our fires with are but stored-up sunshine. Sunshine warms and cheers. It is essential to life. It is as essential to health. Its power to destroy germs of disease is really a new discovery. Our mothers knew the value of sunshine as a sweetener of milk crocks and feather beds, but the why they knew not, but so long as they loved tidiness and sweetness in the milk room and home and were careful to keep the crocks and beds sweet by exposure to the sun, they were killing microbes just as surely as did the scientist who proved his work, and gave us the result of his patient effort."

### CASTRATION

The boar pigs, where it is not desired to reserve them for breeding purposes, should be castrated when from two to ten weeks old, so they may recover from its resulting soreness before weaning time. Castrating should be done when the weather is cool, and flies are not numerous. The pig that is to be fattened has no need to develop sexual characteristics, and for that reason a fairly early castration is advisable. Spaying sows is a more difficult operation than the castration of boars, and on that account is not largely practiced. It should be done after the sow is ten or 12 weeks old, and then only by a person entirely familiar with the proper method. Castration and spaying are more fully discussed in the chapter devoted to these subjects.

### FATTENING PIGS

Up to the time of weaning all the pigs in a litter are fed on the same basis; after that time the manner of feeding will depend on whether they are headed for the slaughterhouse or breeding pen. If any are for breeding stock, their growth-making feed will be continued while those to be fattened should have more carbonaceous rations.

"Growing pigs, and especially those designed for breeding stock," says W. A. Henry, "should be abundantly nourished on feeds rich in protein, since these favor the development of both bone and muscle. Middlings are the best single feeding stuff, and should be extensively used whenever possible. Ground field peas, cowpeas and soy beans may also be used, the latter

two being especially available in the southern states. In no case feed cottonseed meal to pigs. Skim milk and buttermilk are of the highest value. An ideal mixture would be four pounds of skim milk, two pounds of middlings and one pound of corn meal for young pigs. In place of the middlings cowpeas or soy beans might be substituted, if available. A run on a pasture seeded with crimson clover or Japanese clover for the south, and blue grass or red clover for the more northerly points [or alfalfa anywhere] is almost an essential; in any event, a good range must be given for young breeding stock. With good pasture and abundant exercise, pigs designed for breeding purposes can be fed practically to the limit of their desire. Of course, no feed should ever remain in the trough, and it is well to have the animals willing to take just a little more, as an active, well bred ambitious pig is always desirous of doing."

In these days the American pig makes a speedy journey from farrowing bed to scalding tub, and the aim of the judicious feeder is to add constantly to the flesh acquired while suckling, bringing the hog up to 250 to 450 pounds as early and on as inexpensive feed as possible. The young animal will naturally put on weight more cheaply than an older one, and gains after ten months cost considerably more per pound than those made earlier. A pig which is being fattened should gain from one to two pounds a day, and weigh, alive, 250 to 350 pounds when nine to 12 months old.

### FALL PIGS

The possibilities of profit in fall pigs will depend upon the ability and situation of the breeder. Some

swine raisers will make winter pigs profitable in the face of all the disadvantages which may attend their rearing, while others obtain little profit from spring litters reared with every advantage. Where snow falls, the fall pigs will require a good deal of care and warm, dry pens, and not so many can be handled well in winter weather as may be cared for in summer, when growing feed is abundant and exercise is natural. A difficulty with fall pigs, if the climate is at all severe, is in their desire to avoid exercise in cold weather. A calf or a colt will make the most of his freedom on a wintry day, securing both exercise and warmth by playing and moving about, but a hog is inclined to eat and take to his bed until time to eat again. Various methods of overcoming this in a measure have been suggested, but it is difficult to give any which will meet all situations. Herding with corn-fed cattle has been found to work well and where the cattle are fed all the corn they will eat, the pigs will obtain exercise in picking grain from the droppings.

Pigs cannot thrive on ice water, and in cold weather should have access to drink less chilly. Slop fed to them moderately warmed is much better than if near the freezing point.

Late or winter litters in a cold climate may properly be classed as hothouse product, and pigs that come in November, December or January and are saved from perishing only by the use of stoves and coddling in close, stuffy quarters are likely to be more or less stunted and undersized—not a money-making lot at best. Fall

pigs should come early enough that they may be weaned before snow time.

Fall pigs should not be kept together in large numbers; eight or ten are enough for one pen, as they are likely to pile up so that the steaming of their bodies will render them liable to colds. They should have the nearest substitute for fresh, green food that the owner can provide, and be given access to salt and cob charcoal or similar correctives, tonics or appetizers.

Feeds for winter pigs must necessarily be more expensive than for summer pigs; more food is required to produce a pound of pork in winter than in summer, since a greater amount has to be utilized in merely keeping the body warm. If the price of pork remains the same, a dollar's worth of feed stuffs fed to summer-grown hogs will return a greater profit than a dollar thus invested for winter-grown hogs. The matter reduces itself to this: to make winter pig-growing pay, summer conditions as to both cheapness of feed and comfortable surroundings must be approached as nearly as possible.

The foregoing suggestions apply, of course, to the more northern sections of the United States. In the South and milder sections of the Pacific coast region less exacting conditions prevail.

### NEED OF EXERCISE

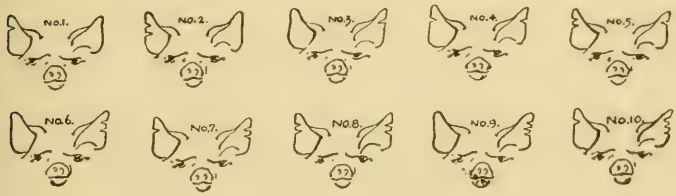
It should not be forgotten that a growing pig needs abundant exercise. This will not only stimulate growth, but it will also do much to ward off sickness. Many outbreaks of disease might have been avoided if its victims

had not been too closely confined. A pig having ample exercise is pretty well insured against thumps. A successful breeder whose pigs were never afflicted with thumps attributed their immunity to the fact that he kept a large box near the pen and if any pig began to be unduly fat and particularly chuffy around the neck it was put into the box and left to squeal and chase about for two hours at a time in endeavor to escape. The treatment was repeated once or twice a day until the pig showed satisfactory evidence of being in no danger.

### MARKING PIGS

With the beginner in pure-bred swine-raising there is always the problem of how best to mark his pigs for identifying the litters or sows to which they belong. No system has been devised which is entirely satisfactory, because the metal buttons or tags made for such use are frequently torn out and lost, and markings with slits or notches in the ears are liable to change or obliteration by accidents. A method perhaps as simple and effective as any in use is shown by the illustration herewith, in which the marking consists of notches cut in the ears. A notch in the right ear counts for one, and a notch in the left ear counts for three. When the first litter arrives all the pigs belonging to it can be given one notch in the upper part of the outside of the right ear. Litter No. 2 can have two notches in the right ear, which means 2, because the one and one mean 2; the third litter is marked with one notch in the left ear, which, as stated, means 3; pigs of the fourth litter are given one notch in each ear, because the one and three mean 4; the fifth

sow's pigs are marked two notches in the right ear and one in the left, because 2 and 3 make 5; litter No. 6 is marked two notches in the left ear, while litter No. 7 is marked two in the left and one in the right; No. 8, two in the left and two in the right; No. 9, three in the left and No. 10, three in the left and one in the right. If there are more than ten sows the




A SIMPLE SYSTEM OF EAR MARKING

same method can be used for their litters, up to ten, placing the notches in the lower part of the ears. For pigs of sows in numbers from 20 to 30 the notches can be in the top of the ear. Sometimes the litters between ten and twenty are marked the same as between one and ten, with the exception that a notch is put in the top of one ear, which simply indicates that all pigs so marked are numbered between ten and 20 and not between one and ten. On little pigs the notches should be made quite small, otherwise disfigurement will result when the hog is grown. Noticeable disfigurement of any sort on animals intended for exhibition, places them at a disadvantage in a close competition, perhaps depriving them of an otherwise merited prize, and this should be borne in mind when marking is being done.

CHAPTER IX

# Pasturing and Soiling

Wheresoever situated, no farmer is rightly prepared to raise hogs profitably in any considerable numbers unless well provided with pasture and grass or facilities for providing acceptable substitutes. In the economical growing of pork there is no more important factor to be considered than that of pasture. Range in pasture affords growing animals the exercise so necessary to health and proper development; and the succulent grasses, while rich in muscle and bone-forming materials, tend to prevent disease and to counteract the heating and fever-imparting properties of corn. This latter quality, and exercise, annually save many thousands of dollars to hog-raisers in the United States, yet the loss that results every day to farmers who do not act upon the fact that the hog is, in his normal condition, a ranging and grass-eating animal, is still enormous. Because the hog is tractable and uncomplaining his keeper often does not realize that an effort to maintain him wholly upon the more concentrated and heating feeds is as unnatural and unprofitable as it would be to keep horses or cows in the same manner. A further and very important consideration in favor of grass and forage for swine in summer is its small cost, which, as compared with grain-feeding, is merely nominal.

It is well put by Director H. J. Waters of the Missouri experiment station, in Bulletin No. 79, and with a wide application elsewhere, outside of his state, in his averment that "perhaps the largest single waste occurring on the Missouri farm is that which comes from the too exclusive use of corn in growing and fattening hogs. The cheapest and most easily applied remedy is a more general use of the proper forage plants in summer and the use of some home-grown protein in winter. It is not, of course, to be denied that the hog is primarily a grain consuming animal, but forage plays an important role in economical hog production and deserves far more attention than it has yet received."

### COMPARATIVE VALUE OF PASTURE FOOD

A comparison merely of the nutritive values in the product of an acre of land in grain or in grass, including the legumes, such as clover, particularly red clover, and alfalfa, serves to show the importance of the grass. If a comparative basis be taken of four pounds of grain or 15 pounds of green clover or alfalfa to make one pound of pork, and the pork is valued at four cents a pound, the following table will show a fair average:

NUTRITIVE MATERIAL PRODUCED ON ONE ACRE OF LAND IN CEREALS OR LEGUMES

| Product | Gross Product per acre | | Pork per acre | Value at 4 cents per lb. |
|---|---|---|---|---|
| Wheat | 15 bushels | 900 pounds | 225 pounds | $9.00 |
| Barley | 35 " | 1,680 " | 420 " | 16.80 |
| Oats | 40 " | 1,320 " | 330 " | 13.20 |
| Corn | 40 " | 2,240 " | 560 " | 22.40 |
| Peas | 25 " | 1,500 " | 375 " | 15.00 |
| Green clover | 6 tons | 12,000 " | 800 " | 32.00 |
| Green alfalfa | 10 " | 20,000 " | 1,333 " | 53.32 |

This estimate of the product of an acre of clover or of alfalfa may be considered rather low (especially for alfalfa), as often a larger yield is obtained in a favorable season. In fact, in an experiment at the Oregon station (Bulletin No. 80) in which 12 pigs about three months old were hurdled on good clover from May 2 to August 2, results nearly one-third better were secured. In addition to the clover the pigs were given 317 pounds of shorts (worth $11 a ton), 69 pounds of whole milk (worth 90 cents a hundredweight) and 1,207 pounds of skim milk (worth 15 cents a hundredweight). A gain of 253 pounds was reported, valued at 4½ cents a pound. The pigs utilized 26 square rods of clover. As the gain was worth $11.38 and the supplementary feed (shorts and milk) cost but $4.17, the profit by means of clover pasture was $7.21, from which the deduction was made in the report of the experiment that "it seems that one acre of good clover for growing hogs represents a value of $44.36."

If the foregoing table, compiled by the author from the figures of scientific observers, may be accepted as reliable in practice, it is evident that an acre of alfalfa is worth for growing swine as much as six acres of average wheat, more than four acres of good oats, almost as much as 2 2-5 acres of good corn, and equal in value to 1 2-3 acres of clover.

### SOILING

Soiling may be defined as the practice of providing confined live stock with freshly cut forage. Its advantages have long been recognized, and one of the earliest

recorded American experiments was that of Josiah Quincy, by which he found that 20 cows could be supplied by soiling from 17 acres of land, while 50 acres were necessary to pasture a like number.

Soiling crops are more frequently used for the larger animals than for swine, and the greater number of experiments with green food for swine have been with pasturage. A dairy cow may be more successfully maintained by soiling than on pasture, but a hog, kept in a pen and furnished grass only, would prove unprofitable. This was tested at the Utah station (Bulletin No. 40), where shotes confined in pens and fed on green forage exclusively, mainly alfalfa, lost more than ¼ pound per day during a period of three months.

This does not at all signify that soiling may not be valuable in swine-rearing, but it emphasizes the importance of supplemental feeding. If grain is the main feed, pasturage or soiling may supplement it, while to hogs on even the best of alfalfa pasture the ear or more of corn that may be given daily will be the supplementary part of the ration. In any case the ratio of feeds should be so adjusted that the hogs will not lose weight or remain at a standstill. The feeder should consider always that any day between weaning and starting to market in which the hogs do not make some gain is a day lost, if not worse.

### VALUE OF PASTURE AND SOILING

Results at the experiment stations, so far as reported, show that soiling swine may be entirely profitable. In Utah, where the problem "resolves itself into

growing pigs with a minimum quantity of grain and a maximum of alfalfa, milk and whey, or other cheap foods," numerous experiments have been conducted to demonstrate the status of pasturage and soiling (Bulletins Nos. 40, 70 and 94). Various tests with pigs fed by soiling compared with others on a grain ration (Bulletin No. 70) gave from the soiling a saving of nearly ten per cent in the feed required to make one pound of gain, besides a daily gain nearly one-fourth of a pound better.

From 1890 to 1902 more than 100 tests were made at the Utah station, which were of direct or comparative value regarding pasturage and soiling for swine. Average results of these are given in the table on page 165, from Bulletin No. 94 of the Utah station, in which conclusions are drawn from the experiments.

The following comment was made in the bulletin containing the following table concerning the results of using part-grain and full-grain rations in connection with pasturage: "The table shows that 14 tests were made, with 43 hogs on pasture and given a part-grain ration. It is obvious that the hogs fed on the light-grain rations did proportionately much better than those fed with a full-grain ration; that is, the gain per day was greater than the ration of grain would indicate, showing that the hogs ate a large proportion of pasture grass and made good use of it. A simple calculation will show this. The hogs fed a full-grain ration on pasture made an average gain of 1.22 pounds per day. Theoretically, those fed a three-fourths-grain ration should have gained but .91

# TABLE AVERAGING RESULTS OF UTAH STATION'S EXPERIMENTS, 1890 TO 1902

| RATIONS | No. of tests | No. of hogs | Average days fed | Average weight at beginning, lbs. | Average weight at end, lbs. | Gain per hog, lbs. | Daily gain per hog, lbs. | Dry matter eaten per day per hog, lbs. | Food for 1 lb. of gain: Grain, lbs. | Food for 1 lb. of gain: Skim milk, lbs. | Food for 1 lb. of gain: Pasture or grass | Dry matter per lb. of gain | Value of 100 lbs. of grain when hogs sell for: Three cents per lb. | Value of 100 lbs. of grain when hogs sell for: Five cents per lbs. | Lbs. grain saved by 100 lbs. skim milk | Lbs. grain saved by 100 lbs. roots or grass | Lbs. grain saved by pasture on 100 lbs. gain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | lbs. | lbs. |
| Grain fed in pens | 25 | 74 | 115.6 | 72.1 | 172.8 | 100.7 | .87 | 3.80 | 4.84 | ..... | | 4.30 | $.62 | $1.03 | .... | .... | .... |
| Grain in large yards | 10 | 22 | 120.6 | 65.2 | 205.2 | 140.0 | 1.16 | 4.76 | 4.56 | ..... | | 4.11 | .66 | 1.09 | .... | .... | .... |
| Grain with grass in pens | 9 | 26 | 108.0 | 73.0 | 198.0 | 125.0 | 1.16 | 4.60 | 4.41 | ..... | 1.15 | 4.22 | ... | .... | .... | 37.4 | .... |
| Grain with grass in yards | 7 | 17 | 115.0 | 71.6 | 198.0 | 126.4 | 1.10 | 4.70 | 4.75 | ..... | 1.23 | 4.51 | ... | .... | .... | 15.4 | .... |
| Grain in small movable pens in pasture | 3 | 7 | 125.0 | 67.3 | 201.7 | 134.4 | 1.08 | 5.17 | 5.34 | ..... | Pasture | 4.81 | ... | .... | .... | .... | 50 |
| Grain in large pasture | 8 | 20 | 111.0 | 65.0 | 200.0 | 135.0 | 1.22 | 4.52 | 4.13 | ..... | Pasture | 3.72 | ... | .... | .... | .... | 43 |
| Grain and skim milk in pens | 11 | 34 | 114.0 | 50.3 | 206.7 | 156.4 | 1.37 | 4.75 | 2.98 | 9.21 | | 3.46 | ... | .... | 20.2 | .... | .... |
| Gr. & s. m. in pens (compare with pasture) | 2 | 6 | 95.5 | 37.5 | 157.0 | 119.5 | 1.26 | 3.79 | 2.54 | 8.96 | | 3.03 | ... | .... | 25.7 | .... | .... |
| Grain and skim milk on pasture | 2 | 6 | 95.5 | 37.0 | 150.0 | 113.0 | 1.18 | 3.51 | 2.48 | 8.79 | Pasture | 2.97 | ... | .... | 18.8 | .... | .... |
| Grain ½ ration and skim milk in pens | 3 | 8 | 105.0 | 58.5 | 152.1 | 96.6 | .92 | 3.18 | 1.89 | 18.79 | | 3.46 | ... | .... | 15.7 | .... | .... |
| Grain ½ ration and skim milk on pasture | 1 | 3 | 87.0 | 31.0 | 123.0 | 92.0 | 1.05 | 2.63 | 1.35 | 14.81 | Pasture | 2.49 | ... | .... | 18.8 | .... | .... |
| Skim milk alone in pens | 3 | 8 | 110.0 | 40.5 | 112.0 | 71.5 | .65 | 2.03 | ..... | 34.05 | | 3.13 | ... | .... | 11.2 | .... | .... |
| Skim milk alone on pasture | 2 | 6 | 95.0 | 37.0 | 103.0 | 66.0 | .69 | 1.60 | ..... | 27.09 | Pasture | 2.32 | ... | .... | 15.2 | .... | .... |
| Grain ¾ ration on pasture | 6 | 17 | 102.0 | 59.3 | 165.0 | 105.7 | 1.04 | 3.57 | 3.83 | ..... | Pasture | 3.45 | ... | .... | .... | .... | 73 |
| Grain ½ ration on pasture | 5 | 16 | 83.0 | 52.0 | 110.0 | 58.0 | .70 | 1.89 | 3.04 | ..... | Pasture | 2.70 | ... | .... | .... | .... | 152 |
| Grain ¼ ration on pasture | 3 | 10 | 74.0 | 58.0 | 94.0 | 36.0 | .49 | 1.09 | 2.47 | ..... | Pasture | 2.23 | ... | .... | .... | .... | 209 |
| Grain ¼ ration with grass in pens | 3 | 7 | 85.0 | 67.0 | 101.0 | 34.0 | .40 | 1.40 | 3.88 | ..... | 9.90 | 6.45 | ... | .... | .... | 9.7 | .... |
| Pasture of mixed grasses | 4 | 10 | 85.0 | 60.0 | 87.6 | 27.6 | .32 | .... | .... | ..... | Pasture | .... | ... | .... | .... | .... | .... |
| Pasture alone, alfalfa and mixed grasses | 7 | 19 | 101.0 | 72.6 | 87.7 | 15.1 | .15 | .... | .... | ..... | Pasture | .. | ... | .... | .... | .... | .... |
| Green grass in pens | 1 | 2 | 91.0 | 116.0 | 92.0 | 24.0 | .26 | .... | .... | ..... | | .... | ... | .... | .... | .... | .... |
| Roots and grain in pens | 3 | 7 | 125.0 | 76.0 | 149.0 | 73.0 | .69 | 3.13 | 5.54 | 8.00 | | 5 36 | ... | .... | .... | 8.7 | .... |
| Sugar beets and part grain rations in pens | 4 | 12 | 86.0 | 72.0 | 117.0 | 45.0 | .71 | 2.40 | 3.22 | 11.29 | | 4.59 | ... | .... | .... | 14.4 | .... |
| Wheat ground fed in yards or pens | 4 | 11 | 113.0 | 85.3 | 197.4 | 112.1 | 1.00 | 3.91 | 4.37 | ..... | | 3.94 | .69 | 1.14 | .... | .... | .... |
| Wheat and bran fed in yards or pens | 12 | 32 | 117.0 | 70.0 | 190.0 | 120.0 | 1.03 | 4.45 | 4.82 | ..... | | 4.34 | .62 | 1.04 | .... | .... | .... |
| Wheat and bran with grass or pasture | 7 | 20 | 90.6 | 58.5 | 166.2 | 107.7 | 1.19 | 4.50 | 4.21 | ..... | | 3.79 | .71 | 1.19 | .... | .... | .... |
| Wheat, bran and skim milk | 4 | 11 | 134.0 | 45.0 | 218.0 | 173.0 | 1.29 | 4.19 | 2.85 | 6.83 | | 3.25 | ... | .... | 28.8 | .... | .... |
| Corn meal fed in pens | 1 | 3 | 91.0 | 97.0 | 173.0 | 76.0 | .85 | 3.10 | 5.58 | ..... | | 5.03 | .54 | .90 | .... | .... | .... |
| Corn meal and bran fed in yards or pens | 6 | 19 | 99.0 | 62.4 | 129.6 | 67.2 | .68 | 2.90 | 4.75 | ..... | | 4.28 | .63 | 1.05 | .... | .... | .... |
| Corn meal and bran with grass or pasture | 4 | 12 | 99.8 | 42.7 | 139.3 | 96.6 | .97 | 3.40 | 3.62 | ..... | 1.41 | 3.51 | ... | .... | .... | .... | .... |
| Corn meal and bran and skim milk | 4 | 12 | 90.5 | 55.0 | 173.5 | 118.5 | 1.31 | 4.83 | 2.68 | 1.22 | | 3.68 | ... | .... | 17.0 | .... | .... |
| Barley and bran in pens and yards | 3 | 7 | 114.0 | 59.4 | 171.0 | 111.6 | .98 | 4.75 | 4.58 | ..... | | 4.12 | .66 | 1.08 | .... | .... | .... |
| Barley and bran with grass or pasture | 4 | 8 | 91.0 | 74.3 | 201.0 | 126.7 | 1.39 | 6.04 | 4.88 | ..... | | 4.40 | .61 | 1.02 | .... | .... | .... |
| Barley and bran with skim milk | 2 | 8 | 161.0 | 38.2 | 251.6 | 213.4 | 1.31 | 4.90 | 3.29 | 7.85 | | 3.69 | ... | .... | 16.4 | .... | .... |
| Peas and bran in pens and yards | 2 | 6 | 124.0 | 67.0 | 193.0 | 126.0 | 1.01 | 4.18 | 4.60 | ..... | | 4.15 | .65 | 1.09 | .... | .... | .... |
| Mixed grain fed in pens or yards | 8 | 22 | 129.2 | 78.0 | 196.0 | 118.0 | .91 | 4.32 | 5.25 | ..... | | 4.73 | .57 | .95 | .... | .... | .... |
| Mixed grain fed with grass or on pasture | 12 | 30 | 140.0 | 82.3 | 241.5 | 159.2 | 1.13 | 5.01 | 4.89 | ..... | | 4.41 | .61 | 1.02 | .... | .... | .... |
| Mixed grain fed with skim milk | 2 | 6 | 87.0 | 31.5 | 144.0 | 112.5 | 1.29 | 3.65 | 2.34 | 8.44 | | 2.82 | ... | .... | 34.5 | .... | .... |

pound per day; they gained, however, 1.04 pounds per day. Those fed on a one-half-grain ration gained .70 pound a day per hog, instead of .61 pound; and those fed on a one-fourth-grain ration gained .49 pound per day, instead of the theoretical amount, .30 pound a day. In fact, the amount of food obtained from the pasture must have been much more than is indicated, as the food of support is a constant factor and makes up about two-fifths of the full-grain ration. The hogs getting the one-fourth-grain ration, therefore, did not receive enough grain to support the life processes of the body, and must have made up this deficiency from the pasture grass and also have eaten enough extra to make a gain of practically half a pound per day. In the earlier tests made in feeding on a pasture of mixed grasses, there were four trials in which ten hogs were used. These showed that the hogs gained one-third pound per day on pasture alone.

"When fed a limited grain ration on pasture, the hogs ate less grain for each pound of gain than when fed the full-grain ration. Using round numbers, a three-fourths-grain ration saved one-third pound of grain; a one-half-grain ration, one pound of grain; a one-fourth-grain ration, 1½ pounds of grain for each pound of increase in live weight. Or, at 75 cents per 100 pounds of the grain, this would be a saving in cost of production of ¼ cent, ¾ cent, and 1⅛ cents for each pound of gain respectively, if nothing is charged for the pasture.

"Our experience shows that the hogs fed on a limited grain ration on pasture gained quite rapidly when later put on a full-grain ration, and made those gains at a

slightly less cost for food than the hogs fed a full-grain ration."

Considering the financial side, with the price of grain as stated, the lot fed with "grain alone on pasture required $5.32 worth of grain, while the value of the gain was $8.13, showing a profit of $2.71 on the feed, or more than 50 per cent. If the gain was worth four cents per pound, then the profit on the grain was over 100 per cent. With a half-grain ration on pasture, the returns, with the gain valued at three cents a pound, are over 100 per cent on the cost of the grain, and at four cents per pound for the gain nearly 200 per cent profit. On this point again a limited-grain ration on pasture gives the largest returns for the grain fed."

### LIMITATIONS OF PASTURAGE

The quantity of food required merely to sustain an animal is not inconsiderable, and this will be influenced somewhat by the effort necessary to secure it. Too wide a range in pasture may therefore be disadvantageous in encouraging the hog to become too much of a traveler. On the other hand, the swine-raiser who gives his hogs all the corn they will eat, with plenty of water and shade in the feed-lot, may wonder why his hogs prefer lying down and resting between meals to roaming in available pasture. Profitable results demand a reasonable limitation in both directions, and an avoidance always of excess in either.

It is doubtful whether unlimited pasture may be considered economical except perhaps, for brood sows. The proper amount of land to give over to pasture must

necessarily vary according to its quality and other local considerations, and the length of time the pasture will sustain hogs likewise is dependent upon the climate, quality of the crop, age and number of the animals, and other varying conditions. For an average it may be said that an acre of red clover should support six to ten hogs for three or four months. Alfalfa, the leading pasture plant for swine, should provide, if of vigorous growth, for twelve to twenty-five animals per acre, but an alfalfa stand should not be grazed by so many hogs that mowings will not be necessary for keeping it in the best condition. The practice with alfalfa should be to pasture fewer hogs than will be able to keep back a rank or woody growth. If only such number of hogs is kept on the alfalfa as will permit from one to three cuttings of hay being harvested from it in course of the season the pasturage will, on account of its fresh growths, be much better for the hogs, and the money values returned be considerably greater. Blue grass may be allotted eight to 12 hogs per acre, and more if the grass is in first-class condition. A good sod of Bermuda grass should provide for about the same number. Cowpeas will probably support six or eight thrifty shotes, and artichokes, chufas and Spanish peanuts will supply eight or ten hogs, the length of time depending upon the proportion of grain provided. These estimates may be entirely out of line in some instances, as modifications are liable to occur in the conditions governing any situation. Taking these into consideration, however, a hog-raiser may use the foregoing as suggestions to figure from, and by the

observation of his own situation for a season or two he will be able to arrange his crop areas according to his individual needs and facilities.

As indicated, it is desirable that the pasture shall not be too large, and particularly when hogs are first turned in, as their natural instinct for foraging will otherwise induce them to traverse too much territory, thereby injuring the crop and failing to reap its full value. This may be avoided by using portable fences or hurdles with which the proper area may be defined. If this is done the hogs will clean up the crop to the best advantage as they go. If it is tubers, beans and peas, much that would otherwise be destroyed will be utilized, and the fences can be moved as occasion may require. Restriction of the hogs' roaming is not so necessary on grass, clover or alfalfa pasture. Overstocking any pasture is to be avoided. If too many hogs are turned in, or, what is practically the same thing, the area is too small, its vegetation may be entirely killed and the hogs fail to thrive.

### EARLY PASTURAGE

A bite of something green early in the year is relished by swine of any age, and it offers qualities highly valued by the farmer who understands the economy of feeding. Some highly rated pasture plants are not available before warm weather, although they may then be the chief reliance for grazing, hence earlier substitutes should be provided. The matter of pasture or pasture substitutes should, in fact, be taken in hand a year or two in advance of the actual need. Blue grass and alfalfa are naturally

among the best for early pasture. Blue grass or orchard grass will supply green feed as soon as the snow is off. Alfalfa is on hand early and late in the regions where it flourishes. Rye, in its territory, sown somewhat early in the fall, makes an excellent substitute for grass early the following spring. For a quick-growing crop sowed in the spring rape is probably to be accorded first place, as hogs may be turned in on it when it is a foot high, which will be within a few weeks from sowing.

### SUCCOTASH

A mixture crop may be used to good advantage for preliminary pasturage. A sowing of equal parts wheat, oats and barley, mixed, with the addition of 2 pounds of rape seed to the acre, supplies good spring grazing. "Succotash" is a term applied in recent years to various mixtures sowed together and designed for either forage or soiling. These mixtures admit of considerable range, but usually consist of one or more legumes, one or more smaller cereals, and corn. Experiments in this line have not been extensive enough to determine what mixtures would be standard for special purposes, and at present the term succotash may be applied to any mixture of green crops for live stock feeding.

A succotash crop may be purposely shortlived, and to tide over an emergency, or it may be so calculated as to return two soiling crops, with a moderate grazing between the cuttings. In the former instance it will probably be grazed off closely, and its usefulness ended. When it is some crop that will yield a growth after the first cutting the mixture should not be of such varieties

that the rapid growth of one will smother others of a slower growth.

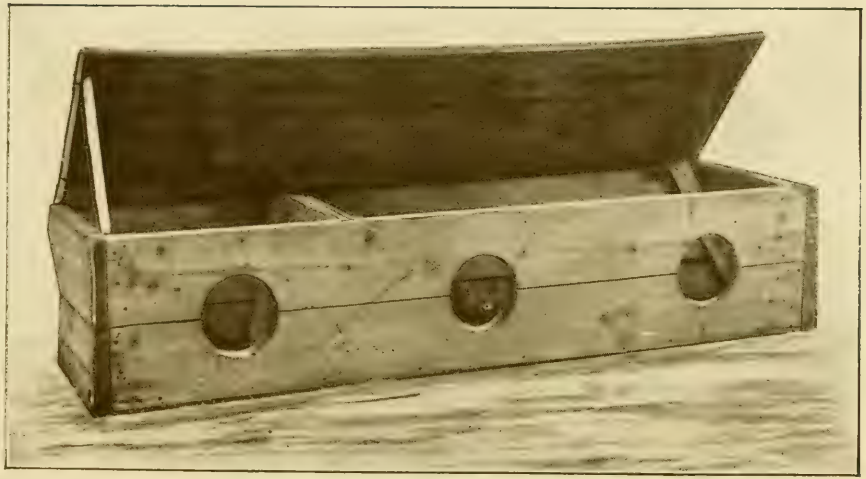
The Michigan experiment station obtained good results with succotash crops (Bulletin No. 235). It was found that a "succotash mixture, consisting of corn, peas, oats, rape and clover, is an extremely useful combination and that it can be produced as regularly and successfully as any other crop or mixture if properly treated. Though the first attempt was to use this mixture as a forage crop for swine, it has not proved so valuable for that purpose as was expected. When the succotash was grazed off, the losses were heavy from the trampling and wallowing of the animals; in fact, so much so that it had to be hurdled off, giving them access to but a limited area every few days, and this is a somewhat expensive and troublesome method. When cut, hauled, and fed in the hog lots or pens there was little or no loss. When the rape and clover were bitten off close to the ground by hogs many plants failed to grow again; when cut higher with a scythe they did not fail to grow. The composition of this succotash does not vary greatly from that of green corn in the earlier stages when used for soiling. If succotash is grown to any great extent for soiling purposes it should be sown at two or three different dates, the first late in April or early in May, the others following at intervals of ten days or two weeks. From the different dates of seeding some one or more of the lots is almost sure to produce a second growth suited for swine pasture. The ability to secure a crop of clover on the same ground the next season is at present uncertain, but is well worth trying for."

### GREEN RYE PASTURAGE

Concerning the use of rye, Thomas Bennett, an Illinois hog-raiser of long experience, says: "As early pasturage for hogs my experience tells me that there is nothing better than rye in Central Illinois. The rye should be sowed not later than September 1, if possible. When they are large enough, ring the pigs and turn them on, and they will have good grazing up to May 10 or 15 following. If the rye should become too rank in the latter part of April, turn the milk cows in with the hogs and keep them there until about the middle of May; then take everything off and you will harvest a fair crop of rye. As soon as your rye is harvested, plow the ground and sow rye as before. Your land becomes richer, and you have an abundance of good pasture. It would be a good plan to have a patch of clover to turn the hogs on when taken from the rye."

The late I. N. Barker, who was a successful Indiana breeder, wrote: "We can say from long experience that for extra early pasturage blue grass and rye make the best combination. These can even be pastured in the winter when there is little or no snow. In May or June clover is the most valuable hog-pasture we ever tried. After rye is used for early pasture it should be turned under with a breaking plow about May 15, the ground leveled with a harrow and then sown in rape or oats, or both together—we prefer them sown together—the seed being well harrowed in. This will make a splendid green tender feed when the clover and other grasses begin to be old and tough. We find that our hogs like this green

MAKING PORK FROM ALFALFA AND CORN



BOX USED FOR FEEDING ALFALFA HAY TO SWINE

oats and rape in midsummer better than any other green feed we ever prepared for them. They are in this pasture early and late and thrive on it remarkably well. It is healthful and a very cheap feed."

### RAPE

The Wisconsin station has probably made more tests of rape as a pasture food for swine than have been undertaken elsewhere, and summing them all up, Prof. W. L. Carlyle, who was in charge, says they seem to warrant the following conclusions:

That with pigs from 4 to 10 months old representing the various breeds, an acre of rape, properly grown, has a feeding value, when combined with a ration of corn and shorts, equivalent to 2,436 pounds of a mixture of these grain feeds and a money value of $19.49 per acre.

That rape is a better green feed for growing pigs than good clover pasture, the pigs fed upon the rape having made on the average 100 pounds of gain on 33.5 pounds less grain than was required by the pigs fed upon clover pasture.

That pigs are more thrifty, have better appetites and make correspondingly greater gains when supplied with a rape pasture in conjunction with their grain feed than when fed on grain alone.

That a plat of Dwarf Essex (the preferable variety) forage rape when planted in drills 30 inches apart, early in May in Wisconsin, will yield three good crops of pasture forage in a favorable season.

That rape is the most satisfactory and cheapest green feed for swine that we have fed.

That every feeder of hogs in Wisconsin should plant each spring a small field of rape adjoining his hog yard, and provide himself with a few rods of movable fence, to properly feed the rape to brood sows and young pigs.

That rape should be sown for this purpose in drills 30 inches apart to facilitate the stirring of the ground and cultivation after each successive growth has been eaten off.

That hogs should not be turned upon a rape pasture until the plants are at least 12 to 14 inches high and that they should be prevented from rooting while in the rape field.

That rape alone is not a satisfactory feed when it is desired to have any live weight gain made in hogs, though it has been found that they will just about maintain themselves without loss of weight on rape.

Rape grows rapidly; it may be sown at successive intervals so as to afford continuous pasturage from the first of June until frost and a large supply of food from a given area. Hogs do not take to rape readily at first, but soon acquire a taste for it and eat it freely. It has an excellent effect on the quality of the product, giving almost invariably a firm carcass. Three pounds of seed per acre give a very good stand, if the seed is fresh and of good quality. If the rape is too thin on the ground it grows somewhat coarse in texture and is not eaten so readily.

The editor of the *Dakota Farmer* says: "Dwarf Essex rape is a godsend to the northwestern hog-grower; it

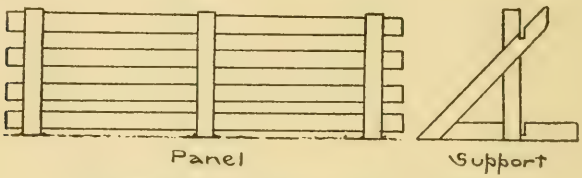
should be found on every farm, and where anything will grow in the Dakotas it will succeed."

Professor Henry says every man with pigs should have rape for them. "Provide an acre of rape of each 2500 pounds of growing pigs that are to be fed upon it. As soon as the plants are a foot high turn in the pigs. They will greedily eat the leaves, and gain about enough nourishment to support their bodies, and this being true all the extra feed will go for gain. Corn, middlings, etc., should be fed with the rape. A great advantage of rape feeding is that it keeps the digestive tract expanded and in healthful condition. Pigs fed rape fatten quickly and very cheaply. Sow none but the Dwarf Essex. Many farmers have bought oil rape seed or bird seed rape, and the crop proved a failure. Sow two or three pounds per acre when drilled and four or five pounds broadcasted. Every pig raiser who has not yet tried rape is urged to do so."

### A PORTABLE BOARD FENCE

A simple portable fence is made with panels 12 or 16 feet long of four 1x6-inch boards. Commencing at the bottom, the first two boards are placed 6 inches apart, while the third and top ones may be 7 inches apart. The boards are held in place by 1x4-inch slats, one placed 6 inches from either end and the other placed in the center. The bottom piece of the triangle which is to support the hurdle is 3 feet 6 inches long and made of 1x6-inch stuff. In the center of this piece is cut a notch 3 inches deep and 2 inches wide. The sides of the

triangle are made of 1x4-inch pieces 4 feet long, with a notch corresponding to the one in the baseboard cut in the top. This fence is hog-proof, is easily and cheaply constructed, will not blow over, and is easily transported from place to place.




A MOVABLE PANELED HOG FENCE.

### COWPEAS

The cowpea is described as being to the South what alfalfa is to the West and red clover to the North—a forage plant well adapted to the needs of the region—and esteemed among the best of crops for grazing and soiling. By a judicious selection of varieties, fields ready for use can be had from midsummer until cold weather, and a good part of what is needed for this purpose can be grown as a "catch crop" without interference with the regular crops grown on the same ground. This is especially so when they are grown between corn rows, being planted when the corn is "laid by" and grazed after the corn is gathered. Probably one-half of the cowpeas grown in the southern states are grown and grazed in this way, and are regarded as providing the best possible pasture for swine. When pastured, the droppings from the animals return nearly all of the fertilizing elements of the crop to the soil, and benefit

the field nearly as much as though the entire crop were plowed under as a green manure. The meat and milk produced represent clear profit. The crop does not bear continuous grazing, still it gives abundant feed for a month or six weeks, and by arranging a succession of fields, good pasture may be provided during several

POD OF COWPEA.

months. More actual feed is produced with less waste per acre when the vines are cut or pulled for soiling, for which cowpeas are a standard crop in the southern states wherever soiling is practiced. Bulletin No. 100 of the Mississippi station says that there cowpeas for hog pasture, without grain, have given better results than any other crop. In one test the crop was grown on thin hill land, where one acre of cowpeas produced 350

pounds of pork. In another test on rich valley land one acre of cowpeas produced 483 pounds of pork. The hogs were turned into the field when the peas were about ripe. Cowpeas do well sown as far north as Central Illinois.

SAND OR HAIRY VETCH.

### SAND VETCHES

A writer who claims to know says southern farmers who are raising swine, and want "the best, most nourishing and quickest-growing pastures, should sow, just before wheat-sowing time in the fall, sand vetches mixed with rye. The hogs may be turned on this when it has made a 5-inch growth, and it will afford good pasture throughout the winter if not too closely eaten down."

### PASTURING ON STUBBLE FIELDS

Occasionally a farmer thinks it economy to turn his swine, for gleaning purposes, on a grain stubble field where there is a stand of young grass or clover started.

In commenting upon such a practice, L. N. Bonham of Butler county, Ohio, has said: "We have always considered turning stock onto the young clover and timothy after grain harvest a losing business. The sooner the pasturing begins the worse for the coming crop. The young stuff has not yet firmly rooted and is heavily taxed by heat and drought and much of it will perish if the weather is unfavorable. In its feeble condition the extra tax of trampling and grazing will destroy much more. With young plants, as young animals, we need to lend a helping hand to insure the best growth. There is no profit in runts. The young clover and grass in the stubble fields are not there for tiding over the stock this season, but to fill barns next year with abundance, and what is of far more importance to the future of the farm, to fill the soil with a lusty growth of roots that may feed coming crops. If one is compelled to pasture the stubble fields in which young grass and clover have started, the damage is much less if stock is kept off until there is a good bite, the young plants are more firmly rooted, and the fall rains have carried them over the trying period that follows harvest. There is more lost than gained by pasturing stubble fields set to grass and clover."

### ROTATION OF PASTURAGE

The question of early pasturage is really involved in a much broader one—that of the proper rotation of pasture crops. A comparatively limited area will grow all the green feed that hogs can utilize, and it is of much greater importance to know how to supply economically such feed continuously through as much of the year as the climate will permit than to furnish a large quantity at one period and scant, woody grazing a little later. A well-arranged rotation will involve some additional expense and labor, but where hogs are raised in numbers, the better condition and growth, especially of breeding animals, and the saving in the more costly feeds will prove an ample recompense.

Professor W. M. Hays, when connected with the Minnesota experiment station, gave considerable attention to discovering the best system of pasture-crop rotation, and has presented the most sensible plan so far worked out, at least for the northern section of the United States. It gives, as he expressed it, "an outline of how land can be used for continuous hog pastures:

"The land is divided into four fields and fenced hog-tight. If practicable, a lane connects the hog-house with each of the four fields, and small inexpensive hog-houses or hog shades in the field are almost necessary. Some of these may be portable. Such small fields, 4x10 rods, may seem ridiculous, but most farmers have more than an acre for their hogs, and this plan will apply even if there are 80 acres devoted to growing hog pasture.

"Figuring out rotation is a little like a game of chess, but it can be learned, as my classes in field crops and field

management have fully demonstrated. The worst difficulty arises from the habit of the farm boys to see things only as they have been before their eyes from birth, and with the fathers there is even more difficulty. Instead of the present lack of system in crop rotation, formal plans may be devised, permitting the fields to be managed systematically.

"The problem is simplified by a chart in which each year's crops are shown on each field, which has a given number or name. Thus, in Table I herewith, the upper

TABLE I—FOUR-YEAR ROTATION FOR HOG PASTURAGE

| | Field A | Field B | Field C | Field D |
|---|---|---|---|---|
| First year | Wheat clover. | Clover. | Oats and peas; rye. | Rye; fodder corn; rape. |
| Second year. | Clover. | Oats and peas; rye. | Rye; fodder corn; rape. | Grain; clover. |
| Third year. | Oats and peas; rye. | Rye; fodder corn; rape | Grain; clover. | Clover. |
| Fourth year. | Rye; fodder corn; rape. | Grain; clover. | Clover. | Oats and peas; rape. |

left-hand square or section represents Field A, and the word 'wheat' shows that this field is seeded to wheat in 1903 (the first year), clover and timothy being sown with the wheat. Next below is the same field in 1904 (the second year of the rotation), when there is clover pasturage; following on the same field we have in 1905 oats and peas pastured off and the land seeded to rye; and in 1906 the rye is pastured off early, a crop of corn pasture is grown, and, following this, rape seeded with the corn makes some late fall feed.

"In the next column the same rotation is outlined on Field B, but the clover comes a year earlier, having been seeded down with grain in 1902. It will be observed that grain comes on Field B in 1906, with which to sow clover for pasture in 1907, and that each of the four fields in the rotation is kept in a regular course, each doing its part in producing each kind of crop in its turn. On Field C, in like manner, the same rotation prevails, each crop coming a year earlier than in the field before, grain having been grown here in 1901 and clover seeded with it. Again, in Field D, rye, fodder corn and rape come in 1903, the wheat and clover having been sown in 1900.

"The chart marks out a four-year period beginning with (say) 1903, the earliest year when all the changes preliminary to introducing the full course will have been completed. During the preceding three years, 1900,

TABLE II—SEVEN-YEAR ROTATION FOR HOG PASTURAGE, SHOWING PRELIMINARY YEARS

| | Field A | Field B | Field C | Field D |
|---|---|---|---|---|
| First year. | Oats and peas; rape. | Oats and peas; rye. | Rye; fodder corn; rape. | Oats; clover. |
| Second year. | Oats and peas; rye. | Rye; fodder corn; rape. | Wheat; clover. | Clover. |
| Third year. | Rye; fodder corn; rape. | Wheat; clover. | Clover. | Oats and peas; rye. |
| Fourth year. | Wheat; clover. | Clover. | Oats and peas; rye. | Rye; fodder corn; rape. |
| Fifth year. | Clover. | Oats and peas; rye. | Rye; fodder corn; rape. | Wheat; clover. |
| Sixth year. | Oats and peas; rye. | Rye; fodder corn; rape. | Wheat; clover. | Clover. |
| Seventh year. | Rye; fodder corn; rape. | Wheat; clover. | Clover. | Oats and peas; rye. |

1901, and 1902, the fields can be gotten ready for the final plan. Table II shows how the crops on each field during the years 1900, 1901 and 1902 can be filled in, that the regular rotation may be fully entered upon on all the fields in 1903.

TABLE III—FIVE-YEAR ROTATION FOR SUPPLYING HOG PASTURAGE

| | Field A | Field B | Field C | Field D | Field E |
|---|---|---|---|---|---|
| First year. | Grain; clover. | Clover. | Clover; corn; rye. | Rye; corn; rape. | Oats and peas; rape. |
| Second year. | Clover. | Clover; corn; rye. | Rye; corn; rape. | Oats and peas; rape. | |
| Third year. | Clover; corn; rye. | Rye; corn; rape. | Oats and peas; rape | Grain; clover. | Clover. |
| Fourth year. | Rye; corn; rape. | Oats and Peas rape. | Grain; clover. | Clover. | Clover; corn; rye. |
| Fifth year. | Oats and peas; rape. | Grain; clover. | Clover. | Clover; corn; rye. | Rye; corn; rape. |

"In Table III a five-year rotation supplying hog-pastures is shown; in Table IV, a three-year rotation; and in Table V, a two-year rotation. Still other arrangements may be devised to suit different numbers of fields and different crops and conditions. The effort should be

TABLE IV—THREE-YEAR ROTATION FOR SUPPLYING HOG PASTURAGE

| | Field A | Field B | Field C |
|---|---|---|---|
| First year. | Oats; clover. | Clover. | Oats; clover. |
| Second year. | Clover. | Oats and peas; rape. | Clover. |
| Third year. | Oats and peas; rape | Oats clover | Oats and peas; rape. |

to get a good yield of really succulent pasturage throughout every month of the year. The crops should be so combined that the soil is prepared for each crop by the crop that precedes it. Wheat or oats may be made to yield some grain, while serving as a nurse crop. Rye, pastured off, makes a better nurse crop than wheat, if care be used in pasturing it off that the clover be not

TABLE V—TWO-YEAR ROTATION FOR HOG PASTURAGE

| | Field A | Field B |
|---|---|---|
| First year. | Rye; fodder corn rape. | Oats and peas; rye. |
| Second year. | Oats and peas rye | Rye; fodder corn; rape. |

killed out by too close or late pasturing, or by the rooting of the hogs. Rye or winter wheat allowed to mature for grain is rather a better nurse crop than spring wheat.

"The farmer who will undertake to grow a succession of succulent crops for hog pasturage will the sooner learn the general principles of crop rotation as applied to the general fields of the farm, and will be ready to study out a better system of cropping his larger fields. Paper, pencil and ruler and the ability to make straight lines are the essentials in making out these plans. Besides, the area and form of the fields need to be known. With a rod-pole or a tape line, or even by counting the fence posts, the dimensions of the fields can be determined. An accurate drawing or map of the farm is a

most convenient piece of information in managing the crops. Four-year rotation requires four fields; a three-year rotation three fields; a two-year rotation two fields."

The suggestions made by Professor Hays, while specially adapted to the more northern latitude so far as the illustrations of rotations go, may be studied with profit and turned to account by a hog-raiser in any part of the world, adapting, of course, the changes in crops to his individual situation. The man who will do this intelligently will gradually find, as Professor Hays has intimated, a wider knowledge of the uses of crops and in addition a better success.

### ROOTING AND RINGING

Nothing is more natural than for swine to root, but if the owner keeps his pastures and meadows with an even, unscarred surface while ranged by hogs, it must be largely by the help of rings in the hogs' noses. There is no quicker way to destroy the even and compact sward of a permanent pasture than to give the brood sows and fattening hogs the run of such a field with their noses free when the land is soft from continued rains. If the whole field is not turned they will soon work the softest parts into holes and a broken and uneven surface that can hardly be leveled again except by cultivation. Without doubt there is too much ringing done by some farmers, and this especially of the early spring pigs when they go out to pasture. Before turning out, some farmers think they must ring every pig with a nose large enough to hold a ring. Much of this is unnecessary, if the hogs are healthy and the fields in the condition they should be.

Fields properly drained will not be rooted as badly as those having wet spots. The hogs will root first in the wet spots and continue in these the longest.

John M. Jamison, a well-known agricultural writer of Ross county, Ohio, writes most intelligently about these matters in the *Ohio Farmer*, from which the following is quoted: "It is generally conceded that the hog roots to meet the wants of his system, which he supplies by worms and insects found in the soil. It is also claimed that these wants can be met by a variety of foods and condiments—the various grains, roots and fruits, with a constant supply of wood ashes and salt. Our experience is in accord with this claim.

"Many farmers ring the early spring pigs when they are turned onto the clover fields. We think this is unnecessary; we have not done it for years, and have had but little injury to our pastures resulting from the free noses. In the fall we aim to have the hogs on the market before the fall rains soften the fields. When not able to do this we lot them for a short time till sold.

"We believe it desirable to avoid ringing whenever possible, for the practice must in some degree interfere with the thrift of the animals. The young pig is checked in growth for a few days till the wound heals; the older hog also is off feed to some extent for a few days. When there is cholera in the neighborhood rings should not be set, by reason of the fact that disease germs find lodgment in the wounds, when perhaps without ringing the herd would escape.

"Much can be said as to the manner of ringing and the kind of rings used. In many cases there is unnecessary

cruelty practiced in setting too many rings and setting them too deep. There are numerous devices, patented and otherwise, for holding the animals. We have never used a cage of any kind, for the reason that we thought it more trouble to adjust the cage to the different sizes than to catch the animals with a small rope looped at one end and slipped into the mouth and over the nose; to have the rope hold well it should be put back of the tusks, otherwise it will slip off when the hog pulls back on it.

"When we ring young hogs, we do not have much trouble in snaring them, but the brood sows that must have their rings set two or three times a year become quite cunning, and will dodge the loop very successfully. When we have this work to do we drive the hogs into a box stall, where there is no possibility of escape; when they crowd into a corner an active person can catch them without much trouble. It is much easier to drive them into a stable or shed that they are accustomed to than to coax or drive them into a pen built on purpose for these few minutes of torture. The rope that they are caught with should have a short stick tied to one end for a handle to hold them with, and when the animals are large and strong we find it a saving of muscle when the animal is caught to put the rope around a post; the animal will stand better when pulling at the post, that does not give.

"In placing the rings care should be taken to set them firmly but not too deep; if set so deep as to bind or pinch the muscles inside the ring, they will always be an annoyance to the animal. Some men take vengeance on their hogs, it would appear, by setting the rings as deeply as possible, causing all the pain they can; in such instances

vengeance comes back with interest compounded. A ring should not be set in the center of the nose, as it will pull out much easier than if set somewhat on one side.

"Except for old brood sows, one ring will usually be found sufficient; if one will answer the purpose, two only add to the annoyance of the animal, which is against thrift. The kind of a ring used has much to do with accomplishing the purpose without unnecessary suffering or annoyance. A ring that closes with the joint in the nose should never be used. We remember seeing, some years ago, at a railroad station, a lot of hogs brought in for shipment. They had every appearance of being out of condition, and no doubt were sold because they were not thriving. Every one had a single ring set in the center of the nose, with joint in the flesh, and every nose was sore—a fact that the owner had failed to observe.

"Recently we saw a lot of thrifty young hogs, all having two rings in their noses. We were a little surprised, as we seldom used rings on hogs of that size, and expressed ourselves in that way to the owner. He replied that he thought they thrived better if not allowed to root. On this point we could hardly agree with him. Nor did we think two rings were necessary when one would answer the purpose. However, these were carefully set, and would turn in the noses, the wounds having healed as they always should, if the animal is to thrive.

"It is our belief that on farms well underdrained and where the hogs are fed a variety ration, and have salt and wood ashes always by them, a great deal of the ringing can be left undone. But where hogs have only corn for food they are as sure to root when the ground is

soft as they are to 'wallow in the mire' when the weather is warm. Because the latter is a natural propensity, we need not accept the same as a truth as regards the former, for there is much to show that the farmer can to some extent control the natural disposition to root, without resorting to heroic means."

CHAPTER X.

# Alfalfa for Swine

No community with high-class swine prominent in its husbandry is poor. No community with large areas of alfalfa can afford to neglect swine husbandry, for its people possess the material for economical pork production equaled by no others. Those who know it best are persuaded that alfalfa will grow, with varying degrees of thrift to be sure, in every one of the United States and in Canada. Hence it is not a misstatement to say, speaking generally, that the American farmer without alfalfa is so through his own fault rather than through any fault of location, latitude, longitude, altitude, precipitation or temperature. These premises being correct, it would seem almost self-evident that he who would rear swine to the best advantage should have alfalfa, and, conversely, the man with alfalfa fields is provided with a part of an excellent equipment for profitable swine-growing. Either interest which is a stranger to the other should take early opportunity for a mutual acquaintance.

### HOGS WILL EAT HAY

In the preceding chapter it was stated that alfalfa is a valuable pasture or soiling crop for pigs. It is equally true that they will with great relish actually eat alfalfa hay. "A hog is not usually ranked as a hay-eating animal, but an exception must be made as to his eating alfalfa hay," says "The Book of Alfalfa."* As

*"The Book of Alfalfa." Orange Judd Company, New York. 344 pp.

a pasture or soiling crop for sows and young pigs, alfalfa proves a wonderfully helpful ration for milk-making in the sow and for growth in the pigs. Experiments have shown that pigs make better growth when the dam is fed considerable alfalfa than those from sows fed the best of commercial rations but with no alfalfa. Of two sets of pigs, one fed clover, rape and soaked corn, and the other with access to alfalfa in lieu of clover and rape, those having the alfalfa seemed to grow the more rapidly. For brood sows it is a most valuable food, either as hay, a soiling crop, or as pasture. The litters of such sows are generally large and vigorous and the dams have a strong flow of nutritious milk. Alfalfa meal in slop may be used with profit where the hay is not to be obtained. It is also claimed that sows fed on alfalfa during pregnancy will not devour their young, its mineral elements seeming to satisfy the appetite of the sow, while contributing to the fetal development of the pigs.

On a farm of former Governor Hoard, in Jefferson county, Wisconsin, all the brood sows have for several years been wintered on alfalfa hay of the season's third cutting, and their drink (skim milk from the dairy), without any grain until the last two weeks of gestation. Mr. Hoard says the object is to give the sows a food that will keep them in a non-feverish state and furnish protein sufficient to build the bodies of the forthcoming pigs.

"It was a matter of experiment at first, our only guide being the knowledge and reason we could exercise from

what we knew, or thought we knew, of the philosophy of gestation. The experiment proved to be a success from the first. The sows went through their work in fine condition, giving milk abundantly. The pigs came with splendid vitality, thus reducing our losses from early deaths fully 30 per cent below what they had previously been. The hay is fed dry and thrown into the pen on the feeding floor without any cutting or chaffing whatever. We have sometimes thought we would try the experiment of cutting it into half-inch lengths and moistening it. Possibly it would take less hay in this way. The sows keep in good flesh, fully as much so as we like."

A Finney county (Kansas) farmer reports having pastured 30 pigs on one acre of alfalfa from May 1st to September 1st, when they weighed 100 pounds each and were in fine condition for fattening. Another Kansas farmer reports keeping 100 pigs from about the middle of April to September on five acres of alfalfa pasture. A little grain during the last two months would have gained him many pounds of pork. Many alfalfa raising pig-growers insist that their pigs can be maintained from May to October on alfalfa for one-half what it would cost for almost any other feed.

The Utah station found that young shotes gained one-third pound a day on alfalfa pasture without grain. But the station found also that the gain was not so great in older hogs. A Wisconsin dairyman reported that he kept nine sows all winter and spring on alfalfa hay and skim milk, without any grain, and raised from them 75 pigs, all healthy and vigorous.

The Colorado station considers that a ration of three-fourths corn and one-fourth alfalfa hay is the best for fattening hogs for market, but for young hogs not ready for fattening the proportions should be reversed. The station does not recommend grinding alfalfa hay for hogs, probably on the theory that the hog's time is not worth much at best, and he can do his own grinding.

### A VALUABLE KANSAS TEST

The Kansas station has made a series of experiments of interest to feeders everywhere. It was to determine the value of alfalfa hay fed to fattening hogs that were receiving all the grain they would eat. The results are related here in the language of the bulletin:

"The hogs fed in this experiment were bought of farmers, and averaged in weight 125 pounds each. They were placed in lots of ten each, in large pens, having for shelter some sheds open to the south. The alfalfa hay used was of the best quality, carefully cured. Black-hulled white Kafir-corn was the grain used, the hogs being fed all they would eat without waste. The hay was fed dry in forkfuls in a large flat trough. The hogs were given more than they could eat, and they picked out the leaves and finer stems, rejecting the coarser stems. One lot of hogs was fed Kafir-corn meal dry and alfalfa hay; one lot whole Kafir-corn dry; one lot Kafir-corn meal dry, and one lot Kafir-corn meal wet.

"The experiment began on November 24 and lasted nine weeks. By that time the alfalfa-fed hogs became well fattened, and were marketed. We estimated that

it would require four to five weeks additional feeding, with ordinary weather, to get the hogs that were fed grain alone into good marketable condition.

"The gains in nine weeks from the different methods of feeding were as follows:

| | Gains per hog in pounds |
|---|---|
| Kafir-corn meal dry and alfalfa hay | 90.9 |
| Kafir-corn whole | 59.4 |
| Kafir-corn meal fed dry | 52.4 |
| Kafir-corn meal fed wet | 63.3 |

"The gain from feeding alfalfa hay with Kafir-corn meal fed dry, over the meal alone fed dry, is more than 73 per cent.

"The gains per bushel of feed were as follows:

| | Pounds |
|---|---|
| Kafir-corn meal dry and 7.83 pounds alfalfa hay | 10.88 |
| Kafir-corn whole | 8.56 |
| Kafir-corn meal fed dry | 7.48 |
| Kafir-corn meal fed wet | 8.09 |

"Ten hogs in nine weeks were fed 656 pounds of alfalfa hay; and as shown above, for each 7.83 pounds of alfalfa hay fed with the dry Kafir-corn meal, the hogs gained 3.4 pounds over those having dry Kafir-corn meal alone—a gain of 868 pounds of pork per ton of alfalfa hay. These results are not due to the feeding value of the alfalfa alone, but also to its influence in aiding the hogs to better digest the Kafir-corn. The alfalfa hay also gave a variety to the ration, making it more appetizing and inducing the hogs to eat more grain.

The ten hogs having grain alone ate 3,885 pounds of dry Kafir-corn meal, while the ten hogs having hay and grain ate 4,679 pounds of the Kafir-corn meal and 656 pounds of alfalfa hay. The hay-fed hogs ate more grain and gained more for each bushel eaten.

"In a former experiment pigs were pastured through the summer on alfalfa with a light feeding of corn. After deducting the probable gain from the corn, the gain per acre from the alfalfa pasture was 776 pounds of pork.

"These facts indicate that to produce pork most cheaply the Kansas farmer must have alfalfa pasture in summer and alfalfa hay in winter."

The Kansas station also found in another test that one acre of alfalfa produced pork worth $20.30, while one acre of rape produced pork worth $10.05.

The Iowa station director estimated that one acre of alfalfa pasture was worth at least three acres of blue grass for pigs. It is claimed by Kansas farmers that an average acre of alfalfa will pasture 15 pigs, while some report having pastured 20 or more pigs per acre. Those who have used alfalfa as a soiling crop for pigs admit, however, that one acre so utilized is equal to two, if not three, used as pasture.

It is argued by feeders that as many hogs may profitably be allowed with cattle that are being fattened on corn and alfalfa as when the cattle are fed corn alone, as the feeders believe in cleaning out the feed racks every few days and giving the left-over stems to the hogs. If necessary, a little corn is added to the hog ration.

### FURTHER KANSAS TESTS

R. J. Kinzer, animal husbandry professor at the Kansas station, writes the author in February, 1908, that an experiment of his covering 65 days "indicates that for every 12 pounds of green alfalfa fed in connection with corn, one additional pound of pork was produced. In this particular experiment it took 595 pounds of corn fed alone to make 100 pounds of pork, and 500 pounds of corn with 190 pounds of green alfalfa to produce 100 pounds of pork, or a bushel of corn in connection with 21 pounds of green alfalfa to produce 11.2 pounds of pork. From this it may be seen that the 190 pounds of fresh, green alfalfa was apparently the equivalent in pork making to the 95 pounds of corn where corn alone was fed, in which case, as will be noted, the average was slightly under six pounds of corn to each pound of pork produced, which would credit the 95 pounds of corn with a fraction less than 16 pounds of pork. On this basis, the 190 pounds of green alfalfa would produce also about 16 pounds of pork, or at the rate of one pound of pork for each 12 pounds of alfalfa consumed. Estimating that an acre will yield during a season 20,000 pounds of green alfalfa, this experiment would show that the product of such an acre of alfalfa fed green to swine, with corn, would give something like 1,670 pounds of pork. While this might be literally true, the point-blank statement that an acre of green alfalfa would produce 1,670 pounds of pork might at the same time be entirely misleading. In one test made in winter, we found that 100 pounds of alfalfa hay saved 96 pounds of corn. Figuring on the basis of five pounds of corn producing

one pound of pork, the 96 pounds of corn would give 19 pounds of pork. Estimating the average yield of alfalfa hay to be four tons per acre, it would, on this basis, mean 1520 pounds of pork per acre from feeding alfalfa hay with corn."

### A NEBRASKA TEST

The Nebraska experiment station at Lincoln, from a hog-feeding test made in 1903, reported the following:

"With the alfalfa hay worth $7 per ton, the leaves, containing 40 per cent more protein, would be worth approximately $10 per ton. The shorts cost $12.50 per ton delivered. The dairy department charged 15 cents per 100 pounds for the skim milk used. Corn was delivered to the barns at 30 cents per bushel. Adding the usual rate of six cents per 100 pounds for grinding, the corn meal cost $12 per ton. At these prices each 100 pounds of gain in the several lots cost as follows:

| | |
|---|---|
| Lot 1, corn alone | $4.48 |
| Lot 2, corn and skim milk | 3.97 |
| Lot 3, corn and shorts | 3.53 |
| Lot 4, corn and alfalfa | 3.40 |

"This experiment shows that at the market prices quoted and the proportions used in the experiment, skim milk will make corn bring four cents more per bushel, wheat shorts eight cents more, and alfalfa leaves nine cents more. Assuming that only five per cent of the 252,520,173 bushels of corn produced in Nebraska this year is being fed to hogs as a single food, these figures would go to show that $1,000,000 more wealth would be added

to the state if wheat shorts or alfalfa were substituted for one-fifth of the corn fed."

### FURTHER NEBRASKA TESTS

A number of extremely interesting tests, of course not decisive, have been made at the experimental substation, at North Platte, under Supt. W. P. Snyder, to test the economy and effect of alfalfa as hay and pasture as a food for swine. The results of these tests have been fully set forth in Nebraska Bulletin No. 99.

Experiment No. 1.—In the summer of 1904, from July 16 to October 22, three lots of 17 pigs each were run on alfalfa pasture and fed rations of corn. All lots were quite uniform and of equal weights.

Lot 1 was fed ½ pound corn daily per 100 pounds of weight of pigs.

Lot 2 was fed 1½ pounds corn daily per 100 pounds of weight of pigs.

Lot 3 was fed 2½ pounds corn daily per 100 pounds of weight of pigs.

The amount of feed was corrected to conform to the weights at the end of each two weeks period. During the 14 weeks of the experiment the average daily gain of the pigs in Lot 1 was .28 pound; in Lot 2, .37 pound, and in Lot 3, .51 pound, increasing as the percentage of grain increased in the three lots. The amount of grain required to produce 100 pounds gain was, by Lot 1, 124 pounds; by Lot 2, 222 pounds; and by Lot 3, 332 pounds; showing that the lighter the grain ration, the less grain was required for 100 pounds gain. The cost of 100 pounds gain was, in Lot 1, $0.78; in Lot 2, $1.39; and

in Lot 3, $2.08. The cost of the grain eaten in producing 100 pounds gain with the lot fed 2½ per cent was 1.30 pounds more than with the lot fed ½ per cent and 69 cents more than with the lot fed 1½ per cent. The price received per bushel of corn eaten by Lot 1 was $2.84; by Lot 2, $1.38; and by Lot 3, $0.92. All these figures indicate that the lighter the grain ration, the cheaper the gain. But when we consider the profits we find that the daily profit per pig was, in Lot 1, 1.3 cents; in Lot 2, 1.5 cents; and in Lot 3, 1.7 cents. The profit during the 14 weeks on each pig was, in Lot 1, $1.28; in Lot 2, $1.48; and in Lot 3, $1.64. The pigs receiving ½ per cent did not do well enough to warrant a repetition of the same test. They had a decidedly stunted appearance. Lot 2 was not as thrifty as most farmers would demand in profitable feeders, but in later experiments 2 per cent grain on pasture has given thrifty growing pigs.

Experiment No. 2.—In the summer of 1906, three lots of 30 pigs each were selected to test the relative profit in growing and fattening pigs on alfalfa, with a light, a medium and a full grain ration. The plan was to run these pigs on a different percentage of grain until green alfalfa was no longer available in the fall, and then to put all lots on a full ration, marketing each lot when it had reached near the average weight of 225 pounds per hog. After the hogs were removed from the alfalfa pastures, the ration was changed from corn to 50 per cent shelled corn and 50 per cent ground rye. As there was required a larger amount of grain to finish Lots 22 and 23 on the lighter rations than Lot 24 on the

full ration after the change was made in the ration, a larger percentage of the grain fed to those lots was rye. To correct this in so far as possible, the rye was figured at the same price per pound as corn. Figuring in this manner should be favorable to the hogs receiving the most rye, as a ration of 50 per cent ground rye and 50 per corn should give larger gains per 100 pounds of grain than a ration entirely of corn.

Wintry storms came much earlier than usual and caught the hogs in summer shelters. It required three weeks to provide permanent winter quarters and to get all lots upon a full ration. In order to present the results clearly, the experiment has been separated here into three periods. Period 1 includes the time the pigs were on green alfalfa; Period 2, the interim between the green pasture and full feed, with suitable winter quarters; Period 3 is the finishing period when the hogs were on full feed.

Period 1, from June 23 to October 20, 1906.

Lot 22 was fed 1 pound corn per 100 pounds weight of pigs.

Lot 23 was fed 2 pounds corn per 100 pounds weight of pigs.

Lot 24 was fed a full ration of corn, about 3.5 per cent.

The ration was shelled corn fed dry. All lots on alfalfa pasture.

During the 17 weeks of the experiment, the average daily gain of each pig in Lot 22 was .5 pound; in Lot 23, .65 pound; and in Lot 24, 1.08 pounds. The amount of grain required to produce 100 pounds gain was, by Lot

22, 132 pounds; by Lot 23, 220 pounds; and by Lot 24, 330 pounds. The cost of 100 pounds gain was, in Lot 22, $0.83; in Lot 23, $1.38; and in Lot 24, $2.10. The price received per bushel of corn eaten by Lot 22 was $2.33; by Lot 23, $1.40; and by Lot 24, $0.91. All these items show that the lighter grain rations gave the cheaper gains. The cost of pasture is not counted.

On the other hand, the average daily profit per pig was, in Lot 22, 2.3 cents; in Lot 23, 2.6 cents; and in Lot 24, 3.6 cents. The average profit for the 17 weeks on each pig was, for those in Lot 22, $2.68; in Lot 23, $3.10; and in Lot 24, $4.27. While Lot 24 required about 2½ times as much corn to produce 100 pounds gain as Lot 22 required, yet it returned nearly 1.6 times as much profit as Lot 22, during the time of the experiment.

Period 2, from October 20 to November 10, 1906.

The ration was shelled corn, soaked rye and alfalfa hay. During this period Lot 22 gained 190 pounds, eating 1,512 pounds of corn and 336 pounds of rye, and requiring 972 pounds grain for 100 pounds gain. There was a loss of $1.08 on the grain eaten.

Lot 23 gained 300 pounds, eating 1,158 pounds corn and 420 pounds rye, and requiring 526 pounds grain for 100 pounds gain. This gave a profit of $6.63 on the grain eaten.

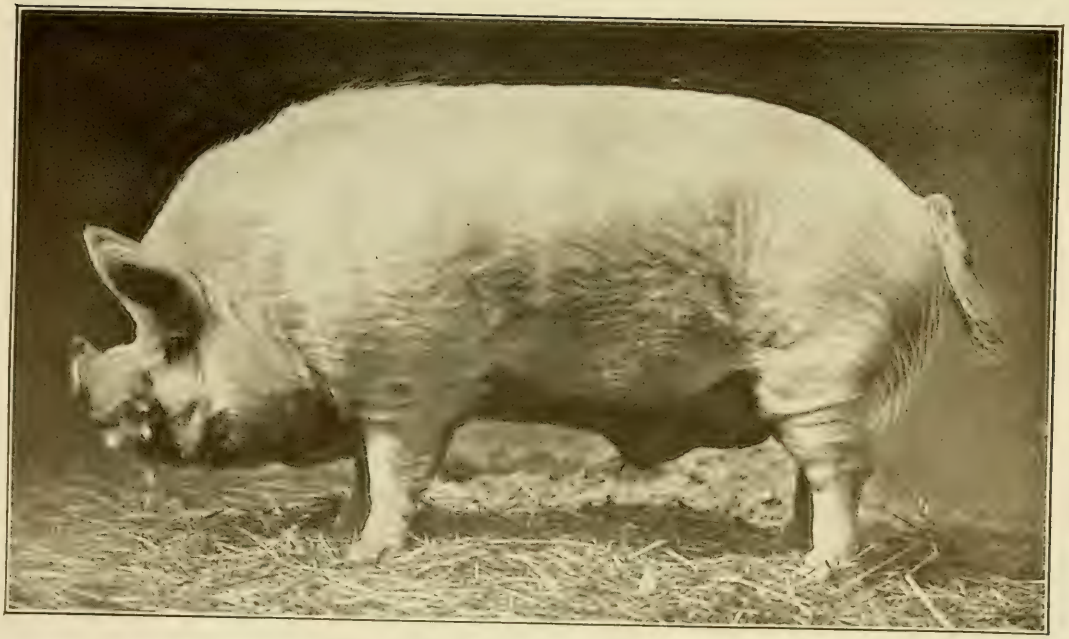
Lot 24 gained 610 pounds, eating 3,270 pounds corn and 574 pounds rye, requiring 630 pounds grain for 100 pounds gain. This gave a profit of $9.51 on the grain eaten.

It will be noted that all gains were made with an unusually large amount of grain. This was due largely to the effect of storms, which came before the hogs were in winter quarters, and with Lot 23 was also due to too light a grain ration after the green alfalfa was no longer available. During this period rye was fed soaked but not ground. This also increased the cost of production.

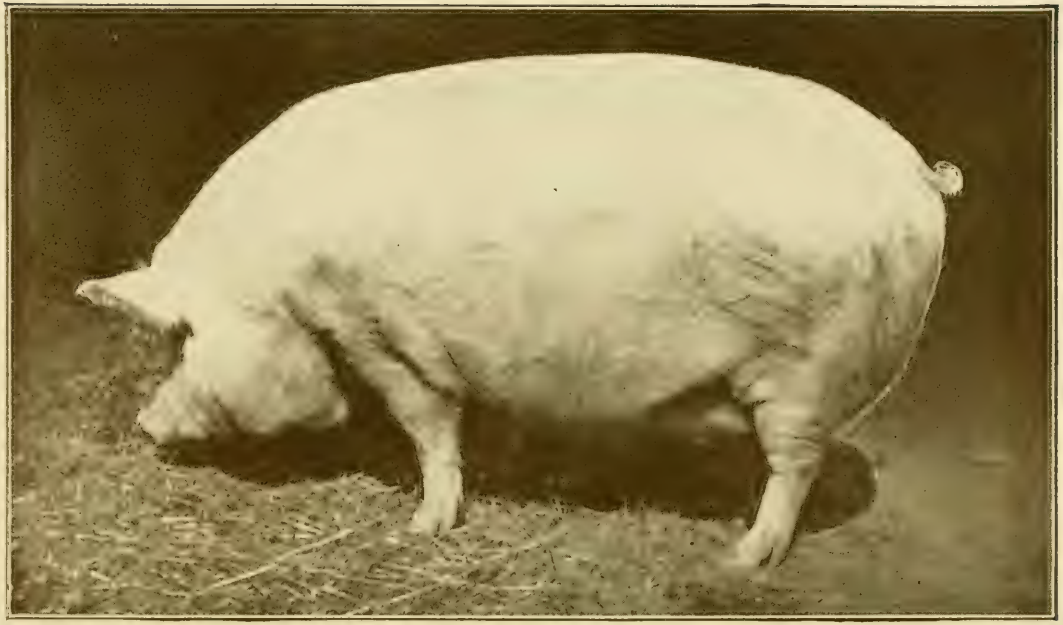
Period 3, from November 10 until ready for market.

Lot 24 reached an average of 228 pounds on December 8, 1906. Lot 23 reached an average of 236 pounds on February 2, 1907. Lot 22 reached an average of 233 pounds on February 11, 1907.

During the fattening period, Lot 22, the pigs which had been grown on alfalfa and a light grain ration, required 467 pounds of grain to produce 100 pounds gain, at the rate of 1.34 pounds gain daily per pig, giving a profit of 3.5 cents per head daily. Lot 23, the pigs that had been grown on a medium grain ration and alfalfa produced 100 pounds gain from 509 pounds grain, at the rate of 1.26 pounds gain daily per pig, giving a profit of 2.7 cents daily per pig. During a much shorter finishing period, Lot 24, the pigs which had been grown on a full grain ration and alfalfa, required 787 pounds grain for 100 pounds gain made at the rate of .8 pound gain per pig daily, giving a daily profit per pig of 1.3 cents. With Lot 24 this was during only the last four weeks of the fattening period when the hogs were being finished for market, while with the other lots these figures cover a much longer time. Hence the results of this period, taken alone, should not be regarded as comparable.



A TWO-YEAR-OLD VICTORIA BOAR



A HANDSOME VICTORIA SOW

The pigs in Lot 22, grown on a light grain ration of 1 per cent of their weight until they averaged 100 pounds, and then finished on a full ration, gained for the entire period .83 pound each per day. They required 377 pounds of grain for 100 pounds gain, and gave a daily profit of 2.6 cents per head. Those in Lot 23, grown on a medium grain ration of 2 per cent of their weight until reaching the average weight of 120 pounds, and then finished on a full ration, gained .87 pound each per day. They required 391 pounds of grain per 100 pounds gain, returning a daily profit of 2.7 cents per pig. The pigs in Lot 24, grown and finished on a full grain ration, gained 1.13 pounds each daily. They ate 395 pounds of grain for each 100 pounds gain, and gave a daily profit of 3.4 cents per pig.

The 30 light-grain ration pigs gave a profit of $179.40 in 230 days, or a profit of $0.78 per day.

The 30 medium-grain ration pigs gave a profit of $179.01 in 221 days, or a profit of $0.81 per day.

The 30 full-grain ration pigs gave a profit of $168.30 in 165 days, or a profit of $1.02 per day.

Lot 22 was kept 65 days longer than Lot 24, and gave a profit of $11.10 more; or, stated in another way, by feeding a light grain ration instead of a heavy grain ration, there was received for keeping 30 hogs 65 days, $11.10. The interest on the money received for Lot 24 at 8 per cent for 65 days would be $5.33. This would leave $5.77 for the care and labor of feeding and bedding, wear and tear on buildings and sheds, and the risk on 30 hogs for 65 days. Comparing Lots 23 and 24, we find that Lot 23 was kept 56 days longer for a

profit of $10.71. The interest on the money received from Lot 24 for the 56 days would have amounted to $4.61 at 8 per cent. This leaves $6.10 for the care and labor of keeping, wear and tear on sheds and risk on 30 hogs for 56 days.

Lot 26, of Experiment No. 3, which follows, gives a comparison of a still more extended feeding period, running 259 days from July 28, 1906, to April 13, 1907, with a continuous light grain ration until the last 42 days. In this lot the daily profit per pig runs slightly below Lot 22 and the total profit per pig slightly below any of the three lots with which it is compared. Had Lot 26 been fed to the final weight of the other three lots, the difference would have been still greater.

Experiment No. 3—Three lots of 30 pigs each were run in alfalfa pastures from July 28 to October 20, 1906.

Lot 25 was fed 2 per cent corn.

Lot 26 was fed 2 per cent grain, of which 75 per cent was corn and 25 per cent shorts.

Lot 27 was fed a full ration, of which 75 per cent was corn and 25 per cent shorts, amounting to between 3 and 4 per cent.

The pigs fed corn in Lot 25 gained .1 pound more each per day than those fed a ration 75 per cent corn and 25 per cent shorts in Lot 26. The lot fed corn produced 100 pounds gain with 23 pounds less grain than the lot fed the same percentage of corn and shorts. The daily profit per pig in Lot 25, fed corn, was 2.8 cents, and in Lot 26, fed corn and shorts, 2.1 cents. The profit per pig in 12 weeks was 56 cents more in Lot 25 than in Lot 26. The cost of 100 pounds gain was 37

cents less in the lot fed corn. Every item of comparison in the results of this test is in favor of corn rather than corn and shorts.

Comparing Lot 26, fed 2 per cent grain, and Lot 27 fed a full ration amounting to between 3 per cent and 4 per cent, we find that the daily gain per pig in Lot 26 was .53 pound, and in Lot 27 .84 pound, and that the grain required to produce 100 pounds gain in Lot 26 was 196 pounds and in Lot 27, 273 pounds. These figures agree with previous comparisons in emphasizing the fact that with the lighter grain rations there is required less grain to produce 100 pounds gain. The cost of 100 pounds gain in Lot 26 was $1.45 and in Lot 27 $1.88 The profits per day, however, are all in favor of a heavy ration. The daily profit per pig was .9 cent more and the profit per pig in 12 weeks 76 cents more in Lot 27, fed a full ration, than in Lot 26, fed a medium ration. The prices per bushel received for corn fed to Lots 26 and 27 were $1.54 and $1.13 respectively, figuring corn and shorts as having the same feeding value in producing gains.

Comparing the results of all pigs having grain and alfalfa pasture, and using the daily profit per pig as the unit of comparison, we find that the most profitable ration has been the heavy rather than the light or medium rations. The lowest daily profit per pig was 1.3 cents from a ration of ½ per cent corn (Lot 1) and the highest profit 3.6 cents from a full ration of corn (Lot 24). The daily profits range quite closely with the percentage of grain fed. The gain from the same ration was more rapid in 1906 than in 1904, due largely to a

thriftier condition of the pigs and possibly to the effect of grading up by the use of good sires.

These experiments carry the pig from the time it weighs from 40 to 50 pounds until it weighs from 80 to 170 pounds, depending on the percentage of grain fed. They give no indication of the cost of producing a 50-pound pig nor the cost of finishing the hogs for market.

Studying the effect of a medium grain ration on the cost of pork, the treatment of Lot 26 furnishes interesting data.

Lot 26, consisting of 30 pigs, was fed in Experiment No. 3 from July 28 to October 20, 1906, on a 2 per cent grain ration consisting of three-fourths corn and one-fourth shorts. This constituted Period 1 of Experiment No. 3.

During Period 2, from October 20, 1906, to March 2, 1907, they received 2 per cent shelled corn, except during the first 20 days of this period, when they received 231 pounds of shorts, which is counted as corn.

During Period 3, from March 2 to April 13, 1907, they received 3 per cent shelled corn and reached a weight of 215 pounds, or approximately the selling weights of Lots 22, 23 and 24.

During Period 1 they ran on alfalfa pasture. During Periods 2 and 3 they pastured upon a field of winter rye and received alfalfa hay.

Experiment No. 5.—This included three tests of keeping hogs on alfalfa without grain. Lot 4 was composed of 14 hogs that were over a year old but light in weight and thin in flesh. They were grown on alfalfa, with a very light grain ration. It will be noted that during

2 1-3 months, when they received no grain, they gained .5 pound each per day.

Lots 5 and 28 were made up of brood sows from which the pigs had been weaned for some time. These gave a daily gain of .43 pound and .53 pound respectively. The average of three trials, including 42 hogs, gives an average daily gain per hog of slightly less than half a pound. This by mature hogs, thin in flesh, on alfalfa pasture and water.

The table herewith gives the details:

MATURE HOGS ON ALFALFA WITHOUT GRAIN

| | Lot 4 | Lot 5 | Lot 28 |
|---|---|---|---|
| Time of experiment | June 17 to Aug. 26, 1904 | Aug. 20 to Oct. 22, 1904 | July 27 to Oct. 20, 1906 |
| Number of hogs | 14 | 10 | 18 |
| Number of days in experiment | 70 | 63 | 95 |
| Average last weight, pounds | 168 | 221 | 240 |
| Average first weight, pounds | 134 | 194 | 190 |
| Average gain, pounds | 34 | 27 | 50 |
| Average gain daily, pound | .5 | .43 | .53 |

Experiment No. 6.—With this lot (No. 29) was an experiment in fattening hogs on a full ration of corn with alfalfa pasture. From May 20 to July 15, 1906, from 17 to 20 hogs, averaging about 130 pounds each, were fed a full ration of corn and given the run of a five-acre lot of alfalfa. The total weight of the hogs put into the field was 2,935 pounds. They ate 7,952 pounds of corn, and gained 1,615 pounds. This gain was at the rate of 1.6 pounds daily for each hog. They ate 492 pounds of corn for each 100 pounds gained. One hundred pounds of gain cost $3.07 with corn at 35 cents per bushel. This left a profit of $2.43 on each 100

pounds of gain. The profit on each hog daily was 3.9 cents. The amount received for each bushel of corn eaten was 62 cents.

Experiment No. 7.—This was in fattening hogs on alfalfa pasture with corn. Twenty-nine shotes were kept in a five-acre alfalfa pasture and fed 3 pounds of corn daily for each 100 pounds of hogs from April 27 to June 8, 1906, six weeks. Their average weight on April 27th was 185 pounds, and six weeks later 252 pounds. The hogs gained on an average 1.59 pounds each per day, or 66.9 pounds each in six weeks. They ate 387 pounds of corn for each 100 pounds gain in weight. The cost of 100 pounds gain was $2.36, leaving a profit of $3.14 on each 100 pounds of gain. Each hog in the test gave a profit of $2.10 on the six weeks' feeding, or 5 cents daily. There were received for each bushel of corn eaten 79 cents. If each hog was charged 10 cents for alfalfa pasture the cost of 100 pounds gain would be $2.51.

Experiment No. 8.—This was a test of the value of alfalfa pasture in fattening mature hogs. Lots 20 and 21 were made up of ten brood sows each, from which the pigs had been weaned. Some changes were made in both lots during the test. Each lot was fed for 30 days. Lot 20 had the run of a five-acre field of alfalfa and was fed 3 pounds of corn daily per 100 pounds weight of hogs, from June 23 to July 23, 1906. Lot 21 was kept in a dry lot and fed 4 pounds of corn daily per 100 pounds weight of hogs, from July 28 to August 27, 1906. The table shows the details:

ALFALFA PASTURE VERSUS DRY LOT FOR FATTENING HOGS WITH CORN. EXPERIMENT BEGAN WITH LOT 20 ON JUNE 23 AND WITH LOT 21 ON JULY 28, 1906

| | Lot 20 | Lot 21 |
|---|---|---|
| Ration | 3% corn, with alfalfa pasture | 4% corn exclusively |
| Number of hogs in lot | 10[1] | 10[1] |
| Number of days in experiment | 30 | 30 |
| Average last weight, pounds | 344 | 333 |
| Average first weight, pounds | 265 | 260 |
| Average gain, pounds | 79 | 73 |
| Average gain daily, pounds | 2.83[1] | 2.55[1] |
| Grain per 100 pounds gain, pounds | 301 | 431 |
| Cost of 100 pounds gain, corn 35c per bushel | $1.88[2] | $2.69 |
| Profit on 100 pounds gain, hogs $5.50 100 pounds | 3.62 | 2.81 |
| Profit on each hog | 2.86 | 2.05 |
| Profit on each hog daily | .10 | .07 |
| Price received per bushel corn | 1.02 | .71 |
| Profit on lot | 28.60 | 20.50 |

[1] Two hogs were added to Lot 20 and one taken from Lot 21. This would make the figures seem inaccurate if not taken into consideration.

[2] If each hog in Lot 20 were charged 10 cents for alfalfa pasture the cost of 100 pounds gain would be $2.00.

The hogs in Lot 20, on alfalfa pasture, gained daily per head .28 pound more than Lot 21, confined in a dry lot, and ate 130 pounds less corn for each 100 pounds gain. The hogs on alfalfa made gains at a cost of 81 cents less per 100 pounds than those in a dry lot. The average profit on each hog in Lot 20 on a feeding period of 30 days was 81 cents more than on the hogs in Lot 21. The daily profit per hog on alfalfa was 10 cents and per hog in a dry lot 7 cents. There was received for each bushel of corn fed to the hogs on alfalfa $1.02, and for each bushel fed to those in a dry lot 71 cents. It required nearly 43 per cent more corn to produce 100 pounds gain in a dry lot than when alfalfa pasture was supplied.

Experiment No. 9.—Methods of feeding alfalfa with grain, for fattening hogs: From November 24, 1906,

until February 23, 1907, six lots of 10 hogs each were used in an experiment to determine the advantage in using alfalfa with corn and with barley in fattening hogs. These hogs were from Lots 25 and 27 of Experiment No. 3. All lots were uniform as to condition and breeding and of almost equal weights. All were fed a full ration. All grain was ground and fed wet.

ALFALFA WITH GRAIN FOR FATTENING HOGS. EXPERIMENT BEGAN NOV. 24, 1906, AND ENDED FEB. 23, 1907

| Lot | 30 | 31 | 32 | 33 | 34 | 35 |
|---|---|---|---|---|---|---|
| Ration | corn | corn alfalfa hay | corn 75% alfalfa cut 25% | barley | barley alfalfa hay | barley 75% alfalfa cut 25% |
| No. of pigs in lot | 10 | 10 | 10 | 10 | 10 | 10 |
| No. of days in exp. | 91 | 91 | 91 | 91 | 91 | 91 |
| Av. last weight pounds per pig | 235 | 247 | 246 | 228 | 237 | 225 |
| Av. first weight pounds per pig | 131 | 131 | 131 | 126 | 127 | 127 |
| Av. gain, pounds per pig | 104 | 116 | 115 | 102 | 110 | 98 |
| Av. gain daily weight pounds per pig | 1.14 | 1.27 | 1.26 | 1.12 | 1.21 | 1.07 |
| Grain per 100 pounds gain | 528 | 491 | 420 | 573 | 562 | 492 |
| Cost of 100 pounds gain, corn 35 cents, barley 30 cents | $3.30 | $3.07[1] | $2.62[1] | $3.58 | $3.51[1] | $3.07[1] |
| Profit on 100 pounds hogs at $5.50 | 2.20 | 2.43 | 2.88 | 1.92 | 1.99 | 2.43 |
| Profit on each pig | 2.29 | 2.82 | 3.31 | 1.96 | 2.19 | 2.38 |
| Profit on each pig daily | .025 | .031 | .036 | .022 | .024 | .026 |
| Price received per bushel grain | .58 | .63 | .73 | .46 | .47 | .54 |
| Pounds of grain saved for each 100 pounds gain, by using alfalfa | ..... | 37 | 108 | ..... | 11 | 61 |

[1]If $5.00 per ton were charged for the alfalfa consumed, the cost of 100 pounds gain would be as follows: Lot 31, $3.15; Lot 32, $2.70; Lot 34, $3.59; Lot 35, $3.14.

Lot 30 was fed corn.

Lot 31 was fed corn and alfalfa hay fed on the ground

Lot 32 was fed 75 per cent corn and 25 per cent chopped alfalfa mixed and fed in troughs.

Lot 33 was fed barley.

Lot 34 was fed barley and alfalfa hay fed on the ground.

Lot 35 was fed 75 per cent barley and 25 per cent chopped alfalfa mixed and fed in troughs.

The results of this test are given without expressing an opinion as to which practice is the most profitable, as this will depend largely on local conditions, conveniences for chopping alfalfa, and cost of labor.

It will be noted that larger and quicker gains were secured when alfalfa was fed, except with Lot 35, and that 100 pounds of gain was secured with less grain when alfalfa was supplied. Where alfalfa hay was fed uncut, there was a saving of 37 pounds of grain on each 100 pounds gain in weight of hogs, and where it was fed cut (chopped or chaffed), as 25 per cent of the ration, there was a saving of 108 pounds of grain for each 100 pounds gain, over corn alone, and 71 pounds over corn and alfalfa hay uncut. Thirty-five pounds of cut alfalfa saved 108 pounds of corn, and the same amount of uncut alfalfa saved 37 pounds of corn.

The results from feeding barley and alfalfa in the manner indicated are in line with those from feeding corn and alfalfa, but not so much in favor of alfalfa. This may be due to the fact that barley contains so much indigestible material in the hull that when alfalfa is added it makes too much bulk to the food, whereas the bulk in the alfalfa is an advantage to the corn. There was about 7 per cent of the cut alfalfa wasted when fed

with corn, and about 17 per cent when fed with barley. There was probably a much larger percentage of the uncut alfalfa wasted. One noticeable feature throughout the experiment was that the hogs not having access to alfalfa were much more easily put off their feed by heavy feeding than the other hogs and would not eat as large a percentage of grain as those having free access to alfalfa hay.

These, as Superintendent Snyder says, are the results of but one test. "It is probable that a less amount of uncut alfalfa would have given equally as favorable results. The amount stated here is only approximate, as it was not weighed at each feeding time, but only sufficiently often to give a fairly accurate estimate. The cut alfalfa was weighed accurately. It is also possible that less than 25 per cent of cut alfalfa would have given more rapid gains. It is not our intention to advocate feeding a ration of 25 per cent cut alfalfa and 75 per cent grain as the most profitable, but simply to give the results of this test, which is only preliminary in the feeding of alfalfa hay. It is probable that maximum profits on corn will be secured with a smaller proportion of alfalfa than the 25 per cent here used, and when the cost of cutting alfalfa hay is considered it may even be possible that the greatest profit to the average farmer will result from feeding uncut alfalfa in racks, and either shelled or ear corn. Much will always depend on the quality of the alfalfa fed, late cuttings choicely cured being preferable to the coarser or damaged hay."

Experiment No. 10.—A comparison of corn, emmer and barley for fattening hogs: From October 24, 1905,

until January 27, 1906, 94 days, three lots of 20 hogs each were fed to determine the comparative value of corn, emmer (speltz) and barley. All had access to alfalfa hay. The average weight of the shotes was near 80 pounds.

Lot 9 was fed corn.

Lot 11 was fed emmer.

Lot 12 was fed barley.

The same amount of grain was fed to each lot. Lot 9 was taken as the standard and was fed 4 per cent corn —a full ration. All grain was ground, and fed wet. The average daily gain per pig in Lot 9 was 1.02 pounds; in Lot 11, .77 pound; and in Lot 12, .81 pound. The grain eaten for 100 pounds of gain was, by Lot 9, 470 pounds of corn; by Lot 11, 618 pounds of emmer; and

COMPARISON OF RATIONS OF CORN, EMMER AND BARLEY FOR FATTENING PIGS. EXPERIMENT BEGUN OCT. 24, 1905, AND ENDED JAN. 27, 1906

| | Lot 9 | Lot 11 | Lot 12 |
|---|---|---|---|
| Alfalfa hay and | 4% corn | emmer | barley |
| No. of pigs in lot | 20 | 20 | 20 |
| No. of days in experiment | 94 | 94 | 94 |
| Av. last weight pounds per pig | 177.7 | 153.5 | 156 |
| Av. first weight pounds per pig | 81.7 | 80.5 | 79.7 |
| Av. gain pounds per pig | 96 | 73 | 76.2 |
| Av. gain daily, pounds per pig | 1.02 | .77 | .81 |
| Grain per 100 pounds gain, pounds | 470 | 618 | 590 |
| [1]Cost of 100 pounds gain, corn 35c per bushel emmer 25c per bushel, barley 30c per bushel | $2.94 | $3.86 | $3.68 |
| Profit on 100 pounds gain, hogs $5.50 per 100 pounds | 2.56 | 1.64 | 1.82 |
| Profit on each pig | 2.46 | 1.19 | 1.38 |
| Profit on each pig daily | .026 | .013 | .014 |
| Price received for 100 pounds of grain | 1.17 | .89 | .93 |
| Price received per bushel grain | .65 | .35 | .44 |
| Profit on lot | 49.20 | 23.80 | 27.60 |

[1]If we assume that 25 per cent of the food consumed consisted of alfalfa hay valued at $5.00 per ton, the cost of 100 pounds gain would be as follows: Lot 9, $3.33; Lot 11, $4.37; Lot 12, $4.17.

by Lot 12, 590 pounds of barley. The cost of 100 pounds gain was, in Lot 9, $2.94; in Lot 11, $3.86; and in Lot 12, $3.68.

Corn gave almost twice the daily profit per pig that emmer or barley gave. The price received per bushel of grain was 65 cents for corn, 35 cents for emmer, and 44 cents for barley. One bushel of corn was equal to 1.83 bushels of emmer or 1.45 bushels of barley. One bushel of barley was equal to 1.26 bushels of emmer. This would indicate that when corn is worth 35 cents per bushel, barley is worth 24 cents per bushel of 48 pounds, and emmer 19 cents per bushel of 40 pounds for fattening hogs, where each grain is fed alone and alfalfa hay supplied. The price per 100 pounds should also be observed in the table, since the difference in weight per bushel may deceive the reader as to the relative values per 100 pounds of these different grains. In these figures 40 pounds of emmer and 48 pounds of barley to the bushel are used.

Experiment No. 11.—This was a test of corn *versus* equal parts corn and emmer and equal parts corn and barley for fattening pigs. Three lots of 12 pigs each were fed from February 3 to March 17, 1906. The average weight at the beginning was about 150 pounds. All grain was ground and fed wet.

Lot 13 was fed corn.

Lot 15 was fed 50 per cent corn and 50 per cent emmer.

Lot 16 was fed 50 per cent corn and 50 per cent barley.

COMPARISON OF CORN, CORN AND EMMER, AND CORN AND BARLEY FOR FATTENING PIGS. EXPERIMENT BEGAN FEBRUARY 3 AND ENDED MARCH 17, 1906

| | Lot 13 | Lot 15 | Lot 16 |
|---|---|---|---|
| Ration, alfalfa hay and | corn | corn 50% emmer 50% | corn 50% barley 50% |
| No. of pigs in lot | 12 | 12 | 12 |
| No. of days in experiment | 42 | 42 | 42 |
| Average last weight, pounds per pig | 225 | 202.91 | 215.8 |
| Average first weight, pounds per pig | 160 | 146.25 | 155 |
| Average gain, pounds per pig | 64.6 | 56.66 | 60.83 |
| Average gain daily, pounds per pig | 1.53 | 1.35 | 1.45 |
| Grain per 100 pounds gain | 470 | 482 | 462 |
| [1]Cost of 100 pounds gain, corn 35 cents, emmer 25c, barley 30c per bushel | $2.94 | $3.01 | $2.89 |
| Profit on 100 pounds gain, hogs $5.50 100 pounds | 2.56 | 2.49 | 2.61 |
| Profit on each pig | 1.65 | 1.40 | 1.58 |
| Profit on each pig daily | .039 | .033 | .037 |
| Price received for 100 pounds of grain | 1.17 | 1.14 | 1.19 |
| Price received per bushel grain eaten | .655 | emmer .445 corn .655 | barley .581 corn .655 |

[1]If we assume that one-fourth of the food consumed consisted of alfalfa hay, valued at $5.00 per ton, the cost of 100 pounds gain would be as follows: Lot 13 $3.33; Lot 15, $3.41; Lot 16, $3.27.

The average daily gain per pig in Lot 13 was 1.53 pounds; in Lot 15, 1.35 pounds; and in Lot 16, 1.45 pounds. These are all large gains and much more nearly together than where emmer and barley were fed without corn. The grain required for 100 pounds gain was, by Lot 13, 470 pounds; by Lot 15, 482 pounds; and by Lot 16, 462 pounds. Where emmer formed one-half the ration, there was required for 100 pounds gain 12 pounds more grain than where corn formed the entire ration. In Experiment No. 10, where emmer formed the entire ration, there was required for 100 pounds gain 148 pounds more grain than where corn formed the entire ration. When barley formed one-half the grain ration, there was required 8 pounds less, and where it formed the entire grain ration 120 pounds more grain to

produce 100 pounds gain than where corn formed the entire grain ration. This indicates that emmer and barley give better results when fed with corn than when fed alone. This is also shown by comparing the price received per bushel for grain in the two experiments. In Experiment No. 10, where each kind of grain was fed alone, the price received per bushel was 65.5 cents for corn, 35.5 cents for emmer, and 44.5 cents for barley. In Experiment No. 11, where emmer and barley were fed with corn, and also where corn was fed alone, the price received per bushel of grain was 65.5 cents for corn, 44.5 cents for emmer, and 58 cents for barley. That is, when emmer and barley were fed with equal amounts of corn, there were received per bushel of emmer 9 cents more and per bushel of barley 13.5 cents more than when emmer and barley were each fed alone. Fifty per cent barley and 50 per cent corn gave a cheaper gain than corn alone, although not so much daily profit.

In the tests discussed, where the hogs were pastured in alfalfa, each lot was kept in a five-acre field. Three crops of hay were harvested, as in other fields, though not so heavy. A fair estimate places the loss due to pasturing of hogs at half or less than half of the growth. This would be about 1½ tons per acre, during the season, chargeable to the hogs, says Mr. Snyder. "Counting the value of alfalfa at $5.00 per ton in the stack, or $2.50 per ton before mowing, there would be due from the hogs, for each acre run over, $3.75. With a medium grain ration 7 hogs per acre should not consume more than one-half of the crop. This would make the cost of grazing a hog on alfalfa for the season about

50 cents. To pasture mature hogs without grain would cost more than twice this amount. Where hogs were fed a heavy ration of grain, 8 head per acre did not damage the alfalfa more than 20 per cent. The same number on a light grain ration would eat and destroy from 50 per cent to 75 per cent of the crop.

"The number of hogs that may be pastured profitably on an acre depends very largely on the amount of grain fed. Probably from six to eight hogs, under ordinary conditions, would be about the right number. This would allow, besides, enough alfalfa standing to make three fair cuttings per year. The fields should be small, rather than large, so that the alfalfa nearest the water and sheds will not be grazed too close to the ground and that at the further end of the field be left untouched.

"We have not observed satisfactory results with sows run on alfalfa without grain during the pregnant period, although very little grain is necessary for pregnant sows which are to farrow in the fall.

"From the results of these experiments and other tests it is evident that alfalfa is a great aid in pork production, and that when it is available there is a profit in raising hogs under the conditions usually existing in western Nebraska. We believe that there is enough alfalfa growing on the uplands and in the valleys in various parts of the West to warrant the statement that there are but few farms in western Nebraska on which alfalfa cannot be grown with much profit for hog pasture and winter feed. With sufficient good alfalfa, well stacked, mature hogs can be carried through the winter in fair

condition with three pounds of corn per head per day, and if necessary with much less grain."

### SOME CONCLUSIONS

From the Nebraska experiments of which the foregoing gives the details the station authorities present the following as among their conclusions, considered in the light of their discussion. All pertain to feeding hogs on alfalfa pasture or when alfalfa hay is supplied under conditions comparable with those existing at the substation at North Platte, Neb.:

"A light grain ration is not the most economical for growing pigs, unless under peculiar circumstances, when alfalfa is abundant, grain very high in price, and market conditions warrant holding the hogs. It seems probable that two or more pounds of corn daily per each hundredweight of hogs is more profitable than a lighter ration (Experiments Nos. 1, 2 and 3).

"Mature hogs thin in flesh may be expected to gain about half a pound per head daily on alfalfa without grain (Experiment No. 5).

"Mature hogs, fed corn in a dry lot while being fattened, required nearly one-half more grain to produce 100 pounds gain, and gave a daily profit of three cents less per hog than similar hogs running on alfalfa pasture (Experiment No. 8).

"For fattening hogs that have access to alfalfa hay, corn at 35 cents, barley 24 cents and emmer 19 cents per bushel should give about equal profits. Under these conditions, four bushels of barley are worth as much as five bushels of emmer (Experiments Nos. 10 and 11).

"Where barley or emmer is fed to hogs it is more profitable to make the ration one-half corn than to feed emmer or barley alone (Experiment No. 11).

"The cost of gain is not a reliable criterion of profit. A cheap gain may be so slow as to be unprofitable. Time, labor and investment should be considered when reckoning profits. A full grain ration, though making the gain more costly, usually gives greater profits, because of the larger amount of business transacted in a given time with a given number of hogs (Experiments Nos. 1, 2 and 3).

"Alfalfa may be fed with profit to growing or fattening hogs in almost any form so long as it does not make up too large a proportion of the ration. When cut (chopped or chaffed) and fed as one-quarter of the ration with ground corn it materially reduced the cost of gains and increased the profits."

J. W. Robison of Butler county, Kansas, an extensive grower of swine, says: "I had 65 sows about one year old in 1907, of Berkshire and Poland-China blood, which farrowed (their first litters) in April, May and June, and these sows, with their pigs, were pastured in a 16-acre alfalfa field from the middle of April to the middle of October—six months. Some of the sows were no doubt too young to give the best results as breeders. During the six months mentioned alfalfa and plenty of good water were all the sows and their pigs had as a diet, except, of course, that the pigs had the milk of their mothers, which, from appearances, was abundant. The pigs ran with the sows all summer and weaned themselves. The sows that farrowed (all but five or

six) raised an average of five pigs each. Their pigs came off the pasture in October weighing an average of approximately 85 pounds, and were but little less in weight than pigs of the same age on similar pasture and fed some corn. The sows were in good, healthy, thriving condition at the end of the grazing season, and none of the 65 died while in the alfalfa.

"On alfalfa pasture, with plenty of good water, I believe growth can be produced more economically without than with grain, but if some corn is fed the quantity should be governed by the price of grain and time desired for maturity of hogs. I usually give one bushel of ear corn per day to each 30 sows and pigs after the pigs are two months old. The 16-acre pasture in which the sows and pigs ranged was mowed twice during the summer, yielding a ton of cured hay at each cutting."

### ALFALFA FOR HOGS SHOULD BE CUT EARLY

It is especially important that alfalfa intended to be fed to hogs should be cut early. An experiment at the Kansas station showed that a ton of early cut and well-cured alfalfa hay, fed with grain, produced 868 pounds of pork, while a ton late cut and poorly cured, fed with grain, produced only 333 pounds. For fattening hogs it is well to feed about one ton of well-cured alfalfa hay with each 250 bushels of grain.

Farmer's Bulletin No. 215 of the United States Department of Agriculture declares that alfalfa is an ideal pasture plant for hogs. "There is no danger from bloat and with a limited number of hogs there is practically no injury to the alfalfa field. Vigorous alfalfa will support

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15 to 25 pigs per acre. It is best to limit the number of pigs to that which will be insufficient to keep down an alfalfa field. Cuttings of hay may then be made at intervals and the growth thus rejuvenated. On the average, pigs weighing 30 to 60 pounds in the spring will make a gain of about 100 pounds each during the season. Although pigs may be grown and fattened upon alfalfa alone, it is best to combine the alfalfa with some kind of a grain ration. Alfalfa by itself is too rich in protein to give a balanced ration. Where pigs are pastured upon alfalfa alone they may be prepared for the market by feeding for a few weeks upon corn. It is still better, however, to feed a third to a half of a ration of corn or other grain during the time of pasturing."

The great mistake made by too many who attempt to pasture swine on alfalfa is in overstocking. There is a tendency to keep within a small pasture more stock than it can comfortably support, with the result that the alfalfa plants are gnawed, trampled and rooted out, while the animals fail to prosper as they would under more rational treatment.

One of the most extensive and successful swine raisers in Kansas tells the author this: "Twenty-five years of pasturing hogs of all ages on alfalfa has proven conclusively to me that a fourth to a half grain ration, while they are on such pasture, will produce in them a greater growth per day than when in dry lots on full feeds of corn. Hogs will maintain a reasonable growth, but not fatten much, on alfalfa pasture alone; I believe it profitable to feed them some grain while running on green alfalfa. If it is desired to full-feed hogs, they will make

a rapid fattening growth from increasing the grain ration while on the pasture, and with the full grain ration the meat will be nearly as firm as that of hogs kept in a dry lot, where grain alone has been fed. I find no distinction on the market between alfalfa-fed swine and those purely grain-fed, and they sell price and price alike. The general health of the alfalfa-fed hogs is equal to that of those maintained on any other feed, and they are prolific."

The Kansas station realized $11.90 per acre from rape pasture and $24.10 per acre from alfalfa pasture in 98 days. These results were obtained in the following experiments, begun July 25 and concluded October 31:

Thirty pigs, averaging 52 pounds in weight, were divided as nearly equally as possible into three lots of ten each. Lot 1 was fed on a grain mixture of one-half shorts, one-fourth corn meal and one-fourth Kafir-corn meal, in a dry lot. The other two lots were fed the same grain ration, but one received rape pasture and the other alfalfa pasture in addition. Each lot was given what grain the hogs would eat up clean, and each had access to water and ashes. The weights of grain consumed and gains made are as follows:

| Feed | Grain consumed in pounds | Total gain in pounds | Grain consumed per 100 pounds gain in pounds |
|---|---|---|---|
| I. No pasture..... | 3,801 | 1,023 | 371 |
| II. Rape pasture..... | 3,244 | 1,076 | 301 |
| III. Alfalfa pasture..... | 3,244 | 1,078 | 300 |

The gains of the three lots are very nearly equal. The dry lot consumed 557 pounds (or 70 pounds for every

100 pounds of gain) more grain than the pasture lots. The lot on rape required one acre of pasture, while the alfalfa lot used a trifle less than half an acre.

The lot without pasture required 3.71 pounds of grain to produce one pound of gain. Assigning the same value to the grain fed the hogs on rape pasture, we have 877 pounds of pork credited to the grain and 199 pounds credited to the rape. At 6 cents per pound, the price at which hogs were selling at the close of the experiment, this would be a credit of $11.90 per acre for the rape. In a similar manner, the alfalfa is credited with 201 pounds of pork, equal to $12.05, and as there was only a half-acre of alfalfa, this makes a rate of $24.10 per acre.

The cost of preparing the seed bed and seeding the rape was $1.80 per acre. It was seeded in the feed lots, on soil that would otherwise have remained idle or would have grown up to weeds.

The shotes on pasture enjoyed their diet and seemed satisfied. Those in the dry lot apparently hankered for something green, and their appetites seemed unsatisfied without some kind of roughness. They would even nibble at straw, in a vain attempt to satisfy their craving.

"The experiment," says Prof. D. H. Otis, "emphasizes the superior value of alfalfa pasture. Where alfalfa is not available, or where variety is wanted, or it is desired to utilize otherwise waste land, Dwarf Essex rape, seeded at the rate of six to eight pounds per acre, any time from early spring to late summer, will furnish an excellent diet that is greatly relished by the hogs."

J. E. Woodford, of Coffey county, Kansas, April 1, 1905, placed ten choice pure-bred Poland-China brood

sows from 12 to 18 months old, that were due to farrow in the latter days of June, on a five-acre field of alfalfa. They were given no other feed than the alfalfa pasturage until they had farrowed and their pigs were a week old. After that the sows had in addition to the alfalfa some bran slop until about August 20, when new corn was fit for feeding. He says: "The sows from the time they were turned on the alfalfa until the last week in June made a remarkable growth, besides gaining somewhat in flesh. They did well with their pigs, reared an average of seven to each sow, and as sucklers they were a sight to see. The pigs were the most attractive bunch ever raised in Coffey county, as admitted by our breeding competitors. We weighed a gilt from this lot when six months and five days old, and her weight of 225 pounds was not above the average of the whole lot. In our lifelong experience in rearing swine we have found nothing as a grazing crop for them that in value approaches alfalfa."

F. M. Sumpter, of Sumner county, Kansas, tells the author he raises and markets 500 to 600 hogs annually. These are grown principally in his abundant alfalfa pastures, with perhaps an average of an ear of corn per day until their six weeks' fattening is begun, when they are heavily fed with corn. The unique circumstance in connection with his successful operations is that he does not stock his pastures heavily enough to prevent harvesting from them three cuttings of hay each season, averaging a ton per cutting. The advantage he claims for this is that the hogs have continuously a fresh, tender growth to graze on instead of the coarse, woody

stems they would have before them if no mowing was done, while the hay secured is as valuable as the same quantity from meadows not used as pasture.

A plat of thrifty, well-established alfalfa suitably fenced and used for pasturing swine of whatever age can scarcely fall short of being among the most profitable parts of any farm upon which swine husbandry is given attention.

In the summer of 1907 an agent of the United States agricultural department interviewed "about 150 of the most successful swine-growers and pork-producers of Kansas and Oklahoma on the subject of crops used for feed. . . . The main pasture crops for hogs in this region are alfalfa, wheat, oats and rye, ranking in importance in the order named."

Bulletin No. 111, Part IV, of the Bureau of Plant Industry, sums up what was learned from the investigations, and what it says of alfalfa is as follows:

### ALFALFA PASTURES

"It is the testimony of 95 per cent of the farmers interviewed in this region that there is no better pasture for hogs than alfalfa, where it can be grown successfully. Those who have failed with it as pasture owe their failure to two causes. First, the alfalfa has been pastured before it has become well rooted. Young alfalfa is too tender a plant to stand severe treatment except under very favorable circumstances. There are a few farmers who have pastured it the same year it was sown and the alfalfa has survived, but this was on rich,

heavy loam soil, usually creek bottom or river valley land, with water not far below the surface, and the season was very favorable. Ordinarily alfalfa should not be pastured until the second year, and better still, not until the third year if it is desired to keep the field as permanent pasture. The second cause of failure with alfalfa is heavy pasturing and lack of judgment in pasturing in unfavorable seasons. A good many farmers have sown a small piece of alfalfa, and then because it has grown rapidly and all kinds of stock are fond of it, they have turned all the stock on the farm on it and have wondered why their alfalfa was killed out. Others pasture regardless of whether the ground is muddy or whether the season is dry and hot. In either case heavy pasturing is very likely to cause the alfalfa to be killed out.

"As to the amount of pasturage or the number of hogs alfalfa will carry per acre without injury to the crop, the estimates given by farmers vary considerably, depending on the kind of soil, the fertility of the land, and the size of the hogs pastured. The following, however, is a safe average estimate as given by conservative men who have had much experience. River valley and creek bottom land well set in alfalfa will carry from 15 to 20 head per acre of 50 to 125 pound hogs. Upland of fair average fertility will support from eight to ten head of the same kind of hogs. There are fields that have supported 25 head per acre all through the season for a number of years and are still in good condition, and there are other fields that will not furnish pasture for more than five head per acre; but these are extremes. When a field is used only for pasture it is better to divide it into several

lots and move the hogs from one to the other as occasion requires.

"The length of the season during which this pasture is furnished also varies. Alfalfa is ready for pasture on the average from the middle of April in southern Oklahoma to the middle of May in northern Kansas. In many cases it will do for grazing earlier, but it is not best, as the young alfalfa has not the start it should have for heavy pasturing, nor has it the strength in the plant. When not pastured too early it will furnish feed at the rate mentioned during nearly the whole season until October in the north and November in the south. In some years the pasture season will continue a month later in the autumn, depending on the rainfall and the lateness of cool weather. In some seasons, if the summer is unusually dry and hot, the pasture will become short; but usually pasture for the number of hogs previously specified can be depended on for about seven months of the year in the southern limit of the territory named and for about five months in the northern limit. This rule will apply to other sections of the country in the same latitude as Oklahoma and Kansas. While many farmers pasture alfalfa fields to their full capacity, in some sections, especially in northern Kansas, it is customary to run about half as many hogs as the alfalfa fields will support. This practice permits the cutting of the usual number of crops of hay, though the yield of hay is, of course, reduced.

"Alfalfa not only furnishes a great amount of pasture, but it is of a character that goes to make bone and muscle. It belongs to the leguminous family of plants,

as do the clovers, the cowpea, the field pea, the soy bean, and the vetches, and while it is furnishing this valuable food it is at the same time adding fertility to the land. Alfalfa pasture or alfalfa hay and corn are very nearly a balanced ration for animals, and while it is better to have a grain ration fed with it to hogs as well as other animals, yet a healthier, thriftier hog can be raised on alfalfa alone than on corn alone. Many instances are found where hogs have been raised on alfalfa alone. One Oklahoma farmer marketed in December, 1905, 61 head of spring pigs eight months old that averaged 171 pounds. These hogs had run from the time they were little pigs with their mothers on 15 acres of alfalfa without any grain. They sold on the market for 5½ cents a pound. This made the cash value of the alfalfa pasture about $38.35 per acre. As will be seen, this is light pasturing, as there were only about four pigs per acre besides the brood sows.

"As already stated, it is much better economy to furnish a grain ration with the pasture, as it results in better gains and a better product. One man estimates that it takes from one-half to one-third less corn on alfalfa pasture than on a straight grain ration to make a hog ready for market. Many let the hogs run on alfalfa until about five to six months old, by which time they reach a weight of 75 to 125 pounds, feeding just a little grain; then they feed heavily for about two months and sell the hogs at eight months old weighing 200 to 225 pounds. One farmer, who raises about a thousand hogs a year and who in one year sold $11,200 worth, makes a practice of growing his hogs on alfalfa pasture

until about eight months old, feeding one ear of corn per head daily. He then feeds heavily on corn for a month or two and sells at an average weight of 200 to 225 pounds. Another man feeds all the corn and slop the pigs will clean up, all the while grazing them on alfalfa pasture, and sells at six to eight months old at weights of 250 to 300 pounds. Another, who raises about a thousand head a year, feeds all the corn the pigs will eat, beginning shortly after weaning and continuing until the hogs are sold at ten to 11 months old, averaging about 275 pounds.

"Still another farmer, from weaning time (two months old) until eight months old, feeds the pigs nothing but dry corn on alfalfa pasture, averaging about one-half gallon of corn (3½ pounds) a day per head. At the end of eight months he sells at an average weight of 250 pounds. Feeding the above quantity of corn a day makes about 11¼ bushels per head. Figuring this at the average price of corn in this locality, 35 cents, and the price received for pork, 5½ cents, the following results will show the cost of growing pork on this farm and the value of alfalfa pasture:

| | |
|---|---|
| Value of 250-pound hog, at 5½ cents | $13.75 |
| Value of pig at weaning, 50 pounds, at 5½ cents | 2.75 |
| Gain from pasture and grain | $11.00 |
| Cost of 11¼ bushels of corn, at 35 cents | $3.93 |
| Value of pasture per head pastured | $7.07 |

"Now, compare these results with those of a man who had to depend on other pasture crops than alfalfa. He

estimates that it will take 15 bushels of corn on wheat, oats, and rye pasture to raise and fatten a hog so it will weigh 240 pounds at nine months old, besides the pasture and slop. At the price of corn mentioned, 35 cents a bushel, and with hogs at 5½ cents a pound, note the cost of producing pork on this farm:

| | |
|---|---|
| Value of 240-pound hog, at 5½ cents | $13.20 |
| Value of pig at weaning, 50 pounds, at 5½ cents | 2.75 |
| Gain from pasture and grain | $10.45 |
| Cost of 15 bushels of corn, at 35 cents | $5.25 |
| Value of pasture per head pastured | $5.20 |

"The pasture specified here will not support more than half as many head per acre on this farm by feeding corn all the time. The value of this pasture is only $5.20 per head, against $7.07 per head for alfalfa pasture on the other farm. The experiences of these men are sufficient to show the value of alfalfa pasture alone, and its greater value when grain is fed in connection, and that it is an important factor in economical pork production.

### ALFALFA HAY

"While alfalfa pasture has been found to be very valuable for hogs, the hay as a part ration for winter is scarcely less important. Throughout the region referred to the farmers are feeding the hay to hogs in winter. Many feed the hay by throwing it on the ground in forkfuls; others have made low racks in which the hay

is placed, where the hogs can feed like cattle or sheep. The hay has been found to be especially valuable for brood sows before farrowing. Where it is fed during the winter only a small grain ration is necessary to keep the sows in good flesh and in healthy condition. Sows thus fed also farrow good litters of strong, healthy pigs.

"To hogs alfalfa hay is usually fed dry. The leaves are more readily eaten than the stems, as they contain more of the nutritive value of the plant. For this reason some farmers save the last cutting of hay for the hogs because it is more relished. It is eaten up cleaner, as the stems are not so woody, and more food value is found in the leaves. Sometimes the hay is cut up fine, wet, and mixed with other feed, and sometimes it is fed ground, as there are now alfalfa mills scattered throughout the alfalfa regions. But it is very doubtful whether this extra expense will pay, unless it be for a ration for young pigs.

"To avoid the expense of chopping, chaffing or grinding, some farmers, in order to get the hay all eaten, have soaked it in water and fed it. This has proved very satisfactory where tried. One Oklahoma farmer carried his hogs through a winter by feeding them alfalfa leaves soaked in hot water for one day and the next day shorts mixed with the pulp and water. He feeds much alfalfa hay to his hogs and is very successful with them. He puts the last cutting in shock as soon as wilted, and thus cures it without bleaching and feeds it to his hogs. Another farmer carried his entire herd of hogs through the winter by feeding them the pulp of alfalfa hay after soaking it in water overnight. He also gave them water to

drink. This was all the feed they had during the winter, and they were in good flesh in the spring, with smooth, glossy coats of hair. A Kansas farmer was feeding a bunch of 50 fall pigs on corn; during the winter they got off feed and were not thrifty. He reduced the corn and gave a ration of two-thirds chopped alfalfa hay and one-third corn meal, the two soaked together. The hogs began to do better, and a little later he changed the ration to one-third alfalfa and two-thirds corn. The results were very satisfactory, and the cost of feed was reduced from $15 a month on corn to $9 a month on alfalfa and corn. So alfalfa hay, as well as pasture, has a very important use on a hog farm."

Prof. H. R. Smith of the Nebraska station says: "I cannot recommend too strongly the feeding of good alfalfa hay to any kind of swine. It not only furnishes protein, or flesh-making material, which is deficient in corn, but it tends to offset the heavy character of a ration consisting of corn alone. Some scatter the hay on the ground, but it is better to construct some sort of a rack through which the hogs can pull the hay without trampling too much under foot. If the feeder has a cutting machine it might be well to cut the alfalfa and mix it with the grain. For fattening purposes do not make this cut alfalfa more than one-fourth of the entire grain ration by weight, and I would be inclined to believe that one-fifth alfalfa would be better."

Swine raisers in the alfalfa growing sections frequently make the claim that cholera is unknown where alfalfa flourishes most, and that hogs given all the alfalfa they will eat in a properly balanced ration, develop

greater vitality and ability to resist disease than would otherwise be the case. In commenting upon this, Henry Wallace gives the following as a result of investigations made of methods of raising hogs in the Platte valley of Missouri:

"The brood sows are kept through the winter on a ration of five pounds of chopped alfalfa hay and one pound of corn. The summer feed of sows and pigs is from one to one and one-half pounds of corn per day and as much alfalfa as they care to eat. Hogs grown in this way do not make as rapid gains as are made with a heavier corn ration, the gain being about one-sixth pound per day for the first 200 or 250 days, the cost being not far from two cents per pound, with corn at 40 cents per bushel.

"What particularly impressed us, however, with hogs grown in this way, was the tendency to differentiate in type from those grown under the conditions prevailing in Iowa and Illinois and the clover country of Kansas and Nebraska. These hogs are longer in the body, set up a little higher on their legs, partake somewhat of the bacon type, and unquestionably have much greater vitality and disease-resisting power. It will not be a great while until the term "alfalfa" hog means a different type from that grown east. In fact, we believe in time to come, when the railroads master the problem of transporting hogs without danger of contagion, that quite a per cent of the hogs of the country will be grown west of the corn belt, where alfalfa thrives better, and shipped east to cattle feeders and farmers who have more corn than hogs. These hogs, when put on a heavy corn diet,

whether on an alfalfa farm or elsewhere, make very rapid gains, and we believe will make better use of corn than hogs grown on a corn ration. In fact, we are very sure of this. Theoretically it can be no other way. We found indications too, that hogs grown on alfalfa have much greater power to resist cholera than those grown on corn and subjected to the same disease under the same conditions. Theoretically this should be true, and we believe experience will prove it."

### A SOILING TEST IN MISSOURI

The Missouri station (Bulletin No. 79) made a test covering 102 days—from July 25 to November 4—with lots of six 50-pound high-grade Poland-China pigs, to compare the value of various forage plants, especially fresh rape, alfalfa, red clover and blue grass, when combined with corn, or rather corn meal, for growing and fattening hogs. The pigs were kept in clean pens having shelter from the sun, and floored with granitoid. Their feed and deep well water were given them morning and evening, and salt mixed with wood ashes and a little bone meal was always within reach. The green feed was cut and hauled to the pens fresh and all given that they would eat without waste. The corn meal was of medium fineness and fed wet to the consistency of a thick dough. Gain on the pigs given alfalfa cost $3 per hundred pounds; on those given clover, $3.25; on those having blue grass, $3.96. The same pigs in the first 40 days of the same experiment had among them one lot of six which were fed green rape with the corn meal ration. In this 40 days the cost per hundred pounds of gain was

thus: From the pigs having rape, $3.34; clover, $2.89; blue grass, $3.27; alfalfa, $2.59.

Director Waters says: "The superiority of alfalfa over red clover, as shown by this experiment, means a difference, on the basis of a 250-pound hog, of 62½ cents, or about $37 on each carload of hogs, or more than enough to pay the freight, even if the yield of the two crops is to be counted the same. Of more importance than the superiority of the feeding value itself is the fact that the alfalfa will yield a much larger amount of pasturage than will red clover, and that it will come on earlier and remain green later than the clover, and will, if kept clipped, remain green throughout the summer and, therefore, afford a green pasture of succulent material which the hogs will relish most highly. It is believed to be possible to grow enough alfalfa for hog pasture at least on practically every farm in Missouri.

"It is not safe or even desirable, however, to rely upon a single crop, excepting alfalfa where it is an assured success, to furnish pasture for hogs throughout the entire season. It is better to arrange for a succession of pastures from the beginning of the season until the hogs are ready for market, making the feed richer and more concentrated toward the close of the season and as we approach the finishing or fattening period. For this purpose red clover or alfalfa, cowpeas and soy beans are recommended."

One of the greatest advantages of alfalfa as a hog pasture is the fact that it affords a fresh growth throughout the grazing season. The pasture should be mowed at least three times each season, thus taking off all the

matured stems and giving opportunity for the sending up of a new, tender growth, just the quality the hog delights to feed on. It is this new, fresh growth that makes alfalfa pasture so generally preferred by the hog and so highly satisfactory as a flesh former. The hog wants fresh pasture. He does not graze like the horse, cow or sheep, but is best suited when he can bite off a fresh clover bloom or a sprig of alfalfa, and does not from choice like to feed on a thick, heavy-coated blue grass sod. He objects to moldy, wet or soured grasses, such as the blue grass and white clover pastures so frequently afford when not closely grazed.

In justice to all, to the author no less than his readers, it should be stated in passing that if after what has been said in this chapter anyone supposes that pigs pastured on alfalfa or fed alfalfa hay, without other feed, grow fat and maintain a show condition he has been misled. Alfalfa, clover, grass or any other forage will not make swine fat, but alfalfa will cause pigs to grow and develop framework as rapidly and inexpensively as any other pasturage, and in most instances more rapidly. This volume is not intentionally advocating any one forage plant or grain alone as a sufficient or satisfactory animal ration for fattening, or even for the most rapid growth.

CHAPTER XI.

# Succulent and Bulky Feeds

The value of succulence is recognized by every experienced swine feeder, and is to be taken into consideration, whether the animal is destined for breeding purposes, the pork barrel or the packing house. In the warmer months this is largely provided by pasturage, to which a preceding chapter is devoted. All succulence is relished by swine fed upon grain or concentrated feeds, to which it adds variety, pleasing as well as wholesome. In a broad way, any green, fresh or juicy food may be classed as succulent, and the term is used to comprehend practically all edible plants or vegetable materials that have not been in some way cured or preserved, and their juicy freshness thereby dissipated. This succulence, in moderation, is a desired and valuable factor at all times, but of less importance when forcing the fattening hog to a quick finish than it is for economical growth or for keeping the breeding animal in good condition. Watery feeds, such as beets, have a loosening or relaxing effect on the flesh. They are excellent for the brood sow toward the time of pigging, for they promote an easier farrowing by overcoming the tense condition of the muscles that results from a dry grain diet. Succulence is of value for its balancing effect against dry, concentrated feeds, for its general tonic or corrective qualities, and in stimulating

the appetite for more satisfactory consumption of other feeding stuffs. Anything which furnishes it naturally is of special worth when unusually dry conditions prevail, for at such a time it may afford the tonic needed to ward off sickness to which hogs subsisted almost entirely on dry or concentrated feeds are liable.

### BULKY FEEDS

The hog requires but a limited quantity of bulky food, and that mainly to aid in the easier or more thorough digestion of concentrated foods of a fat-making nature, usually furnished dry. This bulk should be of a palatable, succulent character, such for example as is typical of sugar beets and pumpkins, which afford appetizing variety along with an appreciable degree of nutrition. The fact should not be lost sight of, however, that the mistake of giving the hog too much bulk is more probable than would be the case with larger animals. An excess in this direction is liable to enlarge the stomach or intestines at the expense of other desirable growth.

### USE OF ROOTS

Roots are mainly desirable because of their stored succulence, available in winter, when otherwise difficult to obtain. Their utilization has not been so general in the United States as abroad and in Canada, but of late years they have increased in favor, and their place in feeding, especially in the corn belt of America, is being better recognized. Sugar beets particularly are in favor, prob-

ably as a result, in part at least, of the numerous experiments made primarily with a view to encouraging the establishment of sugar factories, in connection with nearly all of which some beets were fed to hogs or other stock. The mangel-wurzel, rutabaga, turnip and carrot are also used.

Experiments have been conducted to register the value of roots as aids to the digestion and assimilation of food as well as to discover the nutrients they supply. The tendency has been to give the greatest credit to their value as accessories, although in discussing root crops in "Feeds and Feeding" Prof. Henry says, "the digestible nutrients yielded by each crop are the true measure of its value to the farmer." Taking yields reported at the Ontario agricultural college (Report of 1896) from tests covering five or six years, Prof. Henry has reduced root crops to an estimated yield of digestible nutrients as shown in the following:

ESTIMATED YIELD OF DIGESTIBLE NUTRIENTS PER ACRE IN ROOT CROPS

| Yield per acre. | Dry matter. | Protein. | Carbohydrates. | Ether extract. |
|---|---|---|---|---|
| | Pounds | Pounds | Pounds | Pounds |
| 28 tons carrots | 6,384 | 448 | 4,368 | 112 |
| 24 tons mangels | 4,368 | 528 | 2,592 | 48 |
| 23 tons fall (flat) turnips | 4,370 | 460 | 3,312 | 92 |
| 20 tons rutabagas (Swedes) | 4,560 | 400 | 3,240 | 80 |
| 17 tons sugar beets | 4,590 | 374 | 3,468 | 34 |

The mangel contains less dry matter than other roots, but is in favor because of its heavy yield and its less cost of harvesting, which is generally estimated to be about half that of sugar beets. Comparative experiments were

made in 1890 by the New York (Cornell) station (Bulletin No. 25) with sugar beets and mangels as grown for live stock. The beets and mangels were given the same care, cultivation and fertilizing that would ordinarily be given a farmer's root crop. Test weights gave a yield of 23.1 tons of sugar beets per acre and 31.4 tons for mangels. The yield of dry matter per acre was found about equal, so the conclusion reached was that "the difficulty in starting and in harvesting the sugar beets becomes the main difference in raising the two crops. It requires fully twice the labor to harvest the sugar beets, so that it would seem clear that, if roots are to be raised for stock, so far as yield per acre is concerned, mangels are much to be preferred to sugar beets."

### COMPARATIVE VALUE OF ROOTS

The comparative feeding value of roots most commonly used for swine was tested in 1901 at the Central experimental farm of Canada. Four lots of four pigs each were fed respectively on turnips, mangels and sugar beets, the beets fed to one lot being grown for forage and to another lot beets as grown for sugar production. Each pig was given all the pulped roots he would eat and in addition daily three pounds of skim milk and a meal mixture of one-half corn and one-sixth part each of oats, barley and peas. The results of the experiment (Annual report of Canadian experimental farms, 1901) are shown on the next page.

In arriving at costs of the gain the meal was valued at 90 cents and the skim milk at 20 cents per 100 pounds,

## VALUES OF DIFFERENT ROOTS COMPARED, FED PULPED

| Roots in ration. | Average weight January 7. | Total gain. | Number of days fed. | Average daily gain. | Feed eaten. | | | Feed per 100 pounds gain. | | | Cost of 100 lbs. increase live wt. | Cost to produce roots per acre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Meal. | Roots. | Milk. | Meal. | Roots. | Milk. | | |
| | Pounds | Pounds | | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | | |
| Turnips | 101.25 | 363 | 106 | 0.85 | 780 | 3,808 | 1,284 | 215 | 1,049 | 354 | $3.69 | $26.42 |
| Mangels | 96.75 | 389 | 106 | .90 | 786 | 5,930 | 1,284 | 202 | 1,524 | 330 | 4.00 | 28.33 |
| Forage beets | 76.75 | 500 | 106 | 1.18 | 793 | 4,298 | 1,284 | 159 | 860 | 257 | 3.22 | 35.75 |
| Sugar beets | 57.00 | [1]528 | 138 | .95 | 1,032 | 4,266 | 1,680 | 195 | 808 | 318 | 3.60 | 38.75 |

[1] Feeding ceased May 25.

with the following prices for roots: Turnips and mangels, 10 cents, and sugar beets, both kinds, 15 cents per hundredweight. The results on the carcasses were generally favorable. Commenting on this, Rommel says (Bulletin No. 47, Part II, Bureau of Animal Industry, U. S. Department of Agriculture): "The results are remarkably low in feed requirements and would seem to show that roots and milk may be more advantageously combined than pasture and milk."

### ROOTS AND GRAIN

Experiments at the Indiana, Utah and Montana stations, and at the Ontario agricultural college in feeding roots against grain, to swine, have been summarized comparatively in the bulletin cited above, as shown in the table on page 243.

In the Indiana experiments (Bulletins Nos. 79 and 82) the grain ration was given as slop and was composed of one part corn meal and two parts shorts, with water, salt and ashes available. Mangels were used in the first experiment, and in the second sugar beets were sliced and fed in the slop. Conclusions were summarized as follows: "Roots in some form are a desirable food for pigs in winter, as an addition to the grain ration, in promoting healthful activity of the digestive organs and in acting as an appetizer. Sugar beets, artichokes or carrots would no doubt serve this purpose better than mangels. They are more expensive in view of greater cost of production, but this difference is not important. They, however, contain enough more sugar to make

| Ration. | Number of pigs. | Average weight at beginning. | Total gain. | Number of days fed. | Average daily gain. | Total feed eaten. | | Feed for 100 pounds of gain. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Grain. | Roots. | Grain-fed lots. | Grain-and-root-fed lots. | |
| | | | | | | | | | Grain. | Roots. |
| Indiana: | | Pounds | Pounds | | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds |
| Grain | 6 | 46 | 443 | 77 | 0.96 | 1,643 | .... | 371 | .... | .... |
| Grain and roots | 6 | 44 | 356 | 77 | .77 | 1,320 | 514 | .... | 371 | 145 |
| Grain | 4 | 60 | 444 | 98 | 1.13 | 1,697 | .... | 382 | .... | .... |
| Grain and roots | 4 | 60 | 382 | 98 | .77 | 1,186 | 1,568 | .... | 310 | 410 |
| Ontario Agricultural College:[1] | | | | | | | | | | |
| Grain | 4 | 42 | 501 | 196 | .64 | .... | .... | 439 | .... | .... |
| Grain and roots | 4 | 42 | 672 | 196 | .86 | .... | .... | .... | 380 | .... |
| Grain | 5 | 55 | 664 | 196 | .68 | .... | .... | 455 | .... | .... |
| Grain and roots | 5 | 55 | 744 | 196 | .76 | .... | .... | .... | 404 | .... |
| Utah: | | | | | | | | | | |
| Corn meal | 3 | 97 | 229 | 91 | .85 | 1,279 | .... | 558 | .... | .... |
| Ground wheat | 3 | 97 | 324 | 91 | 1.20 | 1,505 | .... | 464 | .... | .... |
| Bran and roots | 3 | 97 | 167 | 91 | .62 | 471 | 2,761 | .... | 282 | 1,653 |
| Corn meal and peas | 3 | 87 | 410 | 122 | 1.12 | 1,672 | .... | 407 | .... | .... |
| Ground wheat | 3 | 86 | 330 | 122 | .90 | 1,330 | .... | 403 | .... | .... |
| Bran and roots | 3 | 89 | 258 | 122 | .70 | 880 | [2]1,771 | .... | 341 | 686 |
| Montana: | | | | | | | | | | |
| Grain | 7 | 111 | 557 | 66 | 1.20 | 2,967 | .... | 532 | .... | .... |
| Grain and roots | 7 | 115 | 576 | 66 | 1.26 | 2,497 | 819 | .... | 426 | 142 |
| Average | .... | .... | .... | .... | .... | .... | .... | 442 | 359 | 427 |

[1]The grain per 100 pounds gain in the Ontario results is dry matter. [2]Feed includes 111 pounds of potatoes.

them somewhat more relished by the pigs than are the mangels. . . . Mangels are not so desirable a food as sugar beets, as they are less nutritious, sugary and tender. The great advantage in growing mangels lies in the large yield per acre. Sugar beets, however, are relished by all farm animals, and to a greater extent than are mangels, especially by pigs. . . . If the brood sows had been fed with sugar beets it would have been to their material advantage."

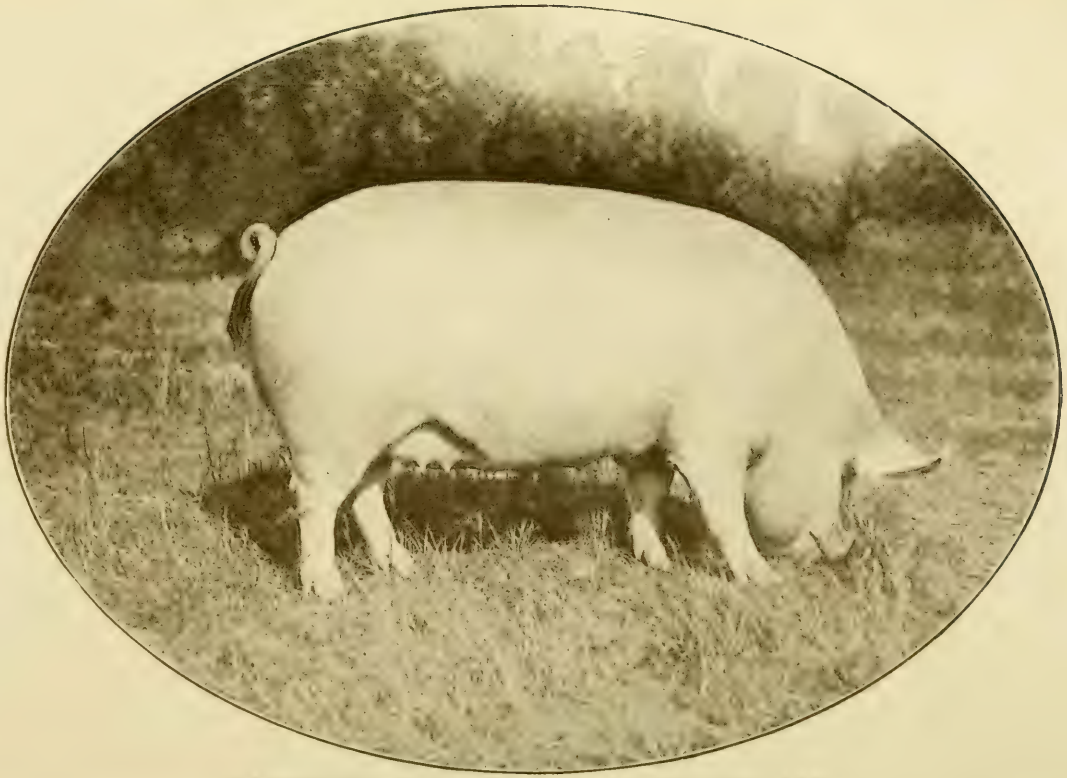
In experiments reported in the following table from the Ontario agricultural college (Annual Report 1901) the grain ration in the first comparison was barley and middlings, and corn and middlings in the second; for roots all lots were given pulped mangels:

TABLE SHOWING GAINS AND DRY MATTER CONSUMED PER 100 POUNDS OF GAIN

| Groups. | Total weight October 23. | Total weight May 7. | Average daily gain per hog. | Dry matter consumed per 100 lbs. gain. |
|---|---|---|---|---|
| | Pounds | Pounds | Pounds | Pounds |
| Experiment A | | | | |
| Group 1, 4 hogs; barley and middlings..... | 169 | 670 | .639 | 439.22 |
| Group 2, 4 hogs; barley, middlings and roots. | 168 | 840 | .857 | 380.15 |
| Experiment B | | | | |
| Group 3, 5 hogs; corn and middlings..... | 276 | 940 | .677 | 424.55 |
| Group 4, 5 hogs; corn middlings and roots..... | 276 | 1,020 | .757 | 403.74 |

The main points brought out by these tests were: "The feeding of equal weights of roots and meal gave more rapid and more economical gains than the feeding of meal alone. The hogs fed roots produced bacon of

A SMALL YORKSHIRE BOAR



YORKSHIRE SOW, MISS HOLLINGSWORTH 4TH

Sweepstakes prize-winner at numerous state fairs

quality superior to those which were not fed roots. There was a marked difference, however, between the hogs which received roots and those which did not in each experiment. Those which were fed roots were much more growthy and thrifty looking than the others, and showed less tendency to become fat. In fact, it was found necessary to reduce the proportion of roots toward the close of the experiments in order to get these hogs fat enough. It is possible, therefore, that the roots had a beneficial effect upon the digestive organs of the animals, causing them to digest their food better than did the others, for there is little doubt that hogs confined closely in pens are likely to suffer from indigestion."

In the Montana experiments oats, barley and damaged wheat were furnished with and without sugar beets, and comment was made on the results obtained, thus: "We have found that pigs soon become very fond of sugar beets; that beets can be used to good advantage raw; and that there is no advantage to be derived from cooking them. They should not, however, be used in larger quantities than from two to 2½ pounds per day to a 150-pound animal. If given too freely they have a too laxative effect and cause some loss of the grain. They have given us good results when fed in larger quantities to store (lean) hogs receiving very little grain during the winter. In this way store hogs can be wintered very cheaply and they will come out in good thrifty condition. Their value extends also to the brood sow; we have for several years made sugar beets a part of her ration. They have a tendency to prevent a torpid

condition of the digestive tract, render parturition easier, increase the flow of milk and aid in the production of a more vigorous offspring. It is necessary, however, to observe the precaution not to give beets except in small quantities to the sow during the first week after farrowing. They are liable to affect the milk, causing bowel trouble among the young pigs.

"What has been said of sugar beets will apply in very much the same way to mangels and carrots. The food value of all three for swine is very much the same. It can be said of carrots, however, that they are very much more expensive than either sugar beets or mangels, owing to the labor involved in giving them the proper cultivation and the difficulty found in harvesting. Under conditions frequently found in Montana the sugar beet is preferable to the mangel for the reason that it keeps much better during the winter season. The mangel, which projects above the ground with a sparse top for a covering, is frequently touched by an early frost, and then will not keep well. As the sugar beet makes its growth within the ground and the crown is well covered with leaves, early frosts, even severe ones, will not do any damage. During the last two years we have had sugar beets to feed as late as the middle of June. The argument against the use of roots is that they are expensive to raise. On the average farm only a very small area is required to produce an abundance of pig feed. One acre will produce, at a fair average, not less than ten to 12 tons of beets, and these, if properly treated, will not cost more than $25 per acre. They are in reality one of the most economical foods."

Results from the Montana experiments would appear to account for those of an unsatisfactory nature from the use of sugar beets in the Indiana trials, in which roots may have been furnished too abundantly. The net profit per head in the experiments at the Montana station was $2.28 when sugar beets were combined with grain, against $1.80 when grain alone was used. Further experiments at the Montana station (Bulletin No. 37) returned a very striking financial gain from the use of sugar beets, which was reported as follows: "In the spring of 1902 two lots of four pigs each were fed for 50 days, one on an exclusive grain ration, the other receiving both grain and sugar beets, with the following results: The four hogs receiving grain made an increase of 316 pounds, or 79 pounds each, a daily gain of 1.58 pounds. The cost per pound of increase on this lot was 4.6 cents. The four hogs receiving grain and sugar beets made an increase of 328 pounds, or 82 pounds each, a daily average of 1.64 pounds. The cost was 3.8 cents per pound. The former lot received a heavy grain ration of 9.11 pounds each per day. The latter consumed 6.65 pounds of grain and 4.58 pounds of sugar beets per head daily. The financial outcome of this test resulted in a net profit of $14.12, or 33 per cent on the investment in 50 days."

### ROOTS AND BACON

It is evident that roots have a special value in American territory outside the corn belt, and in these sections the feeding material available tends to encourage swine raising for bacon production. In the northern and west-

ern sections the sugar beet industry has led to more extensive use of that root for all classes of stock, and in some sections beets are freely used where other roots were little known in feeding. Roots make an acceptable combination with wheat, barley or any other grain than corn, and their effect upon bacon production has been found beneficial.

Experiments corroborating this have been extensively conducted in Canada, and in the compilation on "Bacon Production" by Professor G. E. Day, published by the Ontario Department of Agriculture (Bulletin No. 129, Ontario agricultural college), the influence of roots upon the firmness of bacon is pronounced extremely satisfactory. The bulletin gives the following summary of results from feeding with roots for bacon production:

"Hogs seem to prefer sugar beets to almost any other roots. Some difference of opinion exists as to the quantity of roots that may be fed with profit to hogs. They should be given in limited quantity to small pigs, but pigs weighing over 100 pounds live weight will, in some cases, take five or six times as much roots as meal, by weight, and make very good gains. We have obtained our best results, however, from feeding equal parts by weight of roots and meal. The proportion of roots may be increased considerably, if thought advisable, as the hogs advance in weight. In all our experiments we have obtained very satisfactory results from root feeding, so far as firmness of bacon is concerned. Though not quite so high in feeding value for hogs, mangels compare very favorably with sugar beets. If the hogs have not been fed sugar beets they will eat mangels very readily. Their

influence upon the firmness of bacon is the same as that of sugar beets. Hogs are not so fond of turnips as of mangels and sugar beets, but if they do not know the taste of either mangels or sugar beets, they will eat a considerable quantity of turnips. Turnips are made more palatable by cooking, though it is doubtful whether cooking increases their actual feeding value, which is very similar to that of mangels. We have found the feeding of turnips along with a meal ration to give a firmer quality of bacon than when meal is fed alone. Much of the value of roots consists in their action upon the general health of the animal. They tend to prevent indigestion and constipation, and promote general thrift. The results of our experiments and of those conducted by other stations indicate that from six to eight pounds of sugar beets, mangels or turnips, are equivalent in feeding value to one pound of mixed meal."

### SUGAR BEETS IN THE CORN BELT

The experience generally of successful hog raisers in the corn belt has given a favorable place to the sugar beet. "We raise sugar beets largely, and consider them of great benefit," says Fred H. Rankin of Illinois. "They come nearest to supplying the place of pasture in winter of anything we can find. No similar area on the farm ever produced so profitable a crop as did a patch of sugar beets. We used them whole, and as pastures were short in the fall, we pulled and fed many of the beets, and it was surprising with what avidity the stock ate them, particularly the tops. Frost does not in any wise

injure the tops and we did not dig and pit our crop until late in November. The last beets taken out of the pit in the spring were as fresh and crisp as when placed there. There is no stock that needs succulence in food more than swine or that will pay better for supplying it, especially the breeding herd."

"I have fattened my own hogs for family use for the last three years on sugar beets," says I. L. Diesem of Kansas; "and I did not give them any grain until about two weeks before slaughtering, when I fed them corn, barley and oats. Their meat was as firm as if they had been corn fed. The flavor of our sausage, at least, is just the same as when we feed corn."

A phase of root feeding in winter which is worth consideration has been advanced by A. W. Brayton of Illinois, who says: "Stock fed entirely upon dry feed require a great deal of water, and if the weather is cold and the water near the freezing point they will not drink as much as their systems demand, and the food sometimes becomes impacted, or passes only partly digested, causing injury and disease; or, at times they will drink more than is necessary, thereby washing the food out of the stomach before half the nutriment is extracted. Taken in large quantities ice-cold water reduces the animal temperature, and the beast stands around for hours humped and shivering with cold. If given a ration of succulent food, which is largely juices, the liquid necessary is at least partly supplied, a little at a time and in its most acceptable form."

### THE DANISH EXPERIMENTS

Elaborate swine feeding experiments involving numerous problems have been conducted by the Danish experiment station at Copenhagen. These experiments were extensive and on the co-operative plan; the animals were kept upon estates and fed in the ordinary way by farmers, but the tests were arranged and results observed by officials of the experiment station. The large number of hogs, in some series practically a thousand, gave a certainty to the averages which made the experiments of unusual value. The author of "Feeds and Feeding" painstakingly worked over the 39 periodical reports on the Danish experiments which had been issued prior to the publication of his work, and one of its chapters is devoted to results obtained by the Copenhagen station. In referring to the extensive Danish trials in root feeding, Professor Henry has said:

"In the Danish experiments such roots as mangels and other beets, turnips and carrots, were usually fed uncooked. In one series of experiments it was found that from eight to ten pounds of mangels equaled one pound of grain. The quality of pork from pigs given mangels and other roots was satisfactory. Even when one-fourth of the nutriment furnished consisted of roots the pork was still of good quality. In one group of experiments in which 204 pigs were used, four kinds of roots were fed in addition to dairy refuse and grain. The conclusions were that 7½ pounds of Eckendorf mangels, 6½ pounds of Elvetham mangels, five pounds of fodder beets and four pounds of sugar beets were

each equal to one pound of barley. The quantity of dry matter in each of these allowances of beets is practically the same. It is apparent, therefore, that the value of beets as food for swine depends upon the quantity of dry matter they contain rather than their total weight. It was concluded from these experiments that 40 per cent of the ration of the pig may be advantageously made up of roots."

"In another series of experiments nearly 900 pigs were used in root-feeding trials. Carrots were found to have no higher value than mangels, dry matter being taken into account. The common field turnip is over 90 per cent water. Since grain feeds are much higher in Denmark than in America, it is natural that root crops generally should be more highly appreciated by stockmen there than in this country. On the other hand, even if the grains are cheap with us, we should not insist that growing pigs and breeding swine should be kept upon these concentrated materials alone. Such material lacks bulk, and when fed in reasonable quantity to growing and breeding stock the stomach and intestines are all the time in a condition of collapse. Volume is an essential constituent of feed and, in a way, it is as important as nutriment. Roots furnish this to swine in the best form possible."

### IRISH POTATOES

Potatoes do not have as high feeding value as roots, but are often more readily available. Results from feeding with raw potatoes are not generally satisfactory, but when cooked so as to be mealy and not too soggy the

potatoes are relished. A Canadian authority reports (Bulletin No. 129, Ontario agricultural college) that "their influence upon the quality of bacon is beneficial." It is ordinarily estimated that four or 4½ pounds of potatoes, when cooked and used in connection with corn, other grain or meal, have a value equal to one pound of grain alone. Potatoes alone cannot be used to advantage as a feed, nor can they be eaten by hogs in any great quantity. They are best relished when cooked and mixed with meal, making of the mixture a rather heavy mush. Skim milk and potatoes go well together. (See experiments of Central experimental farm given in the table in Chapter 17.)

### SWEET POTATOES

Sweet potatoes have been fed to hogs with some degree of success, particularly in the southern states, where they have been used both raw and cooked, and the hogs have also been allowed to harvest them. Attempts to maintain hogs on them have proved unprofitable, but their value has been apparent when properly balancing a ration.

The South Carolina experiment station (Bulletin No. 52) fed one lot of hogs, averaging in weight 162 pounds each, on sweet potatoes alone, for 43 days, and another lot, averaging 156 pounds each, for the same period on corn. The average total gain per hog was 26.6 pounds on sweet potatoes and 50.6 pounds on corn from an average consumption of 863.7 pounds of sweet potatoes and 305 pounds of corn, thus requiring to produce one pound of pork 32.47 pounds of sweet potatoes or 6.02

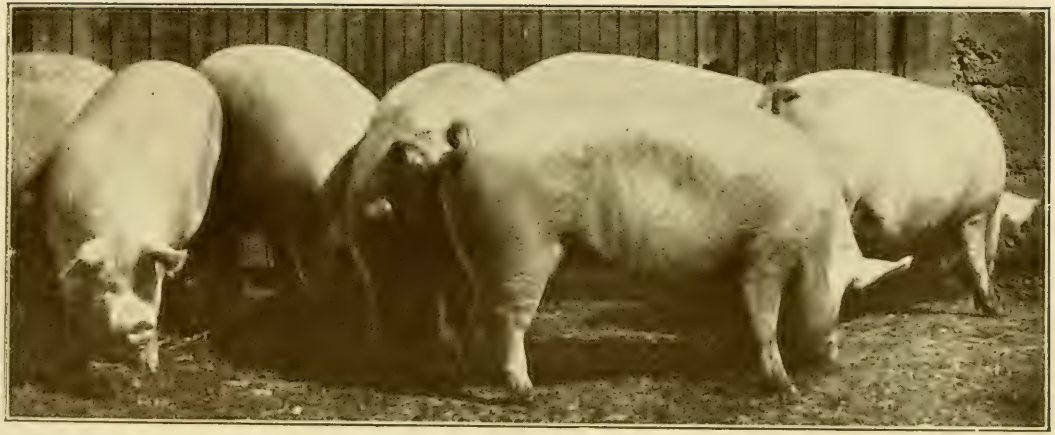
pounds of corn. The yields per acre at the South Carolina station were 200 bushels of sweet potatoes and 15 bushels of corn, and pork was worth five cents per pound. At those figures, for pork production, corn was worth $6.97 per acre and sweet potatoes $18.47 per acre.

The Maryland station found (Bulletin No. 63) feeding an exclusive sweet potato ration to rather mature hogs "not to be economical or desirable," but when sweet potato strings were made part of a ration with gluten meal and skim milk they were estimated to have a feeding value of about 40 cents per 100 pounds.

The Alabama station has found (Bulletin No. 122) that shotes on an average will make one pound of growth in consuming 3.13 pounds of grain, with raw sweet potatoes in addition, and the conclusion was reached (Bulletin No. 93) that "a profit is possible only by saving the expense of harvesting, which is the heaviest single item of expense in sweet-potato culture. If the hogs do the rooting, the sweet potato is doubtless a cheaper food than corn on some sandy soils that yield ten to 15 times as many bushels of sweet potatoes as of corn. The vines are also valuable as food for hogs. The value of sweet potatoes will be enhanced by feeding with them a liberal allowance of cowpeas or peanuts, which supply the nitrogenous material in which the sweet potato is deficient."

The Florida station (Bulletin No. 55) compared the feeding of native shotes on rations of corn and wheat middlings against wheat middlings and sweet potatoes. The animals were common "Razor-Backs," which had

**YORKSHIRE BOAR, S. H. PERFECTION, JR.**
Champion boar of his breed at the World's Fair, St. Louis, 1904



**A GROUP OF YORKSHIRE GILTS**

A delight to the bacon-curer's eye

never been confined prior to the experiments, and the results obtained would doubtless have been better with improved stock. The nutritive ratio was practically the same in each ration. There were four shotes in each lot, and they were fed in open troughs, morning and night, supplied with running water and kept in a large pen without shelter. They were fed for a preliminary period of 20 days before beginning the experiment, in order to accustom them to feeding in confinement. Results obtained are summed up and compared thus:

TABLE COMPARING RESULTS IN FEEDING SWEET POTATOES AND CORN, IN RATIONS WITH MIDDLINGS

| Ration. | Weight of the four hogs at beginning. | Gain made. | Per cent gained. | Feed eaten. | Nutritive ratio. | Cost of rations. | Cost cents per pound gain. |
|---|---|---|---|---|---|---|---|
| | Pounds | Pounds | | Pounds | | | |
| Corn (2 parts)..... | 452 | 160.0 | 35.39 | 406.80 | 1:5.9 | $9.13 | 5.7 |
| Wheat middl'gs (3 parts) | | | | 610.20 | | | |
| Sweet potatoes (1 part) | 406 | 126.5 | 31.16 | 639.45 | 1:5.8 | 10.02 | 7.9 |
| Wheat middl'gs (1 part) | | | | 639.51 | | | |

## ARTICHOKES

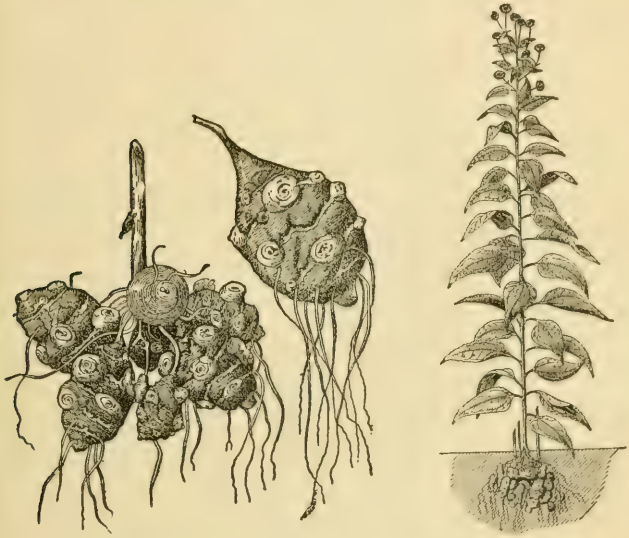
The "Jerusalem" artichoke, a tuber belonging to the sunflower family, is in some sections, mostly outside the corn belt, considerably esteemed as a wholesome and inexpensive fall, winter and spring food for swine. It is estimated as having approximately the same feeding value as potatoes, or a little more. It will grow where the potato does not thrive, and is nearly always harvested

by the hogs. Its worth, cost considered, has not been fully appreciated, perhaps because of the prevalent idea that, once established in the soil, its eradication is very difficult, but this is not necessarily a fact. It grows from the eyes of the tuber, which may be planted whole, or cut. If planted in the late fall the whole tuber is used. In spring the pieces will do. Plant in rows about the same as potatoes, so that cultivation may be given. As the plant grows up several feet high, the rows should be about three feet apart and the plants some 18 inches in the rows. Plant as deep as potatoes, and cultivate about the same. The plot should be near the hog lots and fenced hog tight. In the fall, when the tubers are grown, the hogs will do the harvesting.

By preventing the hogs from securing all the tubers this crop can be grown successively for several years without replanting. In the spring the cultivator is started after the new plants show, and everything torn out except the plants in the rows. To destroy the crop let the hogs root out every tuber if possible. When any stray plants appear, plowing and planting to corn or some cultivated crop makes their eradication comparatively easy.

In tests at the Oregon station hogs which were given the run of an artichoke field, and were also given a partial feed of grain, made a gain of one pound in weight for each 3.1 pounds of grain fed, while it usually takes about five pounds of grain to make one pound of gain. In tests made at the Missouri agricultural college, one bushel of artichokes and three bushels of corn were found superior to four bushels of corn, and other tests

have given similar results. The inexpensive gain in weight is not the only advantage in using artichokes, as the better health consequent on adding to the ration this fresh and succulent feed is a matter of great importance, especially in animals which are kept for breeding. The best soil for the crop is similar to that best for Irish po-



TUBERS AND MATURE ARTICHOKE PLANT.

tatoes. It should be rich, mellow and well drained. On dry, hard clay the yield is always small.

South Carolina experiment station Bulletin No. 128 says: "During November and December, when March shotes ought to be fitted for the block, they should be turned onto patches of artichokes and Spanish peanuts, which make an excellent combination of feeds, that,

moreover, have the advantage of enabling the hogs to do the harvesting. Sweet potatoes and chufas may be used as substitutes for artichokes; on account of the watery nature of potatoes and artichokes they should never be used alone, but in conjunction with more concentrated feeds, like peanuts, peas, corn and grains." In Canada artichokes seem to find favor. The pamphlet on bacon production issued by the Ontario agricultural college (Bulletin No. 129) says: "In some sections this crop is very popular as a hog food. It is suitable, however, only for somewhat light, sandy soils. Artichokes may be planted in the late fall or early spring, in rows 21 to 24 inches apart, and from 12 to 18 inches apart in the rows. They are usually ready for feed about September 15. Artichokes have a little higher feeding value than potatoes, and hogs are very fond of them." In Oregon the yield was found by the experiment station to be 740 bushels per acre. An experiment there (Bulletin No. 54) with artichokes used with a small quantity of chopped (coarsely ground) wheat and oats resulted in an average daily gain of .81 pound each by swine weighing from 117 to 215 pounds. "The pigs were healthy and vigorous during the feeding period," says the report. "It does not cost much to raise a small area of artichokes. A small acreage might be profitably employed by any farmer who expects to make his own bacon or supply the market with a superior grade of pork products. Artichokes do best in rich, loose soil, where there is an abundance of decayed vegetable matter."

At the Central experimental farm of Canada (Annual Report of Experimental Farms, 1900) one-sixteenth of

an acre in artichokes returned a net profit in pork of $9.76. The pigs harvested the artichokes while the tubers were immature, and were given in addition during the 21 days of the experiment 189 pounds of meal, consisting of one-half corn and one-sixth each of oats, peas and barley, making a daily grain ration of 1½ pounds per pig. In commenting upon the fondness for artichokes shown by the pigs, Professor Grisdale said: "I have never seen pigs eat anything with more gusto." The favorable daily gain is interesting, especially in view of the small quantity of grain used. The gains made by the pigs are shown in the following table:

GAINS MADE BY PIGS ON ARTICHOKES AND GRAIN

| No. of the Pig. | Weight Oct. 3. | Weight Oct. 24. | Gain. | Daily rate of gain. | No. of the Pig. | Weight Oct. 3. | Weight Oct. 24. | Gain. | Daily rate of gain. |
|---|---|---|---|---|---|---|---|---|---|
| | Pounds | Pounds | Pounds | Pounds | | Pounds | Pounds | Pounds | Pounds |
| 263... | 100 | 131 | 31 | 1.47 | 269 | 109 | 145 | 36 | 1.71 |
| 264... | 105 | 141 | 36 | 1.71 | 271 | 95 | 127 | 32 | 1.52 |
| 267... | 106 | 138 | 32 | 1.52 | | | | | |
| 268... | 111 | 141 | 30 | 1.42 | Total | 626 | 823 | 197 | 1.57 Aver'ge |

The tops of the Jerusalem artichoke are seldom, if ever, eaten by swine, but are considered excellent fodder for horses or cattle. A comparatively small planting is ample for a number of hogs.

### CHUFAS AND THE CASSAVA

Chufas are used to some extent in the southern states, particularly in winter, with artichokes. The Alabama experiment station (Bulletin No. 122) obtained one pound of growth for 1.92 pounds of grain when shotes

were given a half ration of grain and grazed on chufas. It was found in another experiment at the Alabama station that an acre of chufas converted into pork was worth $13.09 when live hogs were selling at 3½ cents per pound. The Arkansas station (Bulletin No. 54) estimated a product of 592 pounds of pork from one acre of chufas.

The chufa is considered more difficult to eradicate than the artichoke. It is also regarded as having a deleterious effect upon the melting point of lard from hogs that have not had more or less corn in the last weeks of their fattening.

The cassava has been found to give excellent results when fed to swine in connection with wheat middlings and cowpeas for fattening (Florida experiment station Bulletin No. 55).

### PUMPKINS AND SQUASHES

Pumpkins and squashes are much relished by swine, and the former especially have been fed to hogs in America for a century with pleasing results. They make a useful and cheaply raised supplement for corn, and their keeping qualities add to their value as a succulent food for winter. The custom of planting pumpkins with corn results in their being grown at almost no expense. Those of inferior quality should be fed out first, leaving the soundest for storing. The seeds are exceedingly rich in protein, and if hogs are given many pumpkins the animals should be watched to see that they are not being overfed with seeds and their systems thereby deranged.

Pumpkin seeds are a natural vermifuge and are valuable for hogs afflicted with any kind of worms.

Pumpkins are sometimes cooked for swine, but recent experiments indicate that this is not profitable. Trials at the Central experimental farm of Canada (Annual Report of Experimental Farms, 1900), and the Oregon (Bulletin No. 54) and New Hampshire (Bulletin No. 66) experiment stations have been averaged by Rommel (Bulletin No. 47, Part II, Bureau of Animal Industry, U. S. Department of Agriculture) to show that a pound of pork gain was made from 2.73 pounds of grain with 3.76 pounds of raw pumpkin, as compared with 2.22 pounds of grain with 11.5 pounds of cooked pumpkin. Results from the experiments are shown in the table on page 262.

In the Canadian experiment the grain mixture was half corn and one-sixth each of oats, peas and barley. Shorts were fed with the pumpkins at the Oregon station, and skim milk and corn meal were given in the New Hampshire experiment.

A trial of feeding pigs rations of skim milk and raw pumpkins was also made at the New Hampshire station (Bulletin No. 66). In estimating profits the pumpkins were valued at 40 cents per ton, the bare cost of raising in the field, and skim milk at 20 cents per hundredweight. Three shotes averaging 141 pounds each were fed for 25 days on all the pumpkins they would eat and a daily allowance each of 8.4 pounds of milk. They were charged by Agriculturist C. W. Burkett, who conducted and reported the experiment, with eating 3,798 pounds of pumpkins, which would be the astonishing daily average

RESULTS FROM FEEDING OF RAW AND COOKED PUMPKIN

| Ration. | Number of pigs. | Average weight at beginning. | Total gain. | Number of days fed. | Average daily gain. | Feed eaten. | | | Feed per 100 pounds gain. | | | Cost per 100 pounds gain. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Grain. | Milk. | Pumpkins. | Grain. | Milk. | Pumpkins. | |
| | | Pounds | Pounds | | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | |
| Ottawa: | | | | | | | | | | | | |
| Raw pumpkins... | .. | .... | 745 | 107 | .... | 1,981 | .... | 2,090 | 267 | .... | 281 | $3.08 |
| Cooked pumpkins | .. | .... | 706 | 99 | .... | 1,602 | .... | 7,500 | 227 | .... | 1,062 | 2.96 |
| Oregon: | | | | | | | | | | | | |
| Cooked pumpkins | 6 | 171.5 | 499 | .. | 1.49 | 924 | .... | 7,523 | 185 | .... | 1,508 | 2.99 |
| New Hampshire: | | | | | | | | | | | | |
| Raw pumpkins.. | 3 | 142.0 | 170 | 25 | 2.26 | 514 | 630 | 1,348 | 302 | 370 | 793 | 3.31 |
| Cooked pumpkins | 3 | 138.6 | 166 | 25 | 2.21 | 514 | 630 | 742 | 309 | 379 | 447 | 3.32 |

per shote of 50.64 pounds. The gain was 84 pounds for the lot of three shotes, as compared with a gain of 170 pounds for a similar lot fed for an equivalent period on a ration of skim milk, corn meal and raw pumpkins. The food for the latter lot cost $5.64, and the market value of the gain was $9.35 at 5½ cents a pound for live pork, making a profit of $3.71. For the lot fed on milk and pumpkins only the gain was worth $4.62, and the cost for food was but $2.00, making a profit of $2.62. The average gain per day was 1.12 pounds by each shote of the lot having no corn meal, as compared with a daily gain of 2.26 pounds per shote in the lot given the meal.

Squashes are not so frequently used in hog feeding, although their value should be fully equal to that of pumpkins, and hogs will eat them quite as readily. Doubtless the hardness and thickness of the rinds of most squashes has an influence against them. In sections where they are grown in quantities for their seeds squashes with their seeds removed are usually best turned to profit by swine.

A Colorado farmer relates the following in reference to the use of Hubbard squashes in that State: "A neighbor claims he can finish the fattening of hogs on Hubbard squashes in one-half the time he can with corn, while with pumpkins he can only make them hold their own. He says he can finish a hog in fair condition in six weeks on about one ton of squashes, making a 200-to-250 pound hog. He cuts the squashes and feeds them raw, and says the hogs clean up everything, shell and all."

The squash apparently has a fattening value greater than that of the pumpkin, and both pumpkins and squashes are worthy of more attention in swine husbandry than has been generally given them.

**A Yorkshire Sow, as Portrayed in 1870**

CHAPTER XII.

# The Pork-Maker's Mainstay

### NOT DESIRABLE FOR ALL PURPOSES

Indian corn is at once the dependence and the despair of the pork maker. So easily and abundantly raised, and in such convenient form for feeding, especially in cold weather, it has rightfully earned place as the principal grain for fattening all kinds of farm stock. Its very richness and convenient form cause it to be used in many cases without a proper understanding of its adaptability to the animal economy, and the result is naturally shown in tendencies toward disease. In its great strength lies its weakness in the hands of the man who does not use this wonderful grain with a good knowledge of its capabilities and limitations; yet, as a cheap fattening food for all classes of farm stock, corn stands in America without a peer. There is little doubt that with mature animals more rapid gains can be obtained at less expense from corn than from any other single cereal. The ease with which it can be produced, its exceedingly high nutritive value, its digestibility and palatability, give the stockmen within the corn belt a long lead in almost every branch of animal industry.

Corn is the most palatable grain fed to live stock, probably because of the nutlike pieces into which the kernels break when chewed; doubtless it is also better

relished because of the presence in it of so much oil. It is extremely rich in oil and starchy matter, and comparatively poor in protein and ash, being, therefore, unusually well adapted for supplying material for fat and heat, but not for bone and muscle. Hence, its largest value is not for breeding stock and growing pigs, but perhaps more nearly than any other one grain it approaches the ideal, when properly utilized, for quick fattening for market. A carbonaceous food, its use alone is not the best feeding, as experience has abundantly testified. No matter how well one phase of the body's composition may be looked after, if other important constituents are ignored and uncared for, nature is pretty certain to set up a vigorous complaint, which is not uncommonly referred to as hog cholera, but, when the exact truth is desired, will perhaps be more appropriately designated as carelessness. An almost exclusive corn diet and unclean conditions will produce fatal results with human beings; this statement finds verification in the terrible disease known as "pellagra" or "Italian leprosy," afflicting the peasantry of southern Europe. The Encyclopedia Britannica says of this disease: "The special factor is undoubtedly maize as an article of diet or as the staple diet; but it is, on the other hand, perfectly clear that there is nothing in a maize diet itself to induce pellagra. Its presence within its actual endemic area varies much from province to province or from commune to commune, *being always least* where the maize diet is supplemented by wheaten flour, rice, beans, chestnuts, potatoes or fish."

## RESULTS OF ILL-BALANCED FEEDING

The effect of exclusive corn feeding to swine at all ages, even under conditions of average cleanliness, is a matter of important knowledge for the feeder. This was shown in experiments at the Wisconsin station and reported in *"Swine Husbandry"* as follows by Prof. W. A. Henry:

"Knowing corn to be a universal hog food and often used almost exclusively by many of our farmers, and further knowing that chemistry shows that corn is excessively rich in the carbohydrates or heat and fat formers, while it is low or poor in protein and ash elements which go to make up bone and muscle, we thought to feed it exclusively to one lot of hogs that we might see the effect. The experiments show that when we feed hogs a ration rich in carbohydrates but lacking in protein, like corn meal, we will find:

"1. That there is an excessive development of fat, not only on the outside of the muscles and beneath the skin, but also among the muscles.

"2. That the muscles of the body fail to develop to their normal size, especially some of the most important ones, as those along the back.

"3. That an abnormally small amount of hair and a thin skin result.

"4. That, while the brain, heart and lungs do not seem to change in weight, the spleen, liver and kidneys are unusually small.

"5. The amount of blood in the body is greatly reduced from the normal.

"6. The strength of the bones may be reduced one-half.

"We may conclude that a system of feeding which robs the hog of half its blood and half the natural strength of the bones, and produces other violent changes, is a most unnatural one, and must, if persisted in, end in giving us a race of animals unsatisfactory to all concerned. From parents thus weakened must come descendants that will fall easy victims to disease and disaster. Knowing the facts as here set forth, can we any longer wonder that our hogs are weak in constitution and easily break down when attacked by disease? Nor is this all; the meat from such animals can hardly be of flavor and composition satisfactory to the consumer.

"Shall we raise less corn, then? Not at all. The corn crop is the best of all we raise, and let the word be 'more' rather than less. We need it all, but we must not forget that protein is somewhat lacking in corn. We may compare our corn to the bricks which go into a building, and the protein food to the mortar which cements the bricks together. He who would lay up bricks without mortar builds foolishly, and his house will tumble. Should he find out his mistake, such a man should not from that date neglect the bricks and turn his whole attention to the mortar. Plenty of good strong mortar and an abundance of bricks are what he needs. We do not want less corn, but we want more clover, more shorts, more bran, more peas, more skim milk, and more alfalfa to bring the highest results."

### RELATIVE COST OF CORN AND PORK

One hundred pounds of pork from ten bushels of corn is the usual estimate by American farmers who feed whole corn in their large and careless way, under most unfavorable and unpromising conditions, but fed in different form, and in conjunction with other feeds, it will make more, as has been thousands of times fully demonstrated by careful feeders, both in America and Europe. While it is perhaps true that the bulk of the corn fed to hogs does not give a return of ten pounds of pork, live weight, per bushel, it is established that a bushel of corn will make that much, and more, if properly used; and where it does the following basis is approximately correct for making calculations:

Feeding with corn worth 12½ cents a bushel, makes pork costing 1½ cents a pound for the corn consumed.

Feeding with corn worth 17 cents a bushel, makes pork costing 2 cents a pound.

Feeding with corn worth 25 cents a bushel, makes pork costing 2½ cents a pound.

Feeding with corn worth from 33 to 40 cents a bushel, makes pork costing 4 cents a pound.

Feeding with corn worth 50 cents a bushel, makes pork costing 5 cents a pound.

Or, figuring the other way:

Pork at 5 cents a pound, live weight, gives 50 cents a bushel for corn.

Pork at 4 cents a pound, live weight, gives from 33 to 40 cents a bushel for corn.

Pork at 2½ to 3 cents a pound, live weight, gives from 25 to 30 cents a bushel for corn.

The foregoing are merely adaptations of the farmer's rule that hogs are fed with profit when the corn consumed costs around ten cents a bushel for each dollar per 100 pounds received for the fatted hogs, live weight.

### QUANTITY OF CORN REQUIRED

Toward solving the problem as to the corn required to bring a hog to 200 or 250 pounds, live weight, the best help is experience, obtained with hogs in their pens and pastures, and none has more of that character about it than some recited by John Cownie of Iowa:

"I can answer that question," says Mr. Cownie, "for I have weighed, not one or a dozen of hogs, but hundreds of them, at all ages and under common farm conditions. With good, thrifty hogs weighing 200 pounds, and the range of a good clover pasture, I have secured a gain of 15 pounds, live weight, for each bushel of corn. With well-bred, thrifty hogs, confined to a feeding floor and being fattened to a finish, with no other food but ear corn and water, I consider 14 pounds of ear corn daily for hogs weighing 250 to 300 pounds an average allowance, and the gain should be about two pounds daily. In other words, a hog of these weights will consume a bushel of corn in five days and make a gain of ten pounds. These are no guesswork figures or experiments with a few hogs, but the results of feeding hundreds, I might truthfully say thousands, with every ear of corn weighed, the hogs weighed every four weeks, and each and every part of the work done by myself and every figure verified so as to make errors impossible.

"But, again, I have seen less than six pounds of gain obtained from each bushel, although every effort was made to secure better results and the hogs were in a thrifty condition. The weather has much to do with gain in weight, and I have seen during long-continued, cold, stormy weather, even with comfortable quarters, very little increase in weight, while there would be only a small reduction in the quantity of corn consumed.

"A young hog will make a somewhat larger gain from a bushel of corn than an older animal, if thrifty and the feeding is judiciously done, but in round numbers a gain of ten pounds in live weight for each bushel of corn is very satisfactory. A hog weighing 200 pounds would, according to these figures, have consumed 20 bushels of corn, and one weighing 300 pounds, 30 bushels. But to secure these weights the hogs must be well bred, thrifty and judiciously fed, and should have the run of a pasture with plenty of grass. The best results will be obtained by giving corn sparingly to young hogs and substituting in its place shorts, ground oats and other bone-and-muscle-forming food, finishing with corn. Let no one be deceived with these figures and conclude that ten pounds of live weight in hogs is the easy rule for each bushel of corn. I know men who do not secure one-half that gain, and yet have been engaged in feeding hogs all their lives. Painstaking application, good judgment and an unswerving determination to secure success, with a love for the work, are all necessary to secure the best results in raising hogs."

A comparative experiment made at the Ohio state university gave 12.3 pounds of pork as the product from one

bushel of corn, while 13.7 pounds were produced from one bushel of wheat. The actual gain in favor of corn was revealed through a comparison of the market prices of the grains. This showed that the cost of producing 100 pounds of gain from wheat was $4.01, and from corn, $2.85.

At the Illinois station Prof. George E. Morrow made numerous experiments to ascertain the live weight of pork that could be expected from hogs of differing ages confined to a diet of whole corn, at various seasons of the year, and the following table gives the details, and resulting averages:

WEIGHTS OBTAINED FROM WHOLE CORN FED TO HOGS AT THE ILLINOIS EXPERIMENT STATION

| No. of lot. | Time of feeding. | No. of days. | No. of hogs. | Av. wt. of hogs. | Gain per day. | Corn for 100 pounds gain. | Gain per bushel of corn fed. |
|---|---|---|---|---|---|---|---|
| | | | | Pounds | Pounds | Pounds | Pounds |
| 1 | Nov. 24 to Dec. 29.. | 35 | 2 | 290 | 2.56 | 418 | 13.4 |
| [1]1 | Nov. 24 to Dec. 22.. | 28 | 2 | 284 | 2.70 | 382 | 14.7 |
| [1]1 | Dec. 15 to Dec. 22.. | 7 | 2 | 311 | 3.21 | 333 | 16.8 |
| 2 | May 5 to June 2.. | 28 | 5 | 153 | 1.39 | 437 | 12.8 |
| 2 | June 2 to June 30.. | 28 | 5 | 192 | 1.38 | 484 | 11.6 |
| 2 | June 30 to July 28.. | 28 | 5 | 224 | .85 | 646 | 8.7 |
| 3 | April 29 to May 27.. | 28 | 2 | 209 | 1.40 | 380 | 14.7 |
| 4 | June 10 to July 22.. | 42 | 2 | 212 | .90 | 535 | 10.5 |
| 5 | July 30 to Sept. 10.. | 42 | 3 | 66 | .77 | 441 | 12.7 |
| 6 | June 17 to Sept. 9.. | 84 | 3 | 207 | .60 | 676 | 8.3 |
| 7 | Dec. 30 to Feb. 4.. | 56 | 5 | 109 | .51 | 808 | 6.9 |
| 8 | Jan. 24 to Feb. 4.. | 28 | 6 | 106 | 1.05 | 465 | 12.0 |
| 9 | Nov. 22 to Jan. 4.. | 42 | 2 | 210 | 1.30 | 500 | 11.2 |
| 10 | Jan. 17 to Feb. 21.. | 35 | 4 | 192 | 1.29 | 460 | 12.2 |
| 11 | Nov. 3 to Dec. 15.. | 42 | 3 | 120 | .74 | 605 | 9.3 |
| 11 | Dec. 15 to Dec. 22.. | 7 | 3 | 138 | .55 | 620 | 8.9 |
| Totals and averages.... | | ..... | 50 | 173 | 1.09 | 534 | 10.9 |

[1] Omitted from averages.

This shows that on an average the hogs gained about 1.1 pounds per day, and that a bushel of shelled corn weighing 56 pounds produced 10.9 pounds of gain, live

weight. The table shows a wide range of returns—as low as 6.9 pounds of gain from a bushel of corn in one case, while at the other extreme we have 16.8 pounds. This last return, for one week only, was with hogs which had previously followed steers fed corn on blue grass pasture. "While, then," said Professor Morrow, "the gains may range from six to 16 pounds, we may conclude that 11 pounds of increase, live weight, is a satisfactory return from a bushel of whole corn."

### CORN MEAL AND CORN-AND-COB MEAL

Fattening hogs will usually finish faster on corn meal than on shelled corn, and many farmers favor corn meal for that reason. Experiments covering the quantity fed plainly show, however, that hogs given corn meal eat more feed in a given time than those on shelled corn. When both the feed eaten and the gains made are taken into consideration, the profit in favor of corn meal is considerably less than many suppose. Corn-and-cob meal has been shown to have about the same value as pure corn meal; if any advantage is had from corn-and-cob meal, as is claimed by some stockmen, it no doubt largely comes from the bulk furnished by the particles of cob, which by rendering the contents of the stomach less compact or more porous helps to their easier and more complete digestion.

The Missouri station conducted a number of experiments in 1904 testing corn meal and corn-and-cob meal in comparison with other rations for dry-lot feeding (Bulletin No. 65), concerning which the following was reported: "Corn-and-cob meal has had advocates for many

years, and some experiments with this feed, tested in opposition to pure corn meal, have clearly proved the fact that it may be more useful for fattening purposes than corn alone. When used with cattle it is about as valuable as the same number of pounds of pure corn meal and the results of tests have been, in general, consistent. In this case it is merely a question as to whether a bushel of ear corn can be made into corn-and-cob meal at no greater cost than the value of 14 pounds of corn. In the case of hog-feeding, however, tests with corn-and-cob meal have not been consistent. Some investigators prove that it is a good and economical feed; others demonstrate that it is decidedly not useful for hog feeding. There are several elements of difference between the feeding of corn-and-cob meal to hogs and to cattle. It must be ground much finer for the hog than for the steer and this takes much more labor; also, the characteristics of corn-and-cob meal as regards bulk and palatability militate against its usefulness for hog-feeding. The feed is bulky and unpalatable if the percentage of cob is high. The results favorable to the use of corn-and-cob meal for hogs must have been obtained with corn which shelled out a very low percentage of cob. Such value as results from the presence of the cob does not come from the small amounts of nutriment which it contains, but rather from the lightening, or extending tendency which it has, allowing the meal to become more thoroughly impenetrated by the digestive fluids, and requiring longer mastication. Profit, however, requires that this lightening or extending of the ration be accomplished with the minimum amount of indigestible material. The idea has

presented itself to the writer that if there is need of this mechanical improvement in the condition of corn meal it may be attained at less expense by the addition of wheat bran than by the grinding of the corn cob."

The ration with corn-and-cob meal fed in the foregoing experiment contained 14.3 pounds of cob to the bushel, which, said Prof. E. B. Forbes, under whose direction the experiment was conducted, formed a ration which "had nothing to commend it. To give an unpromising feed a fair chance, we reckoned the grinding of corn-and-cob at ten cents per 100 pounds, as with corn meal, considering that with a grinder especially adapted to ear corn the cost might not be appreciably more than with shelled corn; but, as a matter of fact, with the best grinders available, it was necessary to grind this corn-and-cob meal three times before it was fine enough to feed to a hog. Even then it should have been finer. In Missouri there are varieties of corn which shell out only about six pounds of cob per bushel and would make good corn-and-cob meal for pig-feeding; there are others grown especially for large woody cobs, which shell out about 25 pounds of cob to the bushel, and, if made into corn-and-cob meal would be only about as valuable as equal parts of corn meal and sawdust."

In the Missouri experiment the cost of 100 pounds of pork was found to be as follows with corn at 30 cents a bushel; wheat middlings, $15 a ton; wheat bran, $13 a ton; oats, 20 cents a bushel; gluten feed, $19 a ton; linseed-oil meal, $24 a ton; ground bone, $25.50 a ton; cost of grinding corn, 10 cents per 100 pounds, no account being considered as to the cost of soaking:

| Lot | Ration | Cost for 100 pounds gain |
|---|---|---|
| 1 | Corn meal, 5 parts; linseed-oil meal, 1 part | $2.75 |
| 2 | Corn meal, 20 parts; linseed-oil meal, 1 part | 2.85 |
| 3 | Corn meal, 2 parts; wheat middlings, 1 part | 2.88 |
| 4 | Corn meal, 4 parts; wheat middlings, 1 part | 3.03 |
| 5 | Corn meal, 2 parts; ground oats, 1 part | 4.28 |
| 6 | Corn meal, 4 parts; ground oats, 1 part | 4.06 |
| 7 | Corn meal, 4 parts; wheat bran, 1 part | 3.14 |
| 8 | Corn-and-cob-meal | 4.81 |
| 9 | Corn meal | 3.53 |
| 10 | Soaked, whole shelled corn | 3.10 |
| 11 | Shelled corn and bone meal | 3.55 |
| 12 | Shelled corn | 3.71 |
| 19 | Corn meal, 5 parts, and one-half part each of linseed-oil meal and gluten feed | 2.87 |

Other experiments have shown that better results were obtained by soaking corn-and-cob meal 12 hours before feeding than by feeding it dry. It is difficult to finish on corn-and-cob meal because it lacks the quality for keeping the appetite to an edge which will demand enough grain for fattening. When hogs begin to tire of corn-and-cob meal it is time to change to whole corn, straight corn meal, or such other feed or combination of feeds as are both palatable and fattening.

### FROSTED AND SOFT CORN

Untimely severe frosts sometimes damage the corn crop so that its marketable value is considerably lowered, but in this event, as in other cases, the hog comes to the rescue. Soft corn is considered excellent for swine, and especially for the young; in fact, many breeders believe they can obtain better gains from soft corn than with the sound, hard grain. In soft corn the maturing of the grain has been checked, thereby arresting the development of the starch content or fat-producing element. When used it is advisable to add, for finishing, some corn that is well matured. Immature corn that is frozen

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and even somewhat soured may be fed to hogs, but if there is on hand a greater quantity in that condition than can be used on the farm before warm weather sets in it should be disposed of while the weather is cold. Ordinarily it may be used in cold weather without danger, but it should not be carried over into the warm season, as it will ferment and become unfit for use.

### FOLLOWING AFTER CATTLE

A very common method among farmers in the corn-feeding territory is to put shotes of 80 to 150 pounds weight with the cattle whenever grain feeding is begun—generally about October 1—at the rate of 15 to 20 shotes to ten full-fed steers, the number depending on the amount of grain used and the manner in which it is placed before the cattle. In the fine weather of fall and early winter it is common to feed corn in the fodder or in the shuck by throwing it upon the grass in the pasture; the favorite way is to feed in two different inclosures, and each day to turn the hogs into the lot where the cattle were fed the day previous, which enables them to pick up the leavings of the cattle without trampling on and over that day's feed until the cattle have eaten as much of it as they wish.

When full grain feed is given to cattle in this way about two shotes to each steer are not too many, but when corn is fed in tight boxes and troughs, so that but a small proportion is scattered, from one shote to one and one-half to the steer will keep the feed lots well gleaned. If more are kept, additional grain will be required

within their reach to fatten them rapidly, but if only growth is the object two and one-half to three shotes to each steer that is on full feed will fare pretty well.

The grain voided whole by the cattle seems to be so softened and digestible that hogs thrive on it amazingly, consequently those more advanced are soon in a condition to market and others can occupy their places in the feeding lots. Hogs seldom fatten more rapidly, inexpensively, or with less outlay of labor than when handled in this way, and the method is held in high favor from the fact that every pound of increase from the droppings and scattered corn is clear gain, none of which would be realized without the hog. One too common defect in this method of managing is that the hogs are not generally provided with suitable sleeping quarters, where they can be comfortable without crowding, and are out of danger of being trampled and horned by the cattle. When hogs following cattle become heavy and clumsy, they should be taken out of the steer lots, giving way to others more active.

The gain made by giving hogs access to the droppings of cattle will depend considerably upon the manner in which the corn is fed. The waste from feeding corn in any manner is always great enough to make it profitable to follow with hogs, but the gains by the latter will naturally be larger when ear or shelled corn is fed. The Illinois experiment station has found (Bulletin No. 103) that in providing enough pigs to consume the undigested feed in the droppings of steers twice as many are required when corn is given whole, as in cases where corn meal is fed. The experiment at the Illinois station covered

six months from November, 1903, to June, 1904, in the feeding of corn in various forms to steers which were followed by shotes averaging about 110 pounds each at the beginning. The number of shotes kept with the steers varied according to the character of the ration, being made sufficient to consume the droppings available for pork production. The results in pork production are shown in the following table:

PORK MADE FROM DROPPINGS IN THE VARIOUS LOTS

| Lot No. | Form in which corn was fed. | Number of pigs per steer. | Pounds pork per steer. | Pork per 100 pounds corn as fed to steers. | Per cent cost of feed given steers paid for by gain of hogs following[1] |
|---|---|---|---|---|---|
| 1 | Silage and corn meal..... | .10 | 6.30 | .19[2] | .94 |
| 2 | Ear corn..... | .53 | 62.60 | 1.68 | 9.70 |
| 3 | Ear corn (without nitrogenous concentrates)..... | .53 | 74.13 | 1.89 | 14.05 |
| 4 | Corn meal..... | .27 | 20.66 | .67 | 3.00 |
| 5 | Corn meal (hay chaffed)... | .27 | 20.02 | .65 | 2.86 |
| 6 | Corn-and-cob meal..... | .27 | 18.00 | .46 | 2.60 |
| 7 | Corn-and-cob meal (hay chaffed)..... | .27 | 24.00 | .63 | 3.34 |
| 8 | Shock corn and ear corn... | .60 | 73.50 | 1.81 | 12.72 |
| 9 | Shelled corn (mud lot).... | .70 | 85.80 | 2.79 | 12.86 |
| 10 | Shelled corn..... | .70 | 111.50 | 3.61 | 16.67 |

[1] Computed on basis of ear corn in silage and shock corn.
[2] Gain on hogs valued at $5.00 per 100 pounds.

The feeding of Lot 10 was done on a brick pavement where the shotes were able to utilize nearly all of the waste, while Lot 9, which was fed in a mud-lot, had, at times, but little opportunity to recover the waste. The report on this experiment said: "It should be borne in mind that at no time during the test did the hogs get other feed than that secured from the droppings of the steers, and that the steers did not get as heavy grain rations for as long a time as is the usual practice among

cattle feeders. This leads to the conclusion that gains of hogs and the value of the same reported here should be looked upon as the minimum pork production to be anticipated in cattle-fattening operations." Larger gains were made by the hogs where corn only was fed to the cattle than where it was supplemented by linseed-oil meal and gluten meal.

The amount of waste when whole corn is fed to steers may generally be figured at about 25 per cent. It is better for practical results to have more shotes than are needed to clean up the droppings, rather than a smaller number, for they will thereby obtain more exercise and be less liable to laziness with consequent injury or disease. In case more hogs are turned in than are necessary to take care of the droppings, they should be given sufficient additional feed, preferably on a feeding floor in a lot apart from the cattle. The exercise obtained by shotes which run with cattle is an important consideration, and so small a number should not be turned in with steers that they are not compelled to work for their feed.

### "HOGGING OFF" CORN

When farm labor is high priced and difficult to secure, the helpful hog can relieve the situation by harvesting the corn for himself. The practice of turning swine into a portion of the field to gather the corn they eat, which is termed "hogging off" or "hogging down," was formerly much condemned as a shiftless or lazy procedure, but it has grown in favor and many find it good farm economy when rightly managed, especially

through the saving of labor. It is not advisable to turn hogs into the entire corn field, nor to allow them access to the standing corn too early, as the grain will not then have the feeding value it has after full maturity, and the hogs are more liable to the ailments that may come from using new corn. "Maturity" does not, however, necessarily mean, for this purpose, that the corn must be flinty or even hard.

Before hogs are put on full feed on new corn they should be prepared for it by a gradual introduction; this may be by giving them green corn, stalks and ears, in increasing quantities along with their dry feed. Thus the change from old to new feed or from dry to fresh feed is not made so rapidly that the hogs suffer. If they are turned into an acre or two at a time, or not more than they can clear up in a period of two weeks, best results will be secured. The portion of the field set aside for them may be separated from the rest by a temporary fence or hurdles. A wire fence with posts temporarily located as wanted is sometimes used, but wire fencing is difficult to handle in heavy corn.

"Hogging off" corn is most advantageous when the weather is dry. It is not judicious to keep hogs in the fields after heavy rains. If the season is a wet one it will be better to keep them out of the corn field, as turning them in is likely to waste the corn and do injury to the hogs and to the land. On dry ground, however, the droppings by the hogs amount to a distribution of valuable manure. In case this is liable to be washed off the land by rains after the corn has been harvested it will be well to go over the field with a sharp disk or

spike-toothed disk harrow to loosen the surface soil so that the manure will be the better retained and absorbed.

### SAVING MADE BY "HOGGING OFF"

Where conditions are favorable hogs will clean up field corn with but inconsiderable waste and leave comparatively little, if any, to be gathered afterward. One of the agricultural developments in later years is that the swine of greatest profit and wholesomeness are produced by their having pasturage or pasture conditions from pighood to marketing. "Hogging off" corn is pasturing on grain instead of grass, and this, supervised with good judgment, is easily economical rather than wasteful. Pastured in cornfields, the swine are benefited by the exercise and healthful surroundings. It is sometimes estimated that the expense of husking, cribbing and feeding corn is as great as that of growing it, and even if this is or is not approximately correct, the "hogging off" process can be the means of a large saving. A method often followed is that of turning in the fattening hogs first and letting the brood sows and shotes follow them later, which will give a cleaning up with a minimum of waste. Ears which are beyond the reach of swine may be gathered. Pumpkins or rape may be planted to advantage in the section of the corn field intended for the hogs, thus providing a most wholesome variety of feed and more succulence.

As an instance of methods and results in "hogging down" corn the following practical bit of experience is given by an Indiana subscriber to *Farm, Stock and Home:*

"In September, 1905, I decided to allow my shotes, 101 in number, to gather their own feed for a time, and having anticipated the same during the early summer, I had sown in seven acres of corn, at the last plowing, Dwarf Essex rape seed, and, having an abundance of rain to aid germination and growth, the rape did remarkably well, and when the corn was enough matured to feed to hogs safely the rape was from ten to 12 inches high and a good, even stand. I began using this corn by cutting and throwing it over the fence to the shotes on September 5, and on that date the 101 head averaged 79 pounds each, the lot weighing 7,980 pounds.

"After gradually increasing the quantity for about ten days, I turned the shotes into the field to help themselves. The corn was an excellent crop, probably averaging 85 to 90 bushels per acre. The shotes all did exceedingly well, not one being sick. On October 24 the corn seemed to be all consumed and the rape as well. That day being a very rainy one and not suitable for weighing the hogs, I turned them into their former pasture and fed them husked corn for the day. The next day they weighed 18,100 pounds, an average gain of 100 pounds each for the 50 days they were thus fed. I sold them a few days later at $4.85 per 100 pounds, weighed at home. As stock hogs the shotes were worth $5 per 100 pounds at the beginning of the feeding period, or $398.95. I received for them $876.88, or $477.93 gain, equal to $68.28 per acre for the seven acres of corn and rape consumed. Conditions were most favorable for using the crop in this way, as the weather was dry and there was practically no waste. I took a basket and went

over the field a few days after turning the hogs out and got less than a bushel of corn from what remained standing."

Bulletin No. 111, Bureau of Plant industry, U. S. Department of Agriculture, is authority for this: "An Iowa farmer began hogging down corn several years ago, using 20 acres the first year. He watched carefully the feeding of the hogs on this field and concluded that no more corn was wasted than would have been left in the field by the average husker. Since that time he has hogged down all his corn, thus saving the expense of husking. This man says the cost of husking for one year will fence the field hog-tight if there is already a wire fence for cattle. Husking 40 acres of corn yielding 40 bushels per acre, at four cents per bushel, amounts to $64. If the 40 acres are a square field this allows 20 cents a rod for the fence the first year. With a cattle fence already provided this will buy the wire to make it a good hog-tight fence. Besides this there are two great objects to be attained by this method of harvesting corn: (1) The improvement of the land and (2) the health of the hogs. The farmer referred to says that in his first year's experience he snapped 20 acres of corn beside the field hogged down. The next spring both were sown to small grain under the same conditions and with the same preparation. The wheat on the land where corn was hogged down made five and the oats seven bushels more to the acre than did the other. The difference is just as noticeable in a succeeding corn crop. The husks, cobs, stalks, and leaves all remain on the land, and

these, with the manure from the hogs, enrich the soil and add organic matter to it.

"This man allows his pigs to run in the corn as soon as the land is plowed the last time, but does not let the older hogs into the field until the corn is in good condition to feed in the fall. He says he has also had good results from letting cattle into the corn first and following these with hogs. He thinks this is the most practical solution of the labor problem when help is so high-priced and scarce."

D. A. Gaumnitz and associates, A. D. Wilson and L. B. Bassett of the Minnesota station (Bulletin No. 104), made a two-year test of hogging off corn in comparison with other methods of feeding it to swine. Observations during this test, together with experiences collected from farmers in other states who have practiced hogging off their corn one or more years, have justified Mr. Gaumnitz in the following summary:

"Hogging off corn may be practiced with profit on many farms.

"Pork was produced with less grain by hogging off corn than by feeding ears or snapped corn in yards.

"Hogs fed in the field gained nearly one-third more rapidly than those fed in yards.

"The cost of fencing corn fields may be from $1.00 to $2.50 less per acre than the cost of husking the corn.

"The stover lost in following this method is, in many cases, not worth the cost of saving it.

"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 the field than when fed in the yards. They pick the corn as clean as most men do in husking.

"Three pounds of rape seed costing 15 cents sown in corn at its last cultivation furnish considerable succulent feed, which may take the place of high-priced shorts.

"Labor in caring for hogs is not increased by hogging corn, but may be decreased, if systematic methods are employed.

"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 (two or three months in Minnesota) may be very 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."

The following table is made by Mr. Gaumnitz to show approximately the number of days required for hogging off an acre of corn by a given number of swine weighing 125 pounds:

| | With Corn Shrunk to Jan. 1, and Yielding: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 30bu. per acre. | 35bu. per acre. | 40bu. per acre. | 45bu. per acre. | 50bu. per acre. | 55bu. per acre. | 60bu. per acre. | 65bu. per acre. | 70bu. 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 |
| Will keep 30 Hogs..... | 7.5 | 8.7 | 10.0 | 11.2 | 12.5 | 13.7 | 15.0 | 16.2 | 17.5 |
| Will keep 40 Hogs..... | 5.6 | 6.5 | 7.5 | 8.4 | 9.3 | 10.3 | 11.2 | 13.2 | 14.1 |
| Will keep 50 Hogs..... | 4.5 | 5.2 | 6.0 | 6.7 | 7.5 | 8.2 | 9.0 | 9.7 | 10.5 |
| Will keep 60 Hogs..... | 3.7 | 4.4 | 5.0 | 5.6 | 6.2 | 6.8 | 7.5 | 8.1 | 8.7 |
| Will keep 70 Hogs..... | 3.2 | 3.7 | 4.3 | 4.8 | 5.3 | 5.8 | 6.4 | 6.9 | 7.5 |
| Will keep 80 Hogs..... | 2.8 | 3.3 | 3.7 | 4.2 | 4.6 | 5.1 | 5.6 | 6.1 | 6.5 |

When hogs have been full fed as they are hogging off corn, they should be marketed, as quick gains are not made later in yards, and the risk of loss is not inconsiderable.

James Atkinson is of the opinion that it is a great mistake to begin hogging off corn too early. "True, they will eat some of the leaves when the corn is succulent, but even with this there is still an enormous waste. It is our opinion that a given acreage of corn will go three times as far after it begins to dent as it will if pastured when in the roasting-ear condition."

### FEEDING NEW CORN

Many farmers in the corn belt instinctively associate the thought of new corn with "hog cholera," and the belief is common in some localities that the use of new corn will cause the disease. This may indirectly be somewhat true, as the sudden change to new corn is not unlikely to produce a feverish condition which would encourage the thriving of any latent disease germs. It is undeniable that swine appear to be more generally afflicted with disease about the time new corn is made use of, but an examination might show that such a condition is rather to be expected. When the new corn is given they greatly relish the soft, succulent, fresh food, and, if permitted to do so, will eat enough to change their probable constipation to acute diarrhea, and put them in a condition which invites other ailments.

Much of the so-called cholera which comes in the autumn is but the diseased condition brought about by a

sudden change from a limited, dry diet to a plethora of the appetizing new corn. The temptation to rush hogs off to market before cold weather approaches should not encourage the farmer to make too sudden a change in his methods of feeding. When the earliest corn is in full roasting-ear stage it may be given, stalk and all, in moderate quantity, without any change at first in the usual feeding. As the corn hardens it may be given more liberally, but by a gradual increase. By the time the corn is fully matured the hogs will have become well accustomed to it. The judicious use of the new corn is purely an application of the judgment which should prevail in feeding at all times.

Hogs that have had access to plenty of green pasture are less liable to be disturbed by green or new corn than those previously kept in dry lots. Where they have been pastured on rape or green, succulent food of that character, the risk is greatly diminished. Pumpkins are excellent feed for hogs about to be put on green corn. They supply succulence, and their seeds serve well as a vermifuge.

"It is not alone when new corn is fed," says John Cownie, "that the utmost care should be taken in feeding, but at all times the strictest vigilance should be maintained as regards both feed and water. With the hogs in thrifty condition, new corn can be fed without danger, but judgment must be exercised or the worst results will follow. In feeding horses each animal receives its allowance, and it is only by carelessness or accident that a horse fed in a stall could receive an undue allowance. But in feeding a herd of hogs there are always some

more ravenous than others, and it requires the utmost care to prevent a part of them from getting more than their proportionate share. This being the case, and it being impossible to feed each separately, as with horses, it naturally follows that other feed must be supplied in addition to the new corn. Grass, oats, old corn or other grain should be given liberally in conjunction with new corn, and when grain or shorts, etc., are fed it will be found advisable to satisfy the animals with this kind of feed before adding the new corn. In the feeding of new corn there should be no sudden change from the former ration, but it should be added so gradually as to cause no derangement in the digestive organs. Hogs fed new corn are liable to be affected with worms, and hardwood ashes, charcoal and salt are all efficient in either destroying them or preventing their increase. Turpentine and castor oil are now, as in the days of our childhood, sovereign remedies for worms, and a teaspoonful of turpentine with double the quantity of raw linseed oil for each hog, and mixed in slop proves very efficient. Carbolic acid, five to eight drops for each hog, mixed with the water given to drink, will aid in destroying disease germs, and the utmost cleanliness in all the surroundings, and especially in bed, food and water, will aid in promoting health and reduce in no small degree the risk from loss in feeding new corn."

### DANGER IN GREEN STALKS

When the green stalks are given to hogs care should be used to prevent cattle from having access to the woody

fiber which the swine will leave after chewing the stalks. Pigs relish chewing the stalk for the sweetness in it, but leave enough saccharine matter in the fiber to make it attractive to cattle, especially the younger stock. This fiber is indigestible, and the cattle, if allowed to pick it up, will frequently eat a sufficient quantity to cause impaction and harmful if not fatal results. It is not safe to let cattle into yards where swine are given green corn stalks.

### CORN SUPPLEMENTS AND SUBSTITUTES

The proper supplementary feeds which balance corn in a ration not only enable the hog to show better results in fattening, but they also make possible a more economical ration. Feeding a hog on corn alone, whatever the form, is a false economy by which the feeder cheats both himself and the hog. Its natural supplements are those which furnish protein and mineral matter, and, if not easily available on the farm are usually purchasable so as to be used at a profit. Some, such as clover, alfalfa and other pasturage, are unquestioned as to their desirable qualities, and others, such as the prepared meat scraps from the great packing houses and known by their trade names of meat meal or tankage, have rapidly come in favor for the large amount of protein they supply. The ash or mineral matter of the corn grain is considered indigestible for swine, and the absence of mineral matter impairs the nutritive process and injures the structure; yet it is neither difficult nor expensive to supply hogs

with ashes, salt, coal, charcoal or charred cobs as correctives, with corn. The supplementary feeds are treated in their respective chapters following.

In time of a short corn crop from drought or for any other reason, the farmer may be compelled to look to some substitute as an early feed, and this may be at times a perplexing problem. When corn is scarce, other feeding stuffs are likely to be high in price. An Iowa man of long experience, who has weathered a number of "corn famines" as a hog-raiser, and has devoted special attention to this question, gives advice undoubtedly most practical:

"We advise," he has said in *Wallaces' Farmer,* "first the sowing as early in the spring as possible of a mixture of oats, spring wheat, barley and rape; about three pounds of rape seed per acre and about one-third of the usual seeding of each of the rest. Get this in just as quick as you can in the spring. In addition, we would plow up the barn lot, if possible, after the manure is hauled out, and the lots around the buildings where cattle have tramped out the grasses. When the growth is high enough to make a bite, we would turn in the hogs. Where it is not possible to sow a field in this way we would at least have two or three acres sown around the buildings. Bear in mind that you cannot get this in too soon in the spring.

"We would, if possible, put an acre or two in oats and Canada peas, sowing these just as early as we could. Prepare the ground and sow the peas at the rate of 1½ bushels per acre and plow them under about three inches deep, then a few days afterwards, and before they are

up, sow oats at the rate of about two bushels per acre and harrow them in. We would sow Early Champion oats. This in the latitude of central Iowa should give a good grain feed by the 25th of June; earlier, south, and later, north. If you cannot get the Early Champion oats, sow Manshury barley. The next thing we would advise is to select the very earliest varieties of corn, say the Early Wisconsin or Pride of the North. It is not worth while to plant them until about the usual time of early corn-planting. We would plant in the latitude of central Iowa about May 1, if possible, with a drill, about one-third thicker than the usual stand of corn, say a stalk every ten inches. This will furnish early corn—not so much of it as the later varieties, but by feeding it you will get the market price of old corn. Except in case of necessity, we would let it mature, if possible, but we would by all means grow these early varieties, say to the extent of from three to seven or eight acres.

"By this method the farmer can have pasturage for his hogs, of the best kind, until the peas are formed. The corn will furnish him grain feed later. He will be astonished at the amount of feed he will get from two or three acres of rape, but he should sow the grains with it, as the hogs will prefer them until the rape is about eight or ten inches high, after which they will prefer the rape until the grains begin to form seed.

"The shortage of the corn crop means not merely the sale at a cheap price of a large amount of what the English call store cattle or stock cattle, and stock hogs and stock sheep, but it will prevent the growing of hogs the next year. There is a harvest here for the man who can

carry his pigs through on these cheap home-grown feeds until he can grow the corn to finish them off. Do not stop growing hogs because corn is high. Grow all the more, and take this way of producing the frames cheaply to be finished off on next year's corn crop."

Even when corn is high the relative price for pork frequently makes it the cheapest feed for finishing; fifty-cent corn is not expensive feed for six-cent hogs. Up to the last six weeks of feeding, wheat, rye or other cheaper substitutes may be used with grass, but in the ordinary course corn will be the best dependence for the close of the fattening period.

### THE SOUTH CAN RAISE PORK

In some of the southern states, where cotton is made the paramount crop, small attention, relatively, is given to pork production, greatly to the disadvantage of the people whose supply of hog-products must be procured from a distance and always at high cost. These states not being regarded as corn-growing territory in any considerable way, and the chief attention there being given to cotton-growing, the idea has always prevailed that the pork and lard needed there could be purchased more economically than they could be produced.

An experiment reported (Bulletin No. 107) from the branch experiment station at Delta, Panola county, (northwestern) Mississippi, seems to refute the idea that pork, and some corn as well, cannot be raised to advantage in the South, and a gist of the report is presented here, as very suggestive: In October, November and

December, 122 pigs, practically pure-bred Berkshires, were marketed, at an average age of about 10 months, for $1,382.51. They were the produce of ten sows, farrowing two litters a year. The fall pigs were farrowed from September 20 to October 10, and the spring litters from March 18 to April 22. Thirty-two were sold on foot and averaged 175½ pounds; 85 were dressed and averaged 135 3-8 pounds and five gilts for breeding averaged 196 pounds. A financial statement showing cost of production, proceeds of sale and net profit, is as follows:

| | |
|---|---|
| EXPENSES | |
| 265 bushels of corn at 70 cents per bushel | $185.50 |
| 260 bushels of corn (estimated) at 65 cents per bushel | 169.00 |
| 3 tons of shorts at $25 | 75.00 |
| Rent on 13½ acres of land at $6 per acre | 81.00 |
| Seed used on pasture lots | 29.50 |
| Preparing and seeding pasture lots | 39.50 |
| Total expense | $579.50 |
| PROCEEDS | |
| 32 pigs, average live weight, 175½ pounds, at 6 cents per pound | $336.96 |
| 85 pigs, average dressed weight, 135 3-8 pounds, at 8 cents per pound | 920.55 |
| 5 gilts, for breeding purposes | 125.00 |
| Total proceeds | $1,382.51 |
| Net profit | 803.01 |
| If the five gilts, which averaged 196 pounds, had been sold at 6 cents, the net profit would have been | 736.81 |

"The corn (estimated) in the above expense account was grown on 13 acres of land after a crop of oats had been harvested. Peas were planted in the corn, and the hogs were turned in the field in the fall, eating the peas and corn together. In order to get the peas planted in time to mature, the corn was given only one working, and 20 bushels per acre is a fair estimate of the yield." For pasture these swine had Bermuda grass, red clover, wheat, Dwarf Essex rape, and sorghum.

J. W. Fox, the author of the bulletin, adds this: "The farm is fenced, making it possible to fatten the hogs largely on peas planted in the corn as a catch crop for fertilizing purposes. This crop gives the South a distinct advantage over other sections, and this feature of the work cannot be too strongly urged. The fact that the peas can be converted into money without any cost of harvesting should add an additional incentive to grow more corn and peas and thus improve the land, conduct the farm with less labor, and keep the cotton money at home."

Bulletin No. 143 of the Alabama experiment station, issued in July, 1908, gives a summary by D. T. Gray, J. F. Duggar and J. W. Ridgeway of three years' work in swine production, with a view to making a comparison between finishing hogs upon corn alone and upon corn supplemented with either green crops or concentrates. An aggregate of 90 hogs was used in the various tests. The conclusions arrived at from this work were summarized as follows, and are, of course, from the standpoint of a typical southern or cotton-growing state.

When corn was used alone as a ration for fattening hogs both the daily gains and the financial outcome were unsatisfactory. Money was lost in every case where corn was fed without a supplement.

When corn was supplemented with a partial ration of cottonseed meal the daily gains and the financial outcome were satisfactory. Four deaths occurred as a result of the use of cottonseed meal, *but these deaths did*

*not occur while the animals were eating the meal. All of the deaths have occurred soon after the animals were taken off cottonseed meal and placed upon a ration which contained no cottonseed meal.* This suggests that cottonseed meal may be stimulating in its effects—similar to the action of certain drugs—and when removed suddenly from the animals that death may occur through depression.

Tankage, a packing house by-product, proved an exceedingly satisfactory feed to supplement corn. In fact, it was almost as satisfactory as cottonseed meal, and has the advantage over cottonseed meal in that there is no danger in feeding it.

When corn was supplemented with one-half cowpeas (the seed) the results were more satisfactory than when corn was used alone, valuing the cowpeas at 80 cents per bushel. The peas were used profitably until they reached a price of $1.05 per bushel.

As a whole, peanut pasture was found to be more useful than any other tried. Notwithstanding that the peanut pastures were not good two years out of the three, they still gave excellent results. Pork was made at a good profit when peanut pasture was used 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.

When the sorghum was cut and carried to the hogs the results were better than when the hogs were made to graze the crop.

The expense of extracting the juice from the sorghum and feeding the juice only prohibits its use in this way, although excellent daily gains were made. In no case was the juice found to be worth more than 1.8 cents a gallon as a feed for hogs.

Soy bean pasture ranked second to peanut pasture as a supplement to corn.

Chufa pasture was not found to be as good as either peanuts or soy bean pasture.

The average daily gains were as follows: Corn alone, .69 of a pound; corn 2-3 of the ration with cottonseed meal 1-3, 1.04 pounds; corn 9-10 with tankage 1-10, 1.04 pounds; corn ½ with cowpeas ½, .94 pound; corn with peanut pasture, 1.01 pounds; corn with sorghum pasture, .37 pound; corn 2-3 with cottonseed meal 1-3 with peanut pasture, 1.00 pound; corn 2-3 with cottonseed meal 1-3 with sorghum pasture, .46 of a pound; corn with chufa pasture, .72 of a pound; corn with soy bean pasture, 1.02 pounds; corn 2-3 with cottonseed meal 1-3 with soiled (cut) sorghum, .75 of a pound.

The cost of one hundred pounds gain in each case, when the cost of putting in and cultivating the pasture crops was not taken into consideration, was as follows: Corn alone, $7.63; corn 2-3 with cottonseed meal 1-3, $5.75; corn 9-10 with tankage 1-10, $5.18; corn ½ with cowpeas ½, $5.11; corn with peanut pasture, $2.28; corn with sorghum pasture, $5.46; corn 2-3 with cottonseed meal 1-3 with peanut pasture, $1.97; corn 2-3 with cottonseed meal 1-3 with sorghum pasture, $4.85; corn with chufa pasture, $3.81; corn with soy bean pasture,

$1.96; corn 2-3 and cottonseed meal 1-3 with soiled sorghum, $3.39.

The cost of one hundred pounds gain in each case, when the cost of putting in and cultivating the pasture crops was counted against the gains, was as follows: Corn alone, $7.63; corn 2-3 with cottonseed meal 1-3, $5.75; corn 9-10 with tankage 1-10, $5.18; corn ½ with cowpeas ½, $5.11; corn with peanut pasture, $3.20; corn with sorghum pasture, $11.90; corn 2-3 with cottonseed meal 1-3 with peanut pasture, 2.14; corn 2-3 with cottonseed meal 1-3 with sorghum pasture, $7.79; corn with chufa pasture, $8.89; corn with soy bean pasture, $2.74; corn 2-3 with cottonseed meal 1-3 with soiled sorghum, $4.86.

When hogs have been grazing a green crop it usually pays to inclose and feed them in a dry lot for a short period after the green crop is exhausted.

To secure a better price for the corn, feed it in combination with some other feed.

When hogs bring from 5 to 7 cents a pound live weight the farmer cannot afford to sell his corn for 70 cents a bushel.

The Missouri station (Bulletin 65) finds that "corn alone, however prepared, even as cheap as 30 cents per bushel, is a very expensive feed for dry-lot pork production. . . . Soaking corn is much less expensive than grinding, and nearly as valuable. . . . Summer feeding in Missouri in the dry lot seems to require very much more grain per pound of gain than is required in spring and fall. The roughage picked up by the pig in pasture is a very important part of the ration."

CHAPTER XIII.

# Feeding and Fattening

The beginner in swine husbandry is naturally inclined to demand knowledge of exact rations and methods for his operations, unmindful of the fact that the man and his animals and the local facilities or conditions—any one or all of these—may make the specific application of a given method or ration entirely unwise. Precisely the variety and quantity to feed a hog, for example, is a question between the animal and his feeder and the best another can do is to offer suggestions and experiences. To the observing and thoughtful these may be of great value; possibly as much so in furnishing ideas of what not to do as in an affirmative way. The experiences of others will be helpful according to the quality of a man's own judgment in their application. There is ample testimony to enable him to decide whether a certain feed is best suited for growth or for fattening, but the most economical or profitable ration for him to use can only be determined from a knowledge of the feeds available and the current prices for them. Grain or other feed on hand may ordinarily be desirable, yet on occasion of high prices prevailing for one commodity it may be economy to dispose of that on the farm and purchase for the time being one less expensive. Instances might be multiplied showing how far the feeder's judgment and intelligence enter into the attainment of satisfactory results.

### PROGRESS IN FEEDING KNOWLEDGE

In the three or four decades ending with the year 1908 a variety of new ideas as to fattening swine has come to be accepted, and practices strongly approved of formerly, such as cooking feed, have been carefully tested and abandoned in the interest of economy or for other sufficient reason, while new feeds and new methods have won established places on their merits or been cast out as wanting. The main principles of breeding have been established longer, and changes in them in recent years have not been so notable as in feeding and fattening. The work of the state experiment stations has been especially progressive since 1898, when it was stimulated by the publication of Prof. W. A. Henry's incomparable handbook on "Feeds and Feeding," in which he felt compelled to remark that "no extended work has yet been done in this country on the influence of feeds on pork, and for the present we must be guided by the statements of foreign observers." Since that time much experimentation in swine feeding has been carried on at the stations in different states.

No animal on the farm is better adapted to turning good feed quickly into marketable meat than the hog, and none can better repay, from a market standpoint, a discriminating system of feeding. This is particularly true as to first costs, for the hog is by nature planned to utilize the least expensive feeds and will manufacture into toothsome pork much that might otherwise be reckoned of little value, if not waste. In any phase of farm economy the hog is a feature, and his proper feeding

has in innumerable instances been the factor that kept a farm's profit on the right side of the ledger.

### CLASSES OF FEED

Feeds are usually classified as concentrated or bulky, as they give a large or small quantity of nutriment for the bulk supplied. Concentrates, as those of the former class are called, include the grains and seeds, mill feeds, and packing house and other by-products which have the nutritive material in more or less condensed form. Grasses, fodder, hay, roots and vegetables, which provide a considerable quantity of "filling" with a comparatively smaller amount of nutriment, are bulky feeds. Having rather small stomach capacity, the hog needs feeds less coarse than other animals, especially ruminants, like the cow, which require increased bulk to insure a complete digestion; at the same time, the hog is an omniverous creature and craves a variety, and this variety is most easily and healthfully supplied by the more or less bulky products. Digestion of concentrated feeds is less difficult when considerable coarse material is used with them.

The principal constituents of feeds are chemically known as proteids, or nitrogenous compounds, which are utilized mainly to make up the muscular tissues (hence are of importance when growth is needed), and carbonaceous matter, as starches and sugars (carbohydrates) and fats (hydrocarbons), which are utilized in making fat and energy. Water content and ash are feed factors which should have consideration. Water is indispensable for any animal's body, but if more than the normal

quantity is taken it may be harmful rather than beneficial. Ash or mineral matter is a relatively small constituent of the body, except in the bony structure, but is none the less important.

### COMPOSITION OF BODIES

Some knowledge of the composition of the bodies of hogs is of value to the feeder in aiding him to judge of characteristic food requirements. The most extended research on this line was made by Lawes and Gilbert at the Rothamsted (England) experiment station. The results of the analyses were published in 1859, and among the determinations as to the composition of animals were included those of the collective carcass parts, collective offal parts and the entire bodies of a "store" (lean) pig and a fat pig, which follow:

TABLE SHOWING PERCENTAGE COMPOSITION OF CARCASS, OFFAL AND ENTIRE BODY OF STORE (LEAN) PIG AND FAT PIG

| Description of animal. | Mineral matter (ash). | Nitrogenous substance. | Fat. | Total dry substance. | Water. | Contents of stomach and intestines in moist state. |
|---|---|---|---|---|---|---|
| I. Per cent in carcass. | | | | | | |
| Store pig | 2.57 | 14.0 | 28.1 | 44.7 | 55.3 | ..... |
| Fat pig | 1.40 | 10.5 | 49.5 | 61.4 | 38.6 | ..... |
| II. Per cent in offal (excluding contents of stomach and intestines). | | | | | | |
| Store pig | 3.07 | 14.0 | 15.0 | 32.1 | 67.9 | ..... |
| Fat pig | 2.97 | 14.8 | 22.8 | 40.6 | 59.4 | ..... |
| III. Per cent in the entire animal (fasted live weight). | | | | | | |
| Store pig | 2.67 | 13.7 | 23.3 | 39.7 | 55.1 | 5.22 |
| Fat pig | 1.65 | 10.9 | 42.2 | 54.7 | 41.3 | 3.97 |

The Iowa experiment station conducted, in 1897, feeding experiments from birth with different lots of Berkshire, Tamworth, Chester White, Poland-China, Duroc-Jersey and Yorkshire pigs, which were slaughtered in the Chicago packing house of Swift & Company. Eight carcasses, representing as many lots, were shipped to Washington for investigation as to chemical composition by the Division of Chemistry of the United States Department of Agriculture. The blood, hair, entrails, heads, kidneys and kidney fats were not shipped, but the analyses represented practically the composition of the hog as put into commerce for food. The data obtained are given in the following table, in which No. 5 was a Duroc-Jersey from a lot fed on a narrow ration, and No. 6 was from a lot fed on a wide ration:

ANALYTICAL DATA, EXPRESSED IN PERCENTAGES, OF THE ENTIRE DRESSED ANIMAL, THE HEAD, LEAF LARD AND KIDNEYS HAVING BEEN REMOVED

| Number and breed of pig. | Weight in pounds. | Water. | Fat. | Nitrogenous substances. | Lecithin. | Ash. | Total. |
|---|---|---|---|---|---|---|---|
| 1. Berkshire | 129⅜ | 43.10 | 40.46 | 13.02 | 0.27 | 2.57 | 99.42 |
| 2. Tamworth | 141 | 41.09 | 42.97 | 11.99 | 0.17 | 2.63 | 98.85 |
| 3. Chester White | 125⅛ | 35.80 | 51.11 | 9.85 | 0.17 | 1.84 | 98.77 |
| 4. Poland-China | 146⅜ | 37.83 | 48.90 | 9.66 | 0.19 | 1.83 | 98.41 |
| 5. Duroc-Jersey | 137⅜ | 32.32 | 55.07 | 8.99 | 0.11 | 2.01 | 98.50 |
| 6. Duroc-Jersey | 167⅒ | 30.31 | 56.81 | 9.80 | 0.19 | 1.75 | 98.86 |
| 7. Duroc-Jersey | 149½ | 30.58 | 57.68 | 8.96 | 0.42 | 1.81 | 99.45 |
| 8. Yorkshire | 160⅞ | 40.39 | 44.35 | 11.44 | 0.31 | 2.40 | 98.89 |
| Means | 144⅝ | 36.43 | 49.67 | 10.46 | 0.23 | 2.11 | 98.90 |
| Maxima | 167⅒ | 43.10 | 57.68 | 13.02 | 0.42 | 2.63 | 99.45 |
| Minima | 125⅛ | 30.31 | 40.46 | 8.96 | 0.11 | 1.81 | 98.41 |

The methods and results of the foregoing experiment are detailed fully in Bulletin No. 48, page 381, of the Iowa experiment station, and in "Chemical Composition

of the Carcasses of Pigs," Bulletin No. 53 of the United States Department of Agriculture, Division of Chemistry.

### CHARACTER OF FEED NEEDED

The constituents most desirable in feed for swine depend greatly upon the use to which the animal is to put them. A newly born pig's body is largely water, and to grow he must have food that will produce tissue. That is why the milk, primarily designed to furnish proper nourishment for growing animals, needs to be, as it is, so rich in nitrogenous substance. Later, when the time comes that he is intended for quick-fattening, he should, naturally, be supplied with feed containing much fat making material, and it is that quality which has given corn its high place in finishing hogs for slaughter. It is readily seen, therefore, that different kinds of feed will be needed to furnish the most beneficial results, according to the stage of growth of the animal, the energy required for its maintenance, and the end to which the animal is destined; yet it does not necessarily follow that a ration should be one-sided or be dominated by one element to the exclusion of a variety. Losing sight of this is a mistake that has been made more frequently in the use of corn than any other feed; not so much, perhaps, because it is rich in carbonaceous matter, as by reason of its convenience and cheapness in the regions where it flourishes.

### METHODS OF HANDLING FEED

To specially prepare feed it may be soaked, ground or cooked. As a general practice cooking feed for swine

does not pay for the additional time, labor and expense involved, and in fattening swine for market it is no longer regarded as worth while. Henry reports in "Feeds and Feeding" that the recorded trials of cooking feed showed a loss of 6 per cent in the feeding value because of cooking. On this subject he says, however:

"A few feeds appear to require the modifying influence of heat and moisture to render them palatable and digestible for stock. Potatoes cannot be successfully fed to swine in any quantity unless they are first cooked, and roots are more palatable if cooked and meal is added to the mass. Feeders should not confuse the effects of cooked feeds upon farm stock with the advantages of supplying them with warm feed in palatable form. To the assertion that stockmen who cook feed have the finest animals, the writer ventures the opinion that one who is willing to cook feed will usually give his animals many attentions which feeders generally pass by as not worthy their time or notice. It is this extra care and the larger variety of feeds usually supplied rather than the cooking which make animals of superior quality. For the purpose of affording variety, the various grains, roots and tubers, together with clover or alfalfa chaff, may be boiled or steamed for pigs and used as part of the ration."

Proper consideration for a sick hog may occasionally call for the cooking of feed, and where expense is not an object, as in fitting show animals or in bringing up the condition of breeding stock, cooked feed may be preferred.

### GROUND FEED

The advisability of grinding feed is more or less dependent on prices prevailing for it, unless the expense of grinding is slight or may be entirely disregarded. If the whole feed is high in the open market and the feeder's cost of grinding is low he may effect enough of a saving to make grinding profitable. There is undeniably some loss through the excrement when whole grain is fed, more with oats or barley than with corn, but Canadian records (Central Experimental Farm Bulletin No. 33) show that the quantity is not excessive. In case the corn is flinty and unusually hard and it is intended for young swine, grinding may prevent sore mouths, and should aid growth.

Most of the records which have been kept relating to the grinding of feed have concerned the grinding of corn, and the results have been varying and not decisive. The most extended investigations have been made at the Wisconsin station, and are summarized in the Nineteenth Annual Report of that station (page 10); these showed losses in some instances and gains in other trials through grinding the corn. Advantages from the feeding of ground corn for fattening are problematical and dependent on local conditions.

More can be said in favor of grinding peas, soy beans, Kafir-corn, millet seed and the various small grains. Records kept at the Canadian Central experimental farm showed a little gain in weight from feeding peas ground, but there was a saving of 17 per cent in quantity. Experiments with small grains show an advantage from grinding, by reason of the amount saved in digestion.

### WET AND DRY FEED

Corn meal and other ground foods are more palatable and better relished if fed wet. Whole grain is more generally soaked than is ground grain. The experiments made at the different stations in feeding swine with wet and dry feed are summarized by George M. Rommel, however, in the United States Department of Agriculture bulletin on "The Hog Industry" as showing an advantage of but little more than 2 per cent in favor of soaking. So far as tests made by experiment stations and their more or less contradictory results are indicative, either wetting or soaking whole or ground grain is of less importance than popularly supposed. The author, nevertheless, is of the opinion that in many instances, soaking grain, especially old corn that has become very dry and hard, for swine can be done advantageously.

### LIMIT OF FEEDING CAPACITY

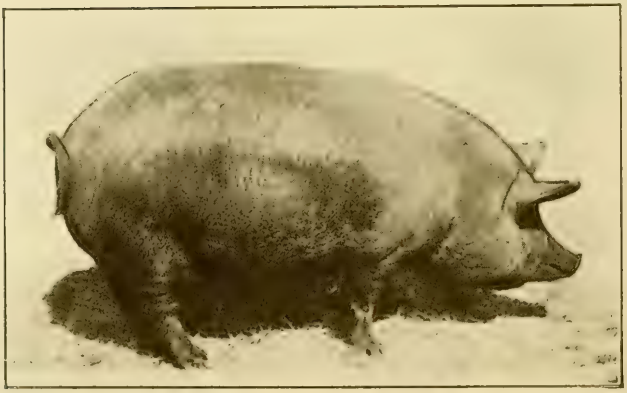
In his own way the hog has unexcelled ability to manufacture the right sort of feed into marketable product, but the good feeder will learn his limitations as well as his abilities. No animal can add to its frame or flesh an ounce more than its natural or inherited capacity will permit, yet this natural capacity may be modified through generations of feeding. The laws therein involved have been amply demonstrated in experimental work, which has shown particularly important results in regard to the wrong nurturing of pigs. Some of the decisive investigations are fully reported in W. A. Henry's "Feeds and Feeding," where, in discussing them, its author says: "These experiments were conducted at

several stations in widely separated states and countries and with different feeds, yet the results were concordant in showing that the frame of the growing animal and the vital organs can be greatly modified by improper nutrition—the muscles produced by such feeding being less than normal in size, the bones robbed of their strength, the vital organs, such as the liver and kidneys, modified, and even the blood reduced in quantity. The observant feeder and breeder of swine studying these trials must be impressed with the plastic character of the body of the growing animal. He learns that the bones and muscles as well as some of the internal organs of the body can be thrown out of their normal relations one to another through an unbalanced or improper food supply. He sees it possible for immature animals to live a long time without showing disease, while being dwarfed in form and made prematurely fat. He learns that nature's plan is to grow the framework first and lay on fat afterwards. He understands that, while no farmer would feed his pigs as these were fed, wrong feeding may, nevertheless, be practiced by many. He concludes, rightly, that if a pig or other young animal is malnurtured so as to modify its bones, muscle and vital organs ever so little, and the animal so affected is later used for breeding purposes, the descendants likewise being malnurtured, the cumulative ill effects may in a few generations become very marked."

Experiments conducted at the Utah station (Bulletin No. 70) demonstrated that the practice of scantily feeding pigs through one period of their growth and depending upon heavy feeding to finish the preparation for

AN ESSEX SOW WITH HER LITTER

A Well-Fatted Essex



An Attractive Essex Gilt

market was distinctly unprofitable. Halts and setbacks in the steady progress of a pig's career will detract from the profit he may be expected to yield. This emphasizes the importance of providing the right kind of supplementary feeds

### SUPPLEMENTARY FEEDS

Many feeds taken in connection with others are of greater importance than on their single merits. Corn feeding demands supplementary feed in order to bring down to the proper degree the excess of its peculiar qualities. Swine on pasture alone receive too much bulk and not enough direct nutriment, which needs to be supplied by supplemental concentrated feeds, if they are expected to fatten. These also furnish the variety required by an omniverous animal. "The hog," says Henry Wallace, "is built more like a man, or the man more like a hog (we do not care how you put it), than any other animal on the farm; therefore, he needs variety. No man wants to live on an exclusive diet of fried mush, or roasting ears, or apple dumplings, or turkey and cranberry sauce meal after meal and day after day. He needs variety, and so does the hog."

In finishing a fattening hog somewhat close confinement generally affords the best results, and in that case, again, supplemental feeds are of importance for the variety they will give.

Satisfactory supplemental feeds are usually available on the farm, and ordinarily are not expensive parts of the ration. These, and the substitute feeds which must be considered in time of drought or at other times when

the main feeds are not easily available, are treated at greater length in other chapters of this volume.

### RESULTS IN FEEDING

Study and comparison of the weights of pigs at various ages, and the quantity of feed consumed and gains made under ordinary conditions, are of no value to the feeder. Averages of this character have been carefully made up by Professor Henry from his experiments at the Wisconsin station and from records reported from many trials at other state stations. He gives the following table regarding the average birth weight and weekly gains made by pigs before and after weaning:

WEIGHTS AND GAINS MADE BY PIGS, BEFORE AND AFTER WEANING, WISCONSIN STATION

| Before weaning, 10 weeks, average of 12 litters, 86 pigs. | | | After weaning, 7 weeks, average of 8 litters, 62 pigs. | | |
|---|---|---|---|---|---|
| Week | Average weight. Pounds. | Gain. Pounds. | Week. | Average weight. Pounds. | Gain. Pounds. |
| At birth..... | 2.5 | .... | 10th week.... | 41.5 | .... |
| 1 week..... | 4.4 | 1.9 | 11th week.... | 46.7 | 5.2 |
| 2 weeks..... | 7.0 | 2.6 | 12th week.... | 52.0 | 5.3 |
| 3 weeks..... | 9.8 | 2.8 | 13th week.... | 58.3 | 6.3 |
| 4 weeks..... | 12.5 | 2.7 | 14th week.... | 64.2 | 5.9 |
| 5 weeks..... | 15.6 | 3.1 | 15th week.... | 69.8 | 5.6 |
| 6 weeks..... | 18.6 | 3.0 | 16th week.... | 76.5 | 6.7 |
| 7 weeks..... | 22.6 | 4.0 | 17th week.... | 84.1 | 7.6 |
| 8 weeks..... | 27.8 | 5.2 | | | |
| 9 weeks..... | 33.1 | 5.3 | | | |
| 10 weeks..... | 38.5 | 5.4 | | | |

In commenting on these averages, Professor Henry said: "The heaviest pig in these litters weighed 3.6 pounds at birth and the lightest 1.6 pounds, the average

for the lot being 2.5 pounds. During the first week after birth the pigs made a gain of 1.9 pounds. Overlooking irregularities, we may say that the pigs made a weekly gain of three pounds per head the fifth week after birth, four pounds the seventh week, and five and one-half pounds the tenth week. At the end of the seventh week after weaning, when 119 days old, they were gaining more than seven pounds each weekly, or over a pound a day."

Professor Henry also collected the records of all the American experiment stations relative to weights and gains of pigs and the feed consumed so far as published prior to the compilation of his book in 1897, embodying in that work practically all the data recorded in America up to that time on the subjects comprehended, and as summarized in the following table:

WEIGHT, FEED CONSUMED AND GAINS MADE BY PIGS
DATA FROM MANY AMERICAN EXPERIMENTS

| Weight of pigs in pounds. | Actual average weight. | Number of stations reporting. | Total Number of trials. | Total Number of animals fed. | Average feed eaten per day. | Feed eaten per 100 lbs. live weight. | Average gain per day. | Feed for 100 pounds gain. |
|---|---|---|---|---|---|---|---|---|
| | Pounds | | | | Pounds | Pounds | Pounds | Pounds |
| 15 to 50. | 38 | 9 | 41 | 174 | 2.23 | 5.95 | .76 | 293 |
| 50 to 100. | 78 | 13 | 100 | 417 | 3.35 | 4.32 | .83 | 400 |
| 100 to 150. | 128 | 13 | 119 | 495 | 4.79 | 3.75 | 1.10 | 437 |
| 150 to 200. | 174 | 11 | 107 | 489 | 5.91 | 3.43 | 1.24 | 482 |
| 200 to 250. | 226 | 12 | 72 | 300 | 6.57 | 2.91 | 1.33 | 498 |
| 250 to 300. | 271 | 8 | 46 | 223 | 7.40 | 2.74 | 1.46 | 511 |
| 300 to 350. | 320 | 3 | 19 | 105 | 7.50 | 2.35 | 1.40 | 535 |
| 350 to 400. | 378 | 1 | 5 | 36 | 8.52 | 2.25 | 1.98 | 431 |
| 400 to 450. | 429 | 1 | 5 | 36 | 8.18 | 1.91 | 1.71 | 479 |
| 450 to 500. | 471 | 1 | 2 | 18 | 10.00 | 2.12 | 1 77 | 562 |

### CONSUMPTION OF WATER

Data obtained in an experiment by the Indiana experiment station in 1900 were utilized by Rommel in compiling a table to show the daily consumption of water at various weights. Different lots of pigs were respectively fed rations with food dry in the trough and with the grain mixed with equal weight and twice and three times its weight of water, and all the additional water desired was supplied. There were four pigs in each lot. The table on page 313 shows the results.

Commenting on this table, Mr. Rommel says: "These figures show little difference in the consumption of water when feed was given dry and when mixed with an equal weight of water. The increase of the consumption of water with age is gradual, but not regular. The pigs that were forced to drink large quantities of water to get enough feed to satisfy hunger evidently drank more than they needed, if the figures of the dry grain lot are a criterion."

### CONFINEMENT AND INCLOSURES

The area that fattening swine should have may be stated in general terms as any space sufficient to afford a reasonable number comfort, cleanliness, and the requisite degree of exercise; while any inclosure is too small that compels any hog or hogs to be filthy and uncomfortable. If a considerable number are to be fattened, and the large, medium and small hogs can be fed by themselves, in different pens or lots according to size, and if not more than 15, 20 or 25 are kept together, they will be more peaceable, feed better, gain faster and be

| Lot. | Rations. | Daily consumption of water (pounds) by pigs weighing: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 60 pounds. | 70 pounds. | 80 pounds. | 90 pounds. | 105 pounds. | 125 pounds. | 156 pounds. | 180 pounds. | 215 pounds. |
| | | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds |
| 1 | Dry Grain | 2.35 | 3.00 | 2.42 | 4.21 | 4.82 | 7.50 | 11.42 | 9.44 | 11.07 |
| 2 | Grain and equal weight of water | 2.42 | 3.27 | 3.35 | 3.27 | 4.50 | 5.60 | 7.50 | 8.39 | 8.17 |
| 3 | Grain and 2 times its weight of water | 4.25 | 6.03 | 6.00 | 6.00 | 7.00 | 9.00 | 11.00 | 14.00 | 14.00 |
| 4 | Grain and 3 times its weight of water | 5.79 | 8.25 | 9.00 | 9.00 | 10.50 | 13.50 | 16.50 | 18.00 | 18.00 |

healthier than if huddled together indiscriminately to spend their time in disturbance and turmoil.

Except with special facilities and resources experience has placed the maximum number for an average farm, under present conditions, at from 75 to 125 hogs. For the average farmer more than this number is more or less a venture into the field of speculation. Many farmers can, and do, raise more, but in such cases the practices and methods are very far above the average. "We have been raising hogs for 25 years," said Henry Wallace in 1906, "and have found our maximum of profit with from 60 to 100 on the farm. Sometimes we have grown from 135 to 150, and invariably found that, while consuming more corn and giving us more trouble, they gave us no more profit that if we raised from 75 to 100. When prices are high farmers are tempted to go beyond this number, and if they do not invite the disease known as 'cholera,' our observations are that something else comes in and robs them of their profit." With the best management it is found that not more than 40 head should be confined to less than an acre of ground.

### IMPORTANT FEATURES

Whatever the number of animals to be fattened, or the season of the year, it is important that the inclosure in which they are kept and fed should have good surface drainage. If possible to secure it without danger of bringing down disease germs from other premises, there should be running water obtainable in such a way that the feed lots may not become miry, and without necessity

for any of the animals drinking from filthy sloughs or mudholes. If kept in dry lots or fed in pens the hogs should have, at least twice a day, as much clean water as they will drink, and as the foregoing recorded experiment of the Indiana station and the experience of practical men amply show, this is no inconsiderable quantity.

In dry lots or in pens plenty of trough room should be provided. Whatever the feed may be, it should be given in such a manner that the hogs will be forced to eat as little filth as possible. When animals, to get their feed, must swallow as much mud and manure as grain only indifferent results may be expected. It is too frequently the practice to confine and feed 50 or more hogs on much less than an acre, where they are compelled to eat, drink and sleep in their own filth; and after some months of this treatment surprise, entirely unjustifiable, is expressed because they are carried off by that ever-convenient scapegoat, "cholera," or in some other manner inevitably become a fair quality of carrion.

### CHANGES IN FEEDING

Any change during the feeding season should be from light to heavier and better fattening feed and never the reverse. The best gains are those which are steadily made, up to the end of the fattening period. When, by gradually increasing the quantity of fattening food, the hogs have become accustomed to it, they should be given at regular hours, early in the morning, at noon, and late in the evening, as much corn as they will eat up clean, but no more. This caution is applicable to all

other feeds as well as corn, although comparatively few hogs are fattened in the corn-growing regions except upon ear corn, and undoubtedly the time is far off when the case will be otherwise. All changes in character of feed should be rather gradual, and especially is this true when hogs are taken from grass or other bulky diet to be fattened on a more concentrated feed. Too sudden a change is sometimes attended with injurious effects, if not the loss of animals outright.

Regularity as to times of feeding and quality and quantity of feed should be observed; no animal should be fed so much as to be surfeited, and only so much feed should be given at once as will be entirely consumed, that all may come to the next meal with sharp appetites. The most perfect development does not depend so much upon the large quantity they can be made to consume as upon the quantity they properly digest and assimilate. Next to good food for the appetite a good appetite for the food is desirable, and should be carefully promoted; the hog that refuses to eat, even for a single day, is set back in his fattening for two or three days, and sometimes much longer. The failure of a hog's appetite at any time denotes something seriously wrong with him and his surroundings, if not with the entire herd and its management.

The quantity of feed will vary somewhat, and usually in frosty and freezing weather more will be eaten to maintain the animal heat than when the temperature is higher and the atmosphere contains considerable moisture. Good feeding consists in giving every particle the

hogs will eat, without leaving any, or cloying their appetites, and to maintain this intelligent care and close observation are necessary. The old saying that the lazy farmer who sits on the fence, watching his hogs until they are through eating, generally markets the heaviest pork is in exemplification of the rules of proper care in feeding. Quiet and comfort are indispensable to thrift, so dogs and boisterous boys should be kept away from the lots and pens.

What has been said in the preceding chapter regarding the effect of warmth and shelter on the quantity of feed required by growing pigs applies with as much force to fattening hogs. Comfortable, sheltered beds, not too deep and dusty, are equivalent to a considerable amount of feed, as stock suffering from cold cannot thrive, and to warm them with grain, applied internally, is much more expensive than good nests and shelter, applied externally. From an experiment made at the Kansas agricultural college in 1882-1883, in which one lot was placed in the basement of a barn and another lot was kept in an open yard with a board fence on the north as the only protection, it was found that the pigs in the unsheltered lot required 25 per cent more corn to make 100 pounds of gain than those which were sheltered. The test was with pure-bred hogs, weighing 200 to 250 pounds each, and was carried on for ten weeks, beginning November 27, through weather ranging in temperature from 12° below to 31° above zero, out-of-doors.

Many farmers find it convenient to accustom their hogs to some particular feeding call which will bring them together, and sometimes they can be called thus

into places where it would be extremely difficult to drive them.

In the corn growing sections autumn, with its mild weather, is the profitable season for making pork and lard, and shotes not intended to follow cattle fattening on grain, later in the season, should be far along in their maturity before severe winter weather sets in. When hogs approach a degree of fatness in which they find it difficult to get up and move about readily they will be fed longer at a loss, and the packer or the pork barrel should take them in.

### INCREASE IN FEED REQUIRED

In experiments by Prof. G. E. Day at the Ontario agricultural college it was clearly shown, as has been done elsewhere, that the quantity of feed consumed or required per 100 pounds of gain increases rapidly with the weight of the hogs. His observations were made on 36 different animals, with this showing:

Increasing in live weight from 54 to 82 pounds, pigs required 3.10 pounds of meal per pound of gain.

Increasing from 82 to 115 pounds, shotes required 3.75 pounds of meal per pound of gain.

Increasing from 115 to 148 pounds, hogs required 4.38 pounds of meal per pound of gain.

Increasing from 148 to 170 pounds, hogs required 4.55 pounds of meal per pound of gain.

Professor Henry gives data along the same line, compiled from many experiments, especially valuable by reason of the large number of animals reported on. The

food consumed is valued at $1 per 100 pounds. This is Henry's table:

FEED AND GAIN OF SWINE AT DIFFERENT STAGES OF GROWTH

| Weight of animals in pounds. | Actual average weight. Pounds. | Number of stations reporting. | Total number of trials. | Total number of animals fed. | Average feed eaten per day. Pounds. | Feed eaten daily per 100 pounds live weight. | Average gain per day. Pounds. | Feed for 100 pounds gain. | Cost per 100 pounds of gain. |
|---|---|---|---|---|---|---|---|---|---|
| 15 to 50..... | 38 | 9 | 41 | 174 | 2.23 | 5.95 | .76 | 293 | $2.93 |
| 50 to 100..... | 78 | 13 | 100 | 417 | 3.35 | 4.32 | .83 | 400 | 4.00 |
| 100 to 150..... | 128 | 13 | 119 | 495 | 4.79 | 3.75 | 1.10 | 437 | 4.37 |
| 150 to 200..... | 174 | 11 | 107 | 489 | 5.91 | 3.43 | 1.24 | 482 | 4.82 |
| 200 to 250..... | 226 | 12 | 72 | 300 | 6.57 | 2.91 | 1.33 | 498 | 4.98 |
| 250 to 300..... | 271 | 8 | 46 | 223 | 7.40 | 2.74 | 1.46 | 511 | 5.11 |
| 300 to 350..... | 320 | 3 | 19 | 105 | 7.50 | 2.35 | 1.40 | 535 | 5.35 |

### SOME CASES OF LONG FASTING

The ability of a hog to fast, or to live upon himself, in close, solitary confinement for long periods is really very remarkable, and although not understood generally, has frequent and striking illustrations. A few such that have been fully authenticated are as follows:

Wm. McBride of Randolph county, Illinois, July 15th, missed one of his fattening hogs weighing about 225 pounds. More than 100 days afterwards it was found in a sink hole into which it had fallen. It weighed about 50 pounds and was very weak, but soon recovered its normal strength and weight.

A farmer of Polk county, Minnesota, missed a valuable pig which three months later he found under the center of his straw stack. The pig "was too weak to grunt, but alive; a few days' feeding restored him and

now he is as fat and handsome as any of his breed, showing no signs of his long fast."

Adam C. Camper of Princess Anne county, Virginia, had a 300-pound sow that became wedged between two straw ricks. "She was without food or water four months, and lost but 10 pounds."

Charles Peter of Riley county, Kansas, owned a shote that was imprisoned in a crevice between two hay stacks 43 days and emerged emaciated and weak, but healthy, when the hay was removed.

A fat shote weighing 125 pounds belonging to Arthur T. Gladhill, of Smith county, Kansas, fell to the bottom of a dry well fourteen feet deep, where it remained for seven or possibly eight weeks. When found and taken out it was very weak, but could walk fairly well. It was estimated to weigh at that time between 50 and 60 pounds, and "its body resembled that of a greyhound more than that of a hog." Later it made a satisfactory growth.

A farmer of Doniphan county, Kansas, owned a fat hog of about 375 pounds weight which was accidentally covered on November 11th by the straw from a threshing machine. January 29th, or 79 days later, the hog was found near the stack trying to walk, "which it did after a little practice." It weighed 150 pounds or less.

A sow nearly ready to farrow belonging to James Laird, of Rickling, Essex, England, was accidentally covered up under a stack of barley straw, and remained there for 133 days. "A more emaciated creature it would be impossible to imagine. She was full of flesh

when lost, but when discovered, her bones were barely covered by skin. All traces of the litter of pigs had disappeared. She is not able to stand yet, though gradually gaining strength; but it will be a long time before she regains her normal condition."

### HOGS EATING COAL AND SAND

Swine having access to it will eat soft (bituminous) coal, and under some circumstances devour inordinate quantities of it. The fact that they do this indicates that some ingredient their systems require is lacking from their ordinary food. Eaten too largely it tends to constipation, but a consensus of breeders' opinions is that in moderate amounts it is beneficial rather than harmful, and as a corrective, tonic or condiment its use should be commended.

Sandstone or sand is sometimes eaten by hogs, and to an injurious extent. As with coal small quantities do no particular harm, but the fact that hogs crave such unusual substances as food suggests their need of a different or broader diet.

### MISTAKES IT IS WELL TO AVOID

A lifetime's experience as a raiser of swine has prompted a successful Kansas farmer to record a list of 21 mistakes which he thinks others less experienced are liable to make—at least in part—and these being of such common occurrence and his counsel so pertinent they are presented here. He says:

"It is a mistake for one inexperienced to undertake the business of rearing hogs unless he expects to make a study of it and to profit by his mistakes.

"It is a mistake for the farmer living in town to trust the care of his hogs to the average hired man. He is not likely to make a success of it.

"It is a mistake to try to raise hogs on an exclusive corn diet. You ask what kinds of feed to give them? I will ask you what kinds of feed can be produced on your farm and in your locality; then give them a variety of these, in such relation to each other as to meet the varied needs of the swine system.

"It is a mistake to forget that the hog is a grazing animal.

"It is a mistake if the hogs are not fed in a clean place, free from both dust and mud.

"It is a mistake to overfeed or underfeed.

"Ordinarily it is a mistake not to feed the liquid before the solid food.

"It is a mistake to feed constipating food with nothing to correct it.

"It is a mistake to feed breeding stock as if you were fitting it for the market.

"It is a mistake to feed all sizes together, when the smaller ones are at a disadvantage.

"It is a mistake not to provide the herd with comfortable quarters at all times. Failure in this will impair the usefulness of the feed.

"It is a mistake not to have the pigs grow rapidly from birth to market. They should gain every pound possible on the way.

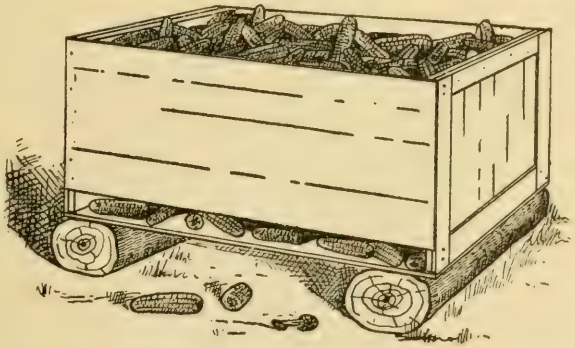
"It is a mistake to feed the brood sow much corn before farrowing. She should have cooling and laxative foods.

"It is a mistake to feed her heavily for some days after farrowing.

"It is a mistake to give her pigs sour food when they are learning to eat.

"It is a mistake to fail to feed the pigs bone-and-muscle-forming materials during their growth.

"It is a mistake to try to feed both the hog and the worms that may be in him or the lice that may be on him; the hog would tell you so if he knew how.



A SELF-FEEDING DEVICE FOR EAR CORN OR ALFALFA

"It is a mistake if hogs are not fed at regular intervals.

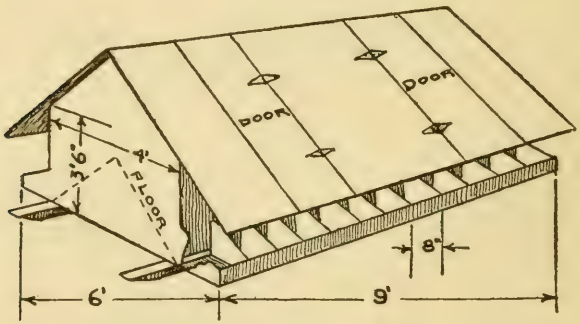
"It is a mistake, as a rule, to feed for fat too many months before marketing.

"It is a mistake to use high-priced feeds and then market at a loss. Figure your probable gain or loss and govern yourself accordingly.

"It is a mistake for any feeder to think himself so wise that he cannot learn more."

A strong box with an opening of about 4 inches on each side next to the bottom, set on something which keeps it up off the ground, as shown in the illustration, makes an excellent feed receptacle to have in a pasture or elsewhere. It is not only useful for holding ear corn, but alfalfa or clover hay as well.

A self-feeder for shelled corn or other like feed is described in *Wallaces' Farmer* by Charles Mason, of Cedar county, Iowa, and an outline of it is given here. The




MASON'S SELF-FEEDER FOR SHELLED CORN

bottom of the troughs is of 2-inch plank, and the sides are of grooved lumber. The roof and the sloping floor on the inside are of flooring, and the roof projects over the sides 2 feet from the plate. The corners are 3½ feet high from the 4x4s on which it is built, with a 2x4 plate to which the roof is nailed. The 4x4s project 12 inches at one end and serve as skids for hitching to when the feeder is moved. A floor 4 feet wide, not attached, is on each side of the feeder for the hogs to stand on when eating. The siding commences 2 inches above the floor

of the troughs, and hinged doors forming part of the roof or cover afford openings for putting in the feed.

### MARKET CLASSES AND GRADES

The farmer in selling his hogs to the local buyer or shipper is often at a disadvantage because of his inability to interpret market reports to the full extent of their meaning, and therefore either does not get what his stock is worth, or perhaps loses a sale through lack of the useful information he needs. Helpful to a better understanding of the market side of the business William Dietrich of the Illinois experiment station, in Bulletin No. 97, explains how swine are classified and graded on the Chicago and other markets, as follows:

MARKET CLASSIFICATION OF SWINE

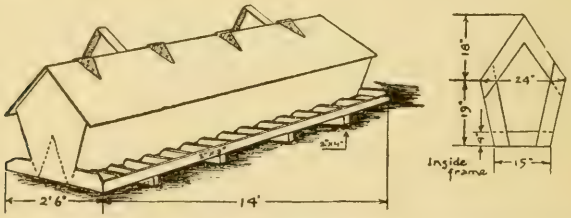
| Classes. | Subclasses. | Grades. |
|---|---|---|
| Prime heavy hogs, 350 to 500 pounds | | Prime. |
| Butcher hogs, 180 to 350 pounds. | Heavy butchers, 280 to 350 pounds | Prime. Good. |
| | Medium butchers, 220 to 280 pounds; Light butchers, 180 to 220 pounds | Prime. Good. Common. |
| Packing hogs, 200 to 500 pounds. | Heavy packing, 300 to 500 pounds; Medium packing, 250 to 300 pounds; Mixed packing, 200 to 280 pounds | Good. Common. Inferior. |
| Light hogs, 125 to 220 pounds. | Bacon: English, 160 to 220 pounds | Choice. Light. Fat. |
| | Bacon: United States, 155 to 195 pounds | Choice. Good. Common. |
| | Light mixed, 150 to 220 pounds | Good. Common. Inferior. |
| | Light light, 125 to 150 pounds | Good. Common. Inferior. |
| Pigs, 60 to 125 pounds | | Choice. Good. Common. |

Roughs.
Stags.
Boars.
Miscellaneous:
Roasting pigs, 15 to 30 pounds.
Feeders.
Governments.
Pen holders.
Dead Hogs.

Mr. Dietrich describes the various classes substantially as follows:

### PRIME HEAVY HOGS

These include prime, heavy, fat-back hogs representing the extreme of the fat or lard hog type. "With the tendencies of the market working toward the lighter hogs, there are not very many of these heavy hogs at present; however, there are still enough to make a market class."




A SELF-FEEDER USED AT THE KANSAS PENITENTIARY

### BUTCHER HOGS

These are commonly used for the fresh-meat trade and constitute about 25 per cent of the hogs coming to the Chicago market. Butcher hogs as a class are principally barrows, and range in age from six months for light butchers to one year for heavy butchers. "Other things being equal, barrows sell more readily and at

better prices than do sows. In a drove of butcher hogs there may be present a few good sows without detracting from the value of the drove. Hogs that will grade as prime butchers, either heavy, medium, or light, must be perfect in quality, ideal in form, and must show much evidence of ripeness in condition as well as maturity."

Good butchers, though not equal to prime butchers, are still very good representatives of highly developed hogs. "Compared with prime butchers, the good butchers may be slightly deficient in form, or a little lacking in quality or maturity, or may be lacking somewhat in condition."

Common butchers are found only in the medium and light butcher classes. "The common butcher hog is one that shows considerable evidence of having been well fed, and possesses compactness, smoothness, and firmness. Frequently, however, he is not a mature animal, and is considerably more deficient in form, quality and condition that the prime butcher hog."

### PACKING HOGS

Packing hogs are as a class of a poorer grade than are the butcher hogs, and include old brood sows and all other hogs heavy enough for this class and not good enough for the butcher hog class, except the very poor classes, such as roughs, boars and coarse stags. "The side pork from these hogs is used principally in the various processes of curing. It is made into mess pork, short-cut mess pork, dry salt sides, and the hams and shoulders are cured. About 40 per cent of the hogs

coming to the Chicago market annually are of this class. They range in age upward of about nine months. A 200-pound packing hog is usually older than a 200-pound butcher hog."

Heavy packing subclass includes the heavy hogs and medium packing the lighter hogs of this class. Mixed packing is a subclass representative of hogs as they come to the yards from local buyers in the country, including hogs of different classes as well as different grades and weight, as the name indicates

### LIGHT HOGS

This class includes all hogs within the weight limits, 125 to 220 pounds, except roughs, stags and boars, which form separate classes. "About 15 per cent of all the hogs coming to Chicago are of this class. They range in age from five to eight months. Since this class includes practically all hogs within the given weight limits, they must necessarily be quite different as to form, quality and condition. Such being the case, the meat from the same is prepared differently, thus making the subclasses of more importance than in the two former classes."

Breakfast bacon, as is well known, is cut from the side of a hog, and is prepared by salting the pork and then smoking. In some cases the hams and shoulders are sold separately, although much of the English bacon is cut into what is called a "Wiltshire side"; *i. e.*, the whole side, with simply the head and feet cut off. Many of the hogs sold in the Chicago and other markets of the

United States for bacon purposes are not of the ideal bacon type. The bacon hog must be "long in body, deep in side, with comparatively narrow back, narrow and light hams and shoulders, and light, muscular neck."

This form is desirable because it is the side of the hog that furnishes the best and most expensive cuts, and it is necessary to have as much as possible of this at the expense of the other parts. This hog must also show indications of having firm flesh, be well covered with lean meat or muscle, and must not have an excess of fat on the outside of the carcass. The fat on the outside should not be more than 1 to 1¼ inches in thickness, and should be evenly distributed over the entire carcass. The weight must be between 160 and 220 pounds, as this makes the most desirable cuts as to size, flavor and firmness. From the very nature of a cut of bacon, size is of much importance. A hog smaller than the given weight would furnish a side of bacon that would be too thin, and one larger than this would furnish one that would be too thick.

### THE BEST AGE FOR A BACON HOG

A hog old enough, that with good care and breeding will weigh from 160 to 220 pounds, furnishes bacon that is of the best flavor. A hog smaller than this would very likely be too young, and one heavier than this would be too old to furnish bacon of the best flavor. In firmness of flesh, also, the 160 to 220-pound bacon hog is likely to be most desirable. A hog younger than is required to produce this size would have too much water in its flesh; for the younger the animal, the more water

it has incorporated in its system, and this excess of water in the system of the young hog not only detracts from the firmness of the flesh, but also replaces much of the food value, thus forming a meat that has less "substance." When a hog is heavier than 220 pounds, he is not so good for bacon purposes, because when beyond the age required to produce this weight there is a greater tendency to lay on fat, not only on the outside of the carcass, but also to intermix more fat with the lean meat, thus producing too much fat in proportion to lean meat for the best bacon. After this age there is also more of a tendency to lay on fat unevenly and in patches, and where this occurs it is impossible to produce good bacon.

By the term choice, in reference to a bacon hog, is meant one that conforms as nearly as possible to the above description. It must have the form that is characteristic of this type of hog, and must have the best quality and condition that is desired for the bacon trade.

To be in good condition a bacon hog must have a good development of lean meat or muscle, with the proper amount of fat as outlined above. He must be smooth, well developed, and have a large proportion of edible meat, while the proportion of fat and other offal must be small. Hams, shoulders, jowls, and neck must also be small in proportion to length and depth of side. If a hog has all these characteristics of form, quality and condition developed to a marked degree, he would be considered a choice bacon hog.

It may be thought that the production of bacon is possible only with certain breeds of swine and that these

breeds will always produce bacon under all circumstances. While this is true in a general way, it is not always true. It is the feed and mode of life that produces the bacon hog and that enables him to retain his form as such after he has been developed.

The bacon-hog type of the United States differs considerably from the English bacon hog, which has recently been introduced into the United States and is rapidly establishing for itself a market class. There is, however, a growing tendency toward the typical bacon type.

### FEW BACON HOGS IN AMERICA

There is a demand on the markets of this country from foreign countries, and more largely from our own country, for bacon, and there being few bacon hogs to supply the demand, the trade is supplied from the lighter hogs of the fat or lard hog type. The bacon, however, does not command so high a price on the market as does bacon from typical bacon hogs. The bacon hogs under consideration here weigh from 155 to 195 pounds, and range in age from six to eight months. They are simply hogs selected from the light hogs in general that conform as nearly as possible to the bacon type. They are not very fat, have fairly good development of muscle or lean meat, and are as long and deep inside as is possible to obtain them. About 20 per cent of the light hogs that come to the Chicago market are of this type.

About 55 per cent of the light hogs coming to the Chicago market are said to be of the light mixed class, a somewhat miscellaneous sort, quite similar, except as

to weight, to mixed packing hogs, and containing hogs of the light butcher weights that are too poor in quality, form and condition for butcher hogs, as well as hogs of the same weight as the bacon hogs, but which are too much of the fat or lard type hog for bacon. "This class, then, is the 'dumping ground' for the outcasts of two former classes of hogs. In one case it takes the poorer hogs and in the other case the better hogs, considered from the fat or lard hog standpoint. Hogs of this class are used principally for the fresh-meat trade. They range in age from five to seven months."

It is stated that about 25 per cent of the light hogs coming to the Chicago market are of the light light class, which includes hogs ranging in age from five to six months and, as the name indicates, the lightest of light hogs. "While the 'light butchers' and 'bacon hogs' are the selected kinds of their respective weight with consequent small variation between the different grades, the class of 'light light hogs' includes all the hogs of this weight, consequently the range in the grades is wider. They are used principally for the fresh-meat trade."

### PIGS

Pigs, as found on the market, range in weight from 60 to 125 pounds, and in age from three and a half to six months. This class, like that of light light hogs, includes all the pigs that range within the given weights. "They are used principally to supply the demand from the cheaper restaurants and lunch counters, and are in greatest demand in winter, being hard to preserve fresh

in summer and too young to cure. About 10 per cent of the hogs coming to the Chicago market are of this class."

### ROUGHS

This class includes hogs of all sizes that are coarse, rough, and lacking in condition—too inferior to be classed as packing hogs or as light mixed hogs. "The pork from these hogs is used for the cheaper class of trade for both packing and fresh-meat purposes. In market reports pigs and roughs are frequently classed together, not because they belong in the same class, but because they sell at approximately the same price."

### STAGS

"Stags are hogs that at one time were boars beyond the pig stage and have been subsequently castrated. They sell with a dockage of 80 pounds. If they are of good quality and condition and do not show too much stagginess they go in with the various grades of packing hogs. When they are coarse and staggy in appearance they are sold in the same class with boars. The intermediary grades sell for prices ranging between these extremes, dependent upon their freedom from stagginess and their quality and condition."

### BOARS

"Boars are always sold in a class by themselves and bring from $2 to $3 per 100 pounds less than the best hogs on the market at the same time. They always sell straight, with no dockage. There are no distinctions as to grades; they simply sell as boars. Of course, if there

are marked differences as to quality and condition, the price varies a little accordingly. The pork from these animals is used to supply the cheaper class of trade, and also for making sausage."

### MISCELLANEOUS

Roasting pigs are not generally quoted in market reports. They reach the market in small numbers and only during the holiday seasons, and their price varies greatly

Feeders are hogs bought on the market and taken back to the country to be further fed, a practice which is followed only to a very limited extent.

Governments are hogs rejected by the government inspector as not sound in every respect. "They are usually bought up by a local dealer and taken to one of the smaller packing houses where they are slaughtered under the supervision of an inspector. If found to be affected so as to make their flesh unfit for human food, they are condemned, slaughtered, and tanked. The tank is a large, steam-tight receptacle, like a steam boiler, in which the lard is rendered under steam pressure. This high degree of heat destroys all disease germs with which the diseased carcass may have been affected. The product of the tank is converted into grease and fertilizer."

"The commission men who sell the stock as it comes to the yards, and the speculators who handle part of it, pay nothing for their privilege of doing business in the yards. They hold their respective positions by common consent and their respective pens by keeping hogs in them."

These hogs are called pen holders, and have no influence on the market.

Dead hogs are those killed in the cars in transit, and are used for the manufacture of grease, soap, and fertilizer. "If they weigh 100 pounds or over they sell for 75 cents per 100 pounds. If they weigh less they furnish no revenue to the producer or shipper, the cost of handling the same being held equal to their value."

About two-fifths of the world's hog supply is produced in the United States, and about six-sevenths of these are produced in the Mississippi valley; hence this section of the country has developed the fat or lard hog and has set the standard for hogs in other parts of the United States.

The fat or lard hog is such because corn has been his principal feed and because there has been a demand for pork from such a hog, and he will conform to the present prevailing type just as long as corn remains his principal feed.

Butcher hogs are the best hogs from the fat or lard hog standpoint that come to market, and should be used as a standard for comparison.

From the bacon market standpoint the English bacon hog is the ideal toward which hogs are being developed.

To the close observer it is apparent that the gradually changing conditions brought about by the development of the United States, and the increase in the price of corn resulting from its varied commercial uses, cause the hog to be fed a more mixed and usually a more nitrogenous ration. It is not improbable that this will in the future affect the type of the hog of the United States,

so that it will more nearly approach that of the English bacon hog.

An obvious deduction from the bulletin is the advantage of uniformity in the lots of hogs shipped to large markets, which conform to recognized classes. The chief purpose of the bulletin is to explain the system of grading or classifying hogs, in order that the farmer may understand the market side of the business more thoroughly and be better able to interpret the market reports. This classification is necessarily somewhat flexible in its application, depending upon individual judgment; and, hence, there is greater opportunity for difference of opinion in the case of an uneven lot of hogs. In the higher grades especially uniformity is quite desirable, and a few inferior animals may bring down the price of the whole lot, as they injure its appearance. This lack of uniformity and the lack of condition is responsible for certain "mixed" classes which are made the dumping ground for the outcasts of the higher grades. Such mixed lots sell at a disadvantage. Speculators take advantage of this, buying several carloads, which they sort into various classes and resell at a profit because they are then properly graded.

CHAPTER XIV.

# Grains and Ground Feeds

Throughout the greater portion of the hog raising territory of the United States, wheat and all other grains are valued as foods for live stock by comparison with Indian corn, and their use is either as a balance for corn, or as a substitute in time of scarcity and high price. Outside the corn growing territory the small grains generally form the basis of animal rations. In either situation a working knowledge of the values of various small grains for feeding swine may be the means of yielding a profit not to be despised.

## WHEAT

Up to recent times the man who used his surplus wheat as a substitute for corn in stock feeding was an object of more or less criticism or ridicule by his neighbors and in the farm press. In 1893, however, an accumulation of wheat and a subsequent low price, coincident with a shortage of and high prices for corn in many states, induced many farmers to feed wheat to their live stock. The results and the experiments conducted since that time have made the feeding value of wheat much better understood and more generally recognized, and where a profit would accrue it has since been considered eminently proper to feed wheat to farm animals.

Pound for pound, wheat is about the equivalent of corn for producing pork. It is estimated that by ordinary farm methods an average of five pounds of wheat or corn are required to yield a pound of pork when either grain is fed by itself. Wheat, having more of the tissue-building elements, will give more lean meat than corn, and, hence, corn is preferred for fattening. Wheat-fed and corn-fed hogs appear to be equally well liked by the packer. The Armour Packing Company said in letters to the author in the winter of 1894-95: "From the information we gather, most of the hogs we have killed this winter have been fed considerable wheat, and we find the quality of the meat is very satisfactory in every way. The percentages do not vary much except in the yield of lard, which is decidedly in favor of corn-fed hogs, but the meat from the wheat-fed hogs is firm, well streaked with lean, and particularly desirable for bacon and fancy cuts." The percentages referred to are shown in the table on page 339 which compares 86 hogs having an average weight of 248 pounds, fed on corn and slaughtered at Armour's November 3, 1894, with 71 hogs having an average weight of 251 pounds, fed on wheat, but no corn, since July, 1894, and slaughtered at Armour's (in both instances at the Kansas City plant) October 11, 1894.

Records kept by farmers as well as at the experiment stations have shown wheat to have a feeding value of $1 per bushel when fed to pigs. P. D. Armour, Jr., made a test in 1894 with 18 pigs about four months old, feeding them wheat crushed and soaked 24 hours, and given three times a day, no other feed being used. The lot

weighed 1,975 pounds on September 15, and by September 29 they had consumed 1,650 pounds of the wheat and weighed 2,500 pounds, a gain of 525 pounds. Taking the market price for hogs at the time, five cents per pound, and the price of wheat, 53 cents per bushel, the value received for the wheat was $26.25, or a little more than 95 cents a bushel. The lot showed a weight October

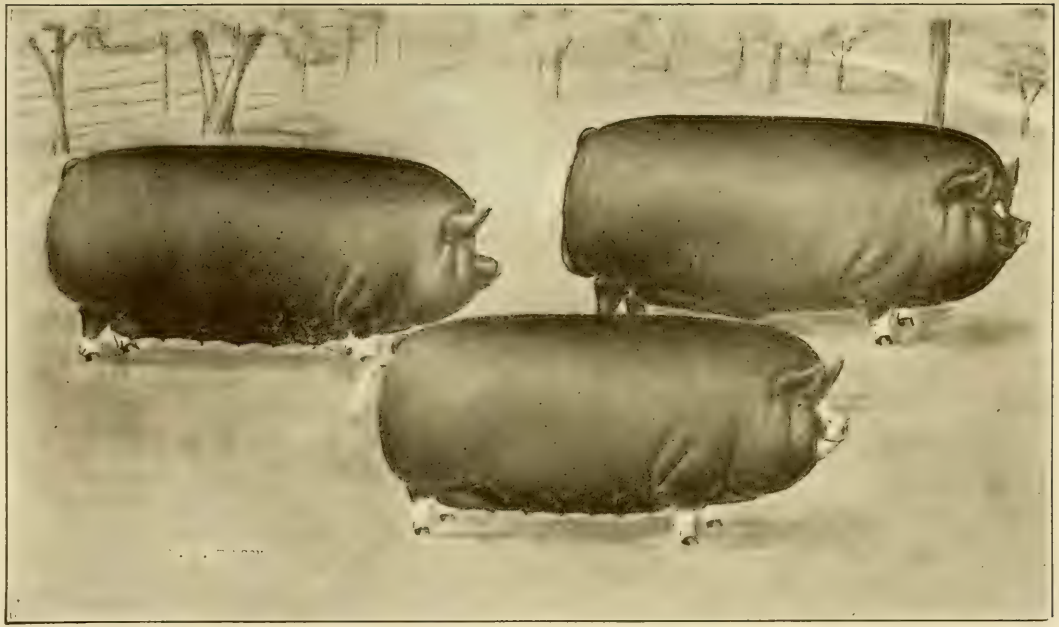
COMPARATIVE KILLING RESULTS FROM CORN-FED AND WHEAT-FED HOGS

| | Corn-fed. | | Wheat-fed. | |
|---|---|---|---|---|
| | Weights. Pounds. | Per cent. | Weghts. Pounds. | Per cent. |
| Ex. S. C. Sides | 5,470 | 25.64 | 4,557 | 25.58 |
| Loins | 1,990 | 9.33 | 1,639 | 9.19 |
| D. S. Shoulders | 1,373 | 6.44 | 1,192 | 6.69 |
| 3-Rib Shoulders | 1,148 | 5.38 | 860 | 4.83 |
| Hams | 2,727 | 12.78 | 2,232 | 12.52 |
| Lard | 2,015 | 9.45 | 1,336 | 7.50 |
| Leaf Lard | 540 | 2.53 | 522 | 2.93 |
| Total Cuts | 15,263 | 71.55 | 12,338 | 69.24 |
| Total Offal | 1,525 | 7.15 | 1,405 | 7.88 |
| Total Turnout | 16,788 | 78.70 | 13,743 | 77.12 |
| Gross Weights | 21,330 | | 17,820 | |

13 of 3,060 pounds, or a gain since the preceding test of 560 pounds. They had consumed since September 29, 1,638 pounds of wheat, and with the hogs at $4.90 on October 14, they would have netted on the gain, $27.44, or a net price for the wheat of $1 a bushel. This showing may probably be taken as a fair average; feeders' reports in the farm press have ranged from 65 cents to $1.38 a bushel as returns from feeding wheat to hogs.

While wheat may, on the whole, have a slight advantage over corn except as a finishing feed, the disparity in prices ordinarily makes it the more expensive. It is evident that wheat will not be used to any large extent in America as food for swine, except in years of extraordinarily low prices. In sections outside the corn-growing territory, where wheat may perchance be the cheapest feed, rye or barley is usually available as a supplement, together with clover, alfalfa, or other pasturage. A good proportion when feeding wheat is two pounds of wheat to one pound of barley, fed coarsely ground and soaked sufficiently to saturate the meal thoroughly, and given in quantities varying according to the age of the pigs, but not larger than they will clean up well. A mixture of two parts of rye, two of barley and one of wheat is excellent. In any event, wheat alone would not be best, and some other suitable feed should be provided with it. Where wheat is more readily available than corn the type of hog will more nearly approach the bacon demand, and corn will continue to reign where the lard hog flourishes. As wheat possesses more of the growth-furnishing elements than of fattening material, compared with corn, it is of greater value for breeding stock and young pigs, when properly used. In the opinion of Prof. H. M. Cottrell, finishing on wheat has some tendency to make the meat tough.

Experiments made at the Central experimental farm of Canada show that wheat may be more or less damaged by frost without destroying its value as hog feed. Spoiled wheat—bleached, shriveled or sprouted—rejected or greatly cut in price at the mill, may be turned to



A TRIO OF KANSAS-REARED BERKSHIRES


**BERKSHIRE SOW, DUCHESS 279TH-75009**

Grand champion sow of her breed at the World's Fair, St. Louis, 1904. This sow, bred to Masterpiece 77,000, sold at auction in August, 1908, when 5½ years old for $2,000

good profit in pork growing. "The shriveled wheat," says one prominent writer, "is a more nearly balanced ration than the perfect grain. The bleached wheat, while light in weight, has yet nearly the food equivalent of the sound wheat. Sprouted wheat has perhaps two-thirds of the feeding value of the wheat before it was sprouted. Millers will give little or nothing for these; therefore, feed them liberally to young, growing stock."

### WHEAT BRAN AND MIDDLINGS

Wheat middlings or shorts has an important and recognized value as a feed, and economical if not too high in price. As with all milling by-products, it should be used in connection with corn or other feed. Middlings, mixed with water enough to make an attractive, milky slop, and used with corn and pasture, makes a pleasing ration. With matured hogs one-third middlings and two-thirds corn will give satisfaction, but with young, growing pigs, the mixture should be two-thirds middlings and one-third corn.

Middlings is rich in protein, with a fair amount of ash, and lacks the crude fiber which lowers the feeding value of bran. Henry has said that "as a feed for swine at all periods of their development, middlings stands pre-eminent." Feeding experiments at the Maine station (Report of 1889) gave, with the same allowance of feed, twice the value to middlings as to wheat bran. Bran can be fed only in limited quantities because of the small capacity for bulk in the pig's stomach.

Henry's compilation of experiments in "Feeds and Feeding" shows that middlings is superior to corn when

fed alone, but that a combination of corn and middlings proves 20 per cent more economical than middlings alone. At a price around $25 a ton for middlings, it may ordinarily be considered an expensive feed.

It should be stated that there is liable to be misapprehension as to the use of the word middlings, and that the meaning and analysis of this commodity as known at the time of preparing this volume and as understood, say up to twenty-five years before, are perhaps quite different. Prior to the manufacturing of flour by the present or "roller" process, middlings was a product in which there was retained a considerable portion of the wheat's flour, that the old buhr process of milling failed to separate from the outer or intermediate bran. This made a quite rich, and when wet, a very sticky mass or food. Millers say that under the present system of flour making there is practically no such product as the old-time middlings; instead, what goes by that name is virtually but shorts or "mill-tailings," and commercially the terms "shorts," "middlings" and "shipstuff" now mean the same thing, which analyses show as having about the same food elements as bran (from the hard winter wheats), thus: Protein, 14 to 17 per cent; carbohydrates, 54 to 57 per cent; fat, 4 to 5 per cent. The same product from northern spring wheats is given a rather lower valuation and sells at $1 to $1.50 less per ton. In spite, however, of what analysis shows, the present-day shorts, middlings or shipstuff sell in the markets for about 20 per cent more than bran, due, it is claimed, to the fact that the finely ground

shorts make a more satisfactory slop for pigs than can be made of bran.

### KAFIR-CORN

Two experiments were carried on at the Kansas station by Prof. C. C. Georgeson in feeding swine with red Kafir-corn meal. The first was planned to ascertain the relative feeding value of Kafir-corn meal, corn meal and ground wheat. Twelve shotes eight months old were selected for the test, and divided into three lots, consisting of one barrow and three sows each. The test continued from December 27 to March 14. The feed, mostly, was wet overnight and each shote was given all it would eat, but no more. They were penned in a gloomy barn basement. From the results obtained the following conclusions were drawn:

"In the comparison of wheat, corn and red Kafir-corn as fattening food for hogs, the wheat proved to be the most effective, followed closely by corn; red Kafir-corn, although a good feed, was not equal in fattening qualities to either of the others. It required respectively 4.11 pounds of wheat and 4.38 pounds of corn to produce a pound of gain, while of red Kafir-corn it required 5.15 pounds to produce the same result; but it should be noted in this connection that the experiment was carried out during the coldest portion of the winter and that the hogs were confined strictly to these feeds. Under favorable weather the results would doubtless have been much better, and in like manner, these grains might have given different results if fed in judicious mixtures with other suitable feed."

The second experiment was to test the value of Kafir-corn meal and soy bean meal in comparison with corn meal. Twelve pigs of Berkshire and Poland-China blood, weighing from 52 to 77 pounds (average 63 pounds), were full fed, three times daily, from November 7 to March 12, with meal that had soaked overnight or longer. Owing to various circumstances, the original plan of the experiment could not be carried out, but from it all Professor Georgeson evolved this summary:

1. Red Kafir-corn meal did not prove quite equal to corn meal as a fattening food. The poor gains of two of the lots were, however, in the main due to their inferior feeding qualities. The Poland-China gilt in one lot fed on Kafir-corn made a fairly good gain on this feed.

2. A mixture of two-thirds Kafir-corn meal and one-third soy bean meal produced excellent gains. The soy bean meal apparently corrected the defects of the Kafir-corn meal in such a way as to make the mixture a desirable feed.

3. A mixture of two-thirds corn meal and one-third soy bean meal gave slightly better results than Kafir-corn meal and soy bean meal. The conclusion to be drawn from this is that red Kafir-corn meal is not as good a feed for hogs as corn meal, but that when either Kafir-corn meal or corn meal is mixed with soy bean meal the results are highly satisfactory."

The table on page 345 in reference to these two Kansas experiments is taken from "Feeds and Feeding," and the succeeding paragraph is Professor Henry's comment.

EXPERIMENTS IN FEEDING KAFIR-CORN MEAL TO PIGS

| Feed. | Number of animals on trial. | Average weight at beginning. | Daily gain per head. | Grain eaten. | Gain. | Grain for 100 pounds gain |
|---|---|---|---|---|---|---|
| First trial: | | Pounds | Pounds | Pounds | Pounds | Pounds |
| Kafir-corn meal..... | 4 | 153 | 1.37 | 2,180 | 423 | 515 |
| Corn meal..... | 4 | 152 | 1.70 | 2,294 | 523 | 439 |
| Second trial: | | | | | | |
| Kafir-corn meal..... | 3 | 63 | .50 | 1,188 | 191 | 621 |
| Corn meal..... | 3 | 64 | .80 | 1,477 | 306 | 482 |
| ⅔ Kafir-corn meal... ⅓ Soy-bean meal... | 3 | 62 | 1.44 | 2,166 | 547 | 396 |
| ⅔ Corn meal..... ⅓ Soy-bean meal... | 3 | 62 | 1.46 | 2,048 | 554 | 369 |

"The table indicates that Kafir-corn meal falls from 18 to 33 per cent below corn meal in value for pig feeding. This grain, though rich in carbohydrates, lacks protein, and is therefore not suitable for feeding alone to young pigs. The advantage of adding some substance rich in protein to the ration of corn or Kafir-corn is shown in the last trial, where the soy bean meal materially increased the daily gain of the pigs, and cut down the requirements of feed for 100 pounds of gain in a marked degree. It is probable that if Kafir-corn were boiled it would prove more satisfactory."

Kafir-corn alone is a very constipating food and hogs tire of it at times, especially young ones. However, E. H. Lupton, of Sheridan county, Kansas, who raises 200 to 500 hogs annually, tells the author that he finds Kafir-corn fed dry to pigs two to five months old superior to Indian corn, and that if necessary he would pay a premium to secure the Kafir-corn. To guard against constipation, using the Kafir-corn with some other food

of a laxative nature is recommended. Soy bean meal is excellent for this purpose.

### OATS

When feeding oats unground there is generally the purpose of securing exercise, and, in that event, the grain is usually scattered on a clean feeding ground. Oats whole will give less satisfactory returns than when ground or crushed. In an experiment reported in Bulletin No. 33 of the Central experimental farm of Canada, oats and corn were fed in comparison, being used whole and soaked 54 hours before feeding, skim milk supplementing both. The average daily gain of the lot fed on oats was .87 pound, and of the corn-fed lot, 1.30 pounds. In commenting upon this test Rommel says in "The Hog Industry:" "This results of this test are not very favorable to oats as a pig feed. To get even as economical a gain as could be had from corn, a feeder would have to get nearly twice as good gains as from the oats; for, pound for pound of nutrient material, oats is about twice as expensive as corn."

Experiments with ground oats have produced more favorable results. Professor Henry made trials of whole and ground oats at the Wisconsin station, concerning which he says in "Feeds and Feeding:" "The best returns were secured when feeding a ration consisting of one-third ground oats and two-thirds corn meal. Whole oats gave poorer returns than ground oats. The feed requirements for 100 pounds of gain in both trials where ground oats was used were very low, and show the high value of this grain for pig feeding when ground and fed

in connection with corn meal." Supplementing this, Professor Henry said in the *Breeder's Gazette* in 1902: "Wheat and oats, half and half, probably form the best combination of grains that one can get for the growing pig. For very young pigs, oat hulls are objectionable and should be removed by sieving. All waste so removed can be fed to other stock, and so nothing will be lost. As the pigs grow larger, their digestive tracts become more roomy and the woody matter of the oat hulls less objectionable—indeed, pigs not heavily fed should have something in the feed to extend it or give it bulk, and a reasonable quantity of oat hulls is not objectionable."

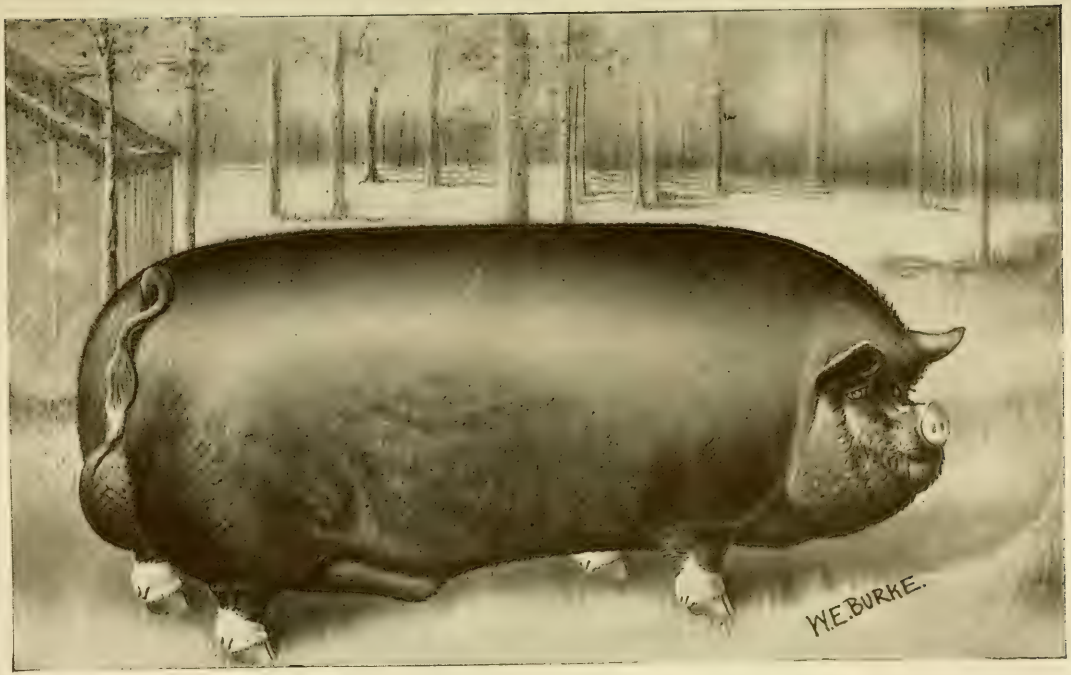
### RYE

Rye is an extremely heavy, concentrated feed, and the grain will usually give best results when not fed to exceed one-third of a ration. Rye and barley are considered of about equal value in feeding for pork. In experiments on this line at the Copenhagen, Denmark, station, reported in "Feeds and Feeding," "the average of 11 experiments with 110 animals shows a daily gain of .865 pound for barley-fed pigs and .873 pound for those fed rye." The carcasses at slaughtering gave 74.3 per cent dressed weight for the barley-fed hogs and 75 per cent dressed weight for the rye-fed hogs.

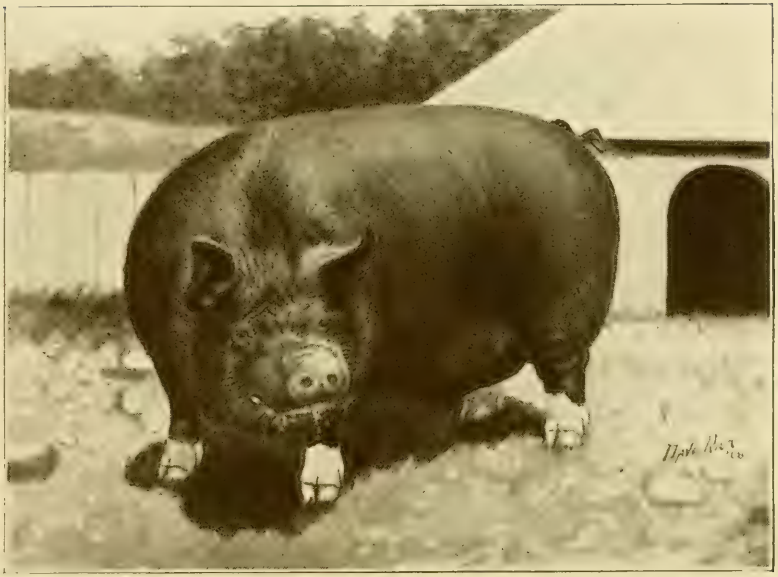
It is considered best to feed the hogs rye in ground form and in rather a thin slop, and some feeders maintain that rye when fed dry makes a sticky mass in the hog's throat on which he is liable to choke.

Rye is much esteemed in many sections as pasture, especially where the soils are rather light, and in such in-

stances "hogging off" is deemed profitable. Where the growth is rank or the weather wet, turning the brood sows and young pigs in the rye field may cause some losses if the pigs find it difficult to keep up with their dams, and caution should be observed in their behalf. By "hogging off" rye on clay or other rather poor lands, the double advantage is obtained of feeding the hogs and distributing the straw and manure on the land in a way that is very excellent. An experience of a Ross county, Ohio, farmer, John M. Jamison, with rye pasture was given in the *Country Gentleman* as follows: "As a farm crop to be grown and harvested as wheat is, we are not much in favor of rye, the heavy straw being so difficult to handle, and when we have a crop we prefer to let the hogs gather it. Our land being principally heavy clay, it is our aim to add all the humus we can to it, and we can use the heavy growth of rye straw to great advantage for this purpose. When it is 'hogged down' it is left on the ground, evenly distributed, just as we want it. The same quantity of wheat straw would often smother the young clover or grasses sown in the rye, but we have never known rye to do so. We regard rye as the best of small grains to start grass crops in, the rye not having as dense a foliage near the ground as oats and wheat. Rye, when fully ripe, will straw-break 15 or 18 inches above the ground, the heads lodging on the bench formed by this breaking, keeping them off the ground and preventing decay of the grain. Again, it will not shatter as wheat will, nor does it, like wheat, decay on account of wet weather. These qualities make it valuable as a crop to 'hog




**BERKSHIRE BOAR, PREMIER LONGFELLOW 68600**
Grand champion boar of his breed at the World's Fair, St. Louis, 1904



**BERKSHIRE BOAR, PREMIER FRANCIS 102900**
An ideal specimen of the breed

down.' We have heard of but one instance where shotes turned on it scoured. In this case the rye was very rank and probably frost-bitten; however, no bad results followed, and the shotes soon became accustomed to it by not being allowed to remain on it too long at first. We would have no fears about turning on to green rye any time during the fall, winter and spring that there is sufficient growth and the land is in a condition not to be injured by trampling. In its use from early growth to maturity, it is our impression that it is best to use it for pasture from the time that it will furnish a good feed on till it begins to joint, taking the stock off then and allowing it to perfect a crop of seed that can be harvested by the growing hogs preparatory to a finish of four to six weeks on corn.

"Some farmers regard it as wasteful practice to gather the crop in this way, but we do not so consider it. If harvested and profitably fed to stock of any kind, rye must be ground. If fed whole, dry or soaked, hogs will not masticate it properly on account of the hardness before soaking and its tough nature after soaking. But when feeding in the field they must also consume the chaff and stem of the head, which, with the grass they eat, makes digestion almost perfect. We have recently noted the condition of the droppings from our pigs, and we have seen no grains voided whole. By sowing rye and allowing the hogs to gather it, the farmer avoids the heavy expense attending the harvesting of a crop of wheat."

According to the Danish experiments, returns from rye shorts are very unsatisfactory, both as to general

results and in the quality of pork produced. Professor Henry says of experiments at the Copenhagen station: "In comparing rye and barley or rye alone with rye shorts in three series of experiments, the grain alone always produced better results than equal mixtures of grain and rye shorts, and these mixtures were again better than rye shorts alone. The quality of the pork produced where rye shorts was fed was poor, especially where all rye shorts was given. The number of points for softness of pork increased rapidly with the feeding of rye shorts, and the classification of the carcass showed that a poor quality of pork was produced when this feed was given."

In its chemical analysis, rye is very similar to barley, although slightly richer in protein. Extensive experiments in Denmark have shown the two to be almost equal in value for swine. But, although ground rye itself has given excellent results both in amount of gain and in the quality of the bacon, the by-products of rye milling, viz., rye bran and middlings, were found very prejudicial to the quality of the product.

### BARLEY

The favorable status of barley as a feed for pork production is well established, especially in the making of firm bacon. It is cultivated, somewhat, over a wide area, and in many sections of Canada, for example, is regarded as essential for making the highest quality of pork, if firmness and flavor are considered without regard to quantity or expense. Where corn is not available, barley is held in high esteem, and in corn growing

territory, when low enough in price, barley is an extremely desirable additional feed. In the amount of pork it yields, corn is superior to barley, experiments by Professor Henry showing that barley is about 8 per cent less valuable than corn, measuring by pork produced and not considering cost. While not equal to corn, barley furnishes more protein and ash, making an excellent feed for building up the pig's structure. As a matter of fact, barley is of such importance in some parts of America that it should command from pork makers considerable more attention than it receives. It has not been relied upon to a great extent in America as the principal part of a hog-growing or fattening food, but the practice of Danish farmers and the results of experiments can very well be studied with profit by American farmers. The Danish bacon, which figures so prominently in the English markets, is produced mainly with barley and dairy by-products. In experiments to determine the nature and causes of "soft" bacon, it has been found that the best bacon was produced by a ration in which barley was at least one-third of the whole.

The grains of barley are so hard that, preferably, it should be ground or rolled, to aid digestion and save waste, and the ground feed should be soaked or made into slop. Swine require more water when fed on barley than on corn or corn meal, and they should not be neglected in this regard. Cooking seems to lessen rather than increase the feeding value of barley.

Numerous experiments have been made in Canada in feeding barley to hogs, particularly from the standpoint of bacon production. The following paragraph from

Bulletin No. 51, of the Central experimental farm of Canada, "Bacon Pigs in Canada," summarizes the main conclusions reached: "In Europe barley is looked on as the ideal feed for fattening and finishing off bacon hogs. In Canada most experimental work goes to support this view. So favorably is it known, in fact, that it has practically become a standard by which other foods are judged, so far as their value for bacon production is concerned. It should be used ground. Soaking for 24 hours or longer before feeding will, in part, make up for lack of grinding. It is not a very good feed for suckling sows nor for very young pigs. It may be fed alone to advantage, but will give somewhat better results if ground peas, shorts or oil meal in small quantities or well-ground oats be added. It makes a prime quality of bacon wherever other conditions permit."

In the same bulletin details are given of an experiment made with two grade Berkshire pigs, which were fed on barley, beginning about January 1. "The barley was given three times a day, chopped (coarsely ground) and mixed with water at the time of feeding. No more was given than would be eaten up clean at each meal. The results shown in the table on page 353 indicate that the barley in this experiment realized in pork 50 cents per bushel; farmers at that time were selling the same grade of barley at an average of 25 cents per bushel, a difference of 100 per cent in favor of feeding it." The pigs were purchased and sold at five cents a pound, live weight. The table shows that it took an average of four pounds and 11 ounces of barley in the four months of feeding for the production of one pound of pork.

TABLE SHOWING RESULTS IN PORK PRODUCTION FROM FEEDING BARLEY TO TWO BERKSHIRE PIGS

| | Amount of barley consumed each month by two swine. | Gain in pounds of pork each month. | Return per bushel of barley fed. | Pounds of barley consumed for one pound of pork. | Weight of swine at the end of month. |
|---|---|---|---|---|---|
| | Pounds. | Pounds. | Cents. | Lbs. oz. | Pounds. |
| First month | 288 | 83 | 69 | 3 7 | 200 |
| Second month | 335 | 71 | 50 | 4 11 | 271 |
| Third month | 370 | 65 | 42 | 5 11 | 336 |
| Fourth month | 341 | 62 | 43 | 5 8 | 398 |

In Bulletin No. 129 of the Ontario agricultural college, entitled, "Bacon Production," similar conclusions are reached: "Barley is a noted hog food in Europe, but some feeders in this country do not look upon it with favor. We have secured excellent results from barley, however, both in the amount of gain and the quality of bacon. For young pigs it should be mixed with wheat middlings, a very little barley being used at first, and the quantity gradually increased. For older pigs, peas or wheat may be added. Some succulent food, such as roots or green food, should always be fed with it, and skim milk makes a great improvement. It is not generally regarded with favor as a food for breeding sows."

Barley will generally yield the most satisfactory gains when used as a portion of the ration. Used with roots it tends to overcome their laxative effect, and excellent results have been derived from this combination. Barley usually flourishes where alfalfa is found in abundance, and these two should combine admirably with other good feeds easily raised in the same locality for making first-class pork. Prof. H. M. Cottrell of the Colorado agri-

cultural college says that in the district surrounding that institution (at Fort Collins) the average yield of barley in 1906 was over two tons (71 bushels) to the acre, sufficient to produce more than 800 pounds of pork, and that in many of their alfalfa-growing sections where irrigation is practiced, alfalfa pasture will give 500 to 1,000 pounds of pork per acre as a yearly average. Where these conditions exist corn is not ordinarily a

FIELD PEA AND SOY BEAN PLANTS AND PODS

staple crop, but the barley-and-alfalfa combination should make weight cheaply and give a high grade of pork.

Experiments made to compare barley with corn have been summarized by Rommel in Part II of Bulletin No. 47, U. S. Bureau of Animal Industry. They show results from feeding corn and barley, both whole and ground; the barley in a majority of the experiments cited in the table herewith having been used in connection with skim milk:

## COMPARATIVE RESULTS FROM FEEDING CORN AND BARLEY

| Ration. | Number of tests. | Number of pigs. | Average weight at beginning. | Total gain. | Number of days fed. | Average daily gain. | Feed per 100 pounds gain. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Corn. | Barley. | Skim milk. |
| Colorado:[1] | | | Pounds | Pounds | .... | Pounds | Pounds | Pounds | Pounds |
| Whole corn | 6 | .... | 71 | .... | .... | 0.39 | 700 | .... | 110[5] |
| Ground corn | 5 | .... | 60 | .... | .... | .46 | 540 | .... | 110[5] |
| Whole bald barley | 8 | .... | 88 | .... | .... | .58 | .... | 500 | 130[5] |
| Ground bald barley | 5 | .... | 67 | .... | .... | .74 | .... | 360 | 80[5] |
| Whole common barley | 4 | .... | 68 | .... | .... | .49 | .... | 540 | 70[5] |
| Ground common barley | 4 | .... | 47 | .... | .... | .70 | .... | 430 | 110[5] |
| South Dakota:[2] | | | | | | | | | |
| Corn meal | 1 | 5 | 126 | 430 | 56 | 1.53 | 453 | .... | .... |
| Barley | 2 | 9 | 112 | 803 | 56 | 1.59 | .... | 457 | .... |
| Ontario Agricultural College:[3] | | | | | | | | | |
| Corn | .... | .... | .... | .... | .... | .70 | 547 | .... | .... |
| Barley | .... | .... | .... | .... | .... | 1.17 | .... | 456 | .... |
| Central Experimental Farm, Ottawa:[4] | | | | | | | | | |
| Whole corn | 1 | 3 | 72 | 354 | 91 | 1.30 | 290 | .... | 231 |
| Ground corn | 1 | 4 | 74 | 392 | 112 | .87 | 416 | .... | .... |
| Whole barley | 1 | 4 | 99 | 400 | 84 | 1.19 | .... | 364 | 252 |
| Ground barley | 1 | 4 | 73 | 444 | 112 | 1.00 | .... | 435 | .... |

[1]Bulletin No. 40. [2]Bulletin No. 63. [3]Annual Reports of 1899 and 1900. [4]Bulletin No. 33. [5]Quarts.

### FIELD PEAS

The field or Canadian pea is extensively grown in Canada (in fact, is one of Ontario's most important crops for meat making), and somewhat along the northern rim of the corn belt, and in the mountain states to the westward, as a food for swine and other stock, where it is a substitute for corn. In Colorado there is much enthusiasm over the prospects of an extensive and profitable swine husbandry there, made possible by the adaptability of the field pea. Used with judgment, the peas, with their abundant protein, supply an excellent food for swine at all stages of development. On account of its sodden character, pea meal is too heavy to be fed as the exclusive grain allowance, and Professor Henry says it should be lightened, by mixing with wheat bran, ground oats or corn meal. Prof. Thomas Shaw, who knows them well, says peas are superior to corn as a food for pigs at any time prior to the fattening season; hence they may be fed to swine more freely, but in no instance should they form the sole ration before the finishing period begins. "During the fattening period they are unexcelled when fed as the sole grain food. They promote growth, while they fatten in excellent form, and they furnish a sweet, firm and excellent quality of pork. Grown in conjunction with some other kinds of grain, peas are of great value as a soiling crop, owing to the larger yields obtained (from 10 to 20 tons per acre may be expected on average soils); to the high nutritive value of the food, combined with its palatability and because of its timeliness. This crop is ready as soon as the spring

grasses begin to fail, and it may be made to continue in season until corn is ready."

J. H. Grisdale, of the Central experimental farm of Canada, says peas are "undoubtedly of very high value as a feed for the production of good, firm bacon, and for young pigs and breeding stock of all classes at practically all times. They should, however, never be fed alone, and should always be ground. Pigs fed on pea meal alone do not thrive, do not get fat, and produce a very inferior quality of meat, dry and hard."

Pea feeds, under various names, are by-products of prepared-food factories, and vary in composition. Some of them are equal to pea meal in feeding value, while others are of little account.

### SOY BEANS

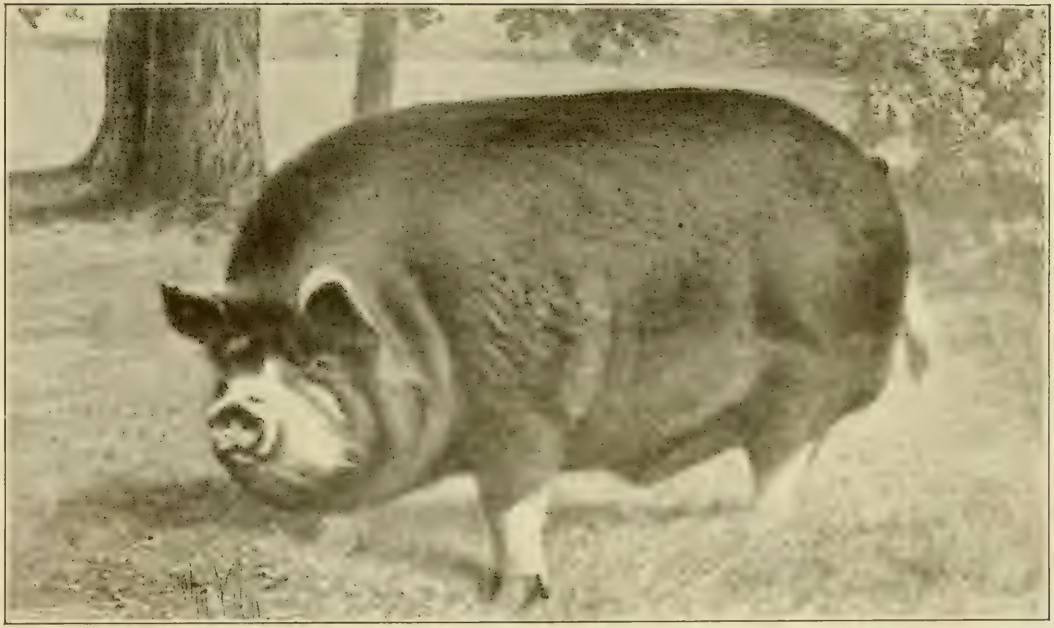
Soy beans are not commonly used in pork production, doubtless owing to lack of knowledge of their characteristics and value. While they have been grown to some extent for several years, only recently has their value to pork makers been understood. At least four experiment stations have made tests with soy beans for hogs. All report favorably. The trials at the Indiana station, taken with the results of other experiments, are convincing arguments as to the efficiency of the seeds of this legume when fed with corn to swine. Soy beans contain 29.6 pounds of digestible protein to the 100 pounds of beans, and pigs fed on them grow rapidly.

At the Indiana station, J. H. Skinner made experiments (Bulletin No. 108), with four lots of four pigs each, averaging 55½ pounds, covering 12 weeks, fed

meals wet with water to a medium thick slop; first, to determine the value of soy beans as a supplement to corn in pork production and to encourage farmers to grow their own protein for hogs; second, to compare soy beans with wheat middlings and tankage as supplements to corn, and add new data to previous experiments with these feeds; third, to emphasize the deficiency of corn as a sole ration for pork production and point out more economical methods of feeding and utilizing corn.

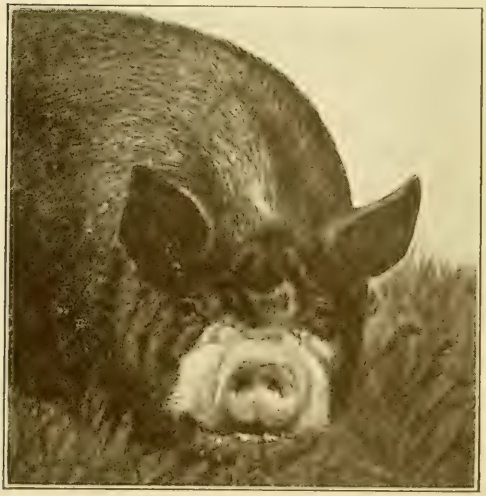
The test showed that it required less feed per 100 pounds gain where soy beans were fed than in any other ration considered, while in this lot the gains, 402 pounds, were 120 per cent greater than the gain in the corn-fed lot and 10 per cent more than the gain in any other lot in the test. The pigs fed more uniformly and developed more evenly than any one of the other lots. The Kansas station reports uniformly successful results from the use of soy beans in connection with Kafir-corn and Indian corn. A resumé of the results there shows a gain, where pigs received soy beans as a supplement, varying from 14.6 to 181.7 per cent over corresponding lots fed corn or Kafir-corn alone.

"Indiana swine growers," says Professor Skinner, "would do well to investigate the merits of soy beans. They can be easily grown and will furnish a home-grown supply of protein in a very desirable form. Farmers will find them to be a very valuable adjunct to corn as shown by results. A yield of 20 bushels per acre means approximately 360 pounds of digestible protein, while 20 bushels of wheat per acre would yield 120 pounds of digestible protein. Another point in favor of soy beans



BERKSHIRE BOAR, STAR MASTERPIECE 102000
Sold at auction for $5.500

**Front of the Kansas-Bred Berkshire Boar, Field Marshal 103300**
The Berkshire breeder's ideal



**Front of the Kansas-Bred Berkshire Boar, Berryton Duke, Jr., 77341**
Considered near perfection

is the power which the growing plant possesses of obtaining nitrogen from the air. They make first-class forage if harvested at the proper time; they are easily grown, are productive, bring nitrogen to the soil, withstand drouth well, are rich in protein and fat, and furnish an efficient food to combine with corn in pork production."

Among the general conclusions presented by Professor Skinner are these:

1. Soy beans proved to be a very valuable adjunct to corn, being the most efficient feed tested.

2. Pigs fed a ration of one part soy beans to two parts of corn produced two and one-fifth times as much gain in the same length of time as did those receiving corn only.

3. It required 310.6 pounds of feed per 100 pounds of gain where one-third of the ration was soy beans, while it took 557.1 pounds per 100 pounds gain where corn alone was fed.

4. Comparing the soy bean ration with the middlings and tankage rations, the amount of feed required per 100 pounds gain stands: Soy beans and corn, 310.6; middlings and corn, 343.4; tankage and corn, 330.6 pounds.

5. Corn meal alone was shown to be very inefficient as a pork producer.

6. The pigs receiving a ration of one-third soy bean meal and two-thirds corn meal produced 402 pounds gain. A ration of one-half middlings and one-half corn meal produced 365 pounds gain. One-sixth tankage and five-sixths corn meal produced 348.5 pounds gain, while a ration of corn meal alone produced only 183 pounds gain. Stated in another way, corn meal alone produced

less than one-half the gain made by a ration of one-third soy beans and two-thirds corn, one-half as much as middlings and corn, and but little more than one-half as much as tankage and corn.

7. Corn meal alone impaired the digestive capacity of the pigs as shown by the feed consumed, which was 320 pounds less than any other lot consumed.

8. The longer the pigs were fed on corn alone the more inefficient it became, requiring 1219 pounds feed per 100 pounds of gain during the last week of the test against 500 pounds the first week, and an average of 557 pounds.

9. Corn meal alone produced poor appetites, light bone, deficient development in valuable portions of the carcass, and a general state of unthrift as shown by the hair, skin and hungry look of the animals.

10. The gains on pigs fed under the conditions of this test cost $5.01 per 100 pounds where corn meal alone was used, $3.44 with one-half corn meal and one-half middlings, $3.59 in the lot receiving two-thirds corn meal and one-third soy bean meal, and $3.71 where five-sixths corn and one-sixth digester tankage was fed.

In Indiana Bulletin No. 126 Skinner records a test in which two lots of four 84-pound pigs were fed 70 days—one lot on five parts corn meal and one part linseed meal and the other lot on five parts corn meal and one part soy bean meal. The cost of the feed was figured at $18 per ton for corn meal and $30 per ton for the linseed and soy bean meal. The cost of 100 pounds of gain on the linseed meal lot was $3.82, and on the soy

bean lot $3.46, a showing decidedly in favor of the latter. The percentage of protein in the two meals is practically the same.

Three different trials were made at the Wisconsin station (Annual Report, 1906) to compare the value of soy bean meal and wheat middlings as a supplement to corn for growing and fattening swine. A summary of the conclusions to which these tests led, as given by Professors George C. Humphrey and J. G. Fuller, is:

1. Soy bean meal makes an excellent supplement to corn meal for growing and fattening pigs.

2. 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.

3. Soy bean meal mixed with corn meal in the proportion of 1:2 produces greater gains than wheat middlings and corn meal in the same proportion.

4. In feeding equal amounts of the two rations, soy beans and corn meal supply a slightly higher per cent of dry matter and digestible matter than wheat middlings and corn meal.

5. 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.

As to the flesh of the test hogs when dressed, the report gives these observations: "The first difference noted in handling the carcasses was the soft and flabby condition of the lot fed corn meal and soy bean meal, and the firmness of flesh of the lot fed corn meal and wheat middlings.

"The amount of meat in the carcasses of the lot fed corn meal and soy bean meal did not appear to be much greater, if any, than that in the carcasses of the lot fed corn meal and wheat middlings. The muscular flesh of the latter, however, was of a bright cherry red, with a fine grain, which, together with its firmness and nicely marbled condition, made it a better quality of pork for the block. The flesh of the former lot was pale red, and the fat was not so well mingled with the lean, but seemed to be deposited beneath the skin in a superficial manner. From all that could be judged from viewing the cuts with the naked eye, the ration of corn meal and wheat middlings was superior to that of corn meal and soy bean meal for producing a good quality of pork."

### EMMER AND SPELTZ

Emmer, sometimes miscalled spelt or speltz, is a drouth and cold-resisting variety of wheat from Russia, raised to a limited extent for stock food in the Dakotas and other northwestern states. Recorded tests of its value for swine are few. The South Dakota station (Bulletin No. 100) fed different lots of 250-pound hogs 44 days on whole "speltz," ground "speltz," and "speltz" and corn. The feed consumed to make each pound of gain was for the lots as named, 7.71, 8.26 and 5.29 pounds, respectively. The cost per pound of gain in each lot as named was 4.6, 5.5 and 3.5 cents, respectively. It is seen that when the grain was ground, the consumption was not only greater, but it required .55 of a pound more grain to make a pound of gain. At the same station the gain on hogs following fattening steers fed on "speltz" as their grain ration was small.

### BUCKWHEAT

Buckwheat, in most localities, usually commands a price which makes it less profitable as a swine feed than other grains, but when it may be used advantageously it is found to have considerable value, although somewhat less than wheat. Buckwheat has been fed extensively in some sections of the north, especially Canada. The middlings from buckwheat, when obtainable, makes an excellent feed, but the bran is of little value.

Comparative feeding tests made at the Ottawa experiment station (annual reports of 1894 and 1895), in the feeding of buckwheat and wheat, ground and in mixtures, showed that six pounds more were needed in the buckwheat mixture than in the wheat mixture for producing 100 pounds of gain. In the first trial detailed in the following table, five pigs in each lot were fed 77 days. A second trial lasted 140 days, and was made with six pigs in each lot. The meal was soaked for 30 hours before using in every instance. The details of the two trials were as shown:

COMPARATIVE FEEDING VALUES OF BUCKWHEAT AND WHEAT

| Kind of Feed. | Average weight at beginning. | Feed eaten. | Gain. | Feed for 100 pounds gain. |
|---|---|---|---|---|
| First trial: | Pounds | Pounds | Pounds | Pounds |
| Ground buckwheat | 103 | 2,109 | 474 | 445 |
| Ground wheat | 97 | 1,272 | 310 | 410 |
| Second trial: | | | | |
| One-half ground buckwheat; one-half a mixture of barley, rye, wheat, and wheat bran | 45 | 3,238 | 800 | 405 |
| One-half ground wheat; one-half a mixture of barley, rye, wheat, and wheat bran | 49 | 2,463 | 649 | 380 |

### MILLET SEED

Prof. James W. Wilson, at the South Dakota station (Bulletin No. 83), made tests extending through 84 days with six Yorkshire pigs divided into three lots, to ascertain the feeding value of millet seed as a swine food in comparison with wheat and barley. All three grains were ground before feeding. The results justified the conclusion that millet seed does not furnish as good a ration for swine as either barley or wheat; it required 20 per cent more millet than it did barley, and a trifle more barley than it did wheat to make a pound of gain; a bushel, or 56 pounds, of millet seed is equal for hog-feed to 48 pounds of barley; it is not so good a fattening feed in extremely cold weather as barley or wheat meal, and it produces a softer quality of fat than barley or wheat.

The color of the lean meat in the millet and wheat lots was lighter than that of the barley lot. "The fat on the wheat and barley carcasses was several shades darker than the fat made from millet; in fact, it had a yellow tinge not noticeable in the millet lot, while the color of the fat on the carcasses that had been fed millet was pure white, and was pronounced by the local butcher as being of superior quality to that of the other carcasses, although not so firm in texture."

"On account of being so well adapted to the conditions there," says Professor Wilson, "and so palatable a feed, millet should have a place in the rotation of crops on every stock farm in South Dakota."

### ADULTERATED GROUND FEEDS

The temptation to meet the demand for a low-priced feed by utilizing by-products has not infrequently led

to the mixing of hulls or sweepings with what would otherwise be a meritorious article. It should be remembered that the experiments with shorts or other ground feed or by-products have been with a product of good grade, and not one that has been used as a medium for working off otherwise unsalable material. Middlings, for example, has sometimes been found to contain sweepings and bran reground. As a rule, feed of this character is not economical.

### BURNT OR FROSTED GRAINS

Occasionally, when a large elevator burns in which much grain is stored, the damaged contents are thrown on the market at a low price for hog-feed. Instances have been reported where wheat damaged in this way has been fed satisfactorily to hogs after it was recovered from a burned elevator, and, so far as the author has been able to discover, no reports have been made of injurious results from its use. It is not safe, however, to conclude that such feed may always be used with impunity. While the nominal price at which grain may usually be secured following a fire may make the opportunity seem attractive, it is well to use caution. A fair trial will sometimes determine whether the damaged grain may be safely used, and ordinarily a sample may be sent to the director of the nearest experiment station and his counsel obtained as to the advisability of its use.

Grain injured by frost while yet immature, or known in Canada as "frozen wheat," has been fed without apparent ill results. Bulletin No. 51 of the Central experimental farm of Canada, gives the following ex-

perience: "Some years ago frozen wheat was available in considerable quantities and was quite extensively used as feed. It was found to be very valuable for bacon production. The meat was of good quality and was produced at the rate of one pound, live weight, from four and one-half to five and one-half pounds of the frozen wheat." The details of the experiments are tabulated in Bulletin No. 33 of the Central experimental farm.

The North Dakota station (Bulletin 84) found that in comparison with corn it requires 8.9 per cent more "rejected" wheat than corn to produce the same gains.

Damaged grain may often have but little market value, thereby offering the swine-feeder a serviceable feed at a low price; but local conditions will have much to do with determining whether or not it is advisable to utilize material of this sort.

### FLOUR AS A FEED

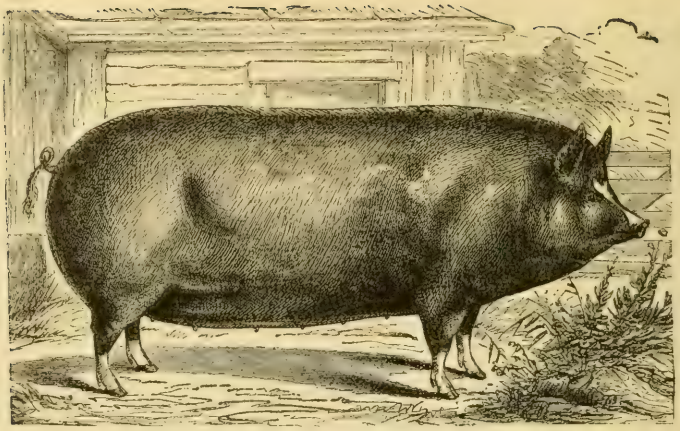
Low-grade flour may sometimes be available for feeding, although, as a rule, inferior grades of by-products will be obtainable at comparatively lower prices. Professor Henry shows, in "Feeds and Feeding," that the nutrients in low-grade flour vary but little from those in flour of higher grade. This low grade of flour is occasionally designated as "feeding flour," "red dog," and by other special names.

The Virginia experiment station (Bulletin No. 167) reports profitable results from feeding red dog with corn meal. The method of feeding is described as follows: "In the test where red dog, which is a low-grade flour relatively rich in protein, was combined with an equal

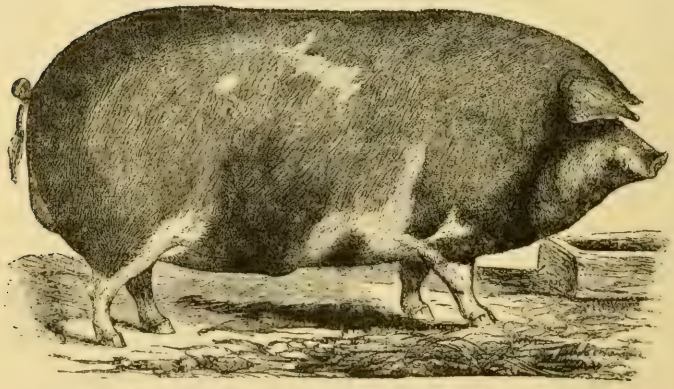
amount of corn meal and fed wet, a gain of .89 of a pound per head per day was obtained with seven months animals. When this same food was soaked 12 hours the gain was at the rate of 1.28 pounds per head per day, which showed a marked advantage in favor of the soaked food. Where red dog was used, unsoaked, the amount of food consumed per head per day varied from 4.3 to 4.9 pounds. The cost of a pound of gain where red dog and corn meal were soaked, was 4.34 cents; when unsoaked, 5.42 cents." Nineteen pigs were used in each of the two groups, and the cost of red dog was figured at $27.50 a ton.

### "STOCK FOODS"

In view of the many condimental, proprietary, or patented "stock foods" everywhere on sale, and the wonderful claims advertised by their manufacturers as to the worth and importance of their goods to stockmen, Prof. F. W. Woll, chemist of the Wisconsin experiment station (Bulletin No. 151), made a series of investigations to learn the ingredients, effects and probable original cost of a large number of the "foods" kept most prominently before the public. Their ingredients were found to be mainly, in greater or less proportions, wheat and corn offal, bean or pea hulls, corn meal, oil meal, mustard hulls, common salt, epsom salt, glauber salt, charcoal, sulphur, pepper, fenugreek, saltpeter and lime. The average cost of the drugs entering into the compounding of the "foods" is apparently not above ten cents per pound, and the price at which the foods are sold to farmers ranges as



A Berkshire Sow, as Portrayed in 1870



A Poland-China Boar, as Portrayed in 1870

high as 25 cents per half pound, or at the rate of $1,000 per ton. Professor Woll's summing up of the patent stock food situation is this:

"The evidence at hand goes to show that there is a practical unanimity of opinion among scientific men in public positions who have given the subject special study in regard to several points connected with condimental stock foods:

"First, 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.

"Second, 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 cases 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 foods consisting of a filler which possesses no medicinal properties whatever.

"Third, exorbitant prices are charged for these foods, as is natural, considering the extensive advertising the manufacturers are doing, and the liberal commissions which they pay agents and dealers. The large sales of stock foods are doubtless mainly to be attributed to these facts.

"Fourth, by adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock foods of any kind. If a farmer believes it is necessary to feed stock foods at times, he can purchase the ingredients at a drug

store and make his own stock foods at a fraction of the prices charged for them by the manufacturers. He will then have the additional satisfaction of knowing just what he is feeding, and of feeding a concentrated 'food' instead of one largely diluted with non-medicinal ingredients."

CHAPTER XV.

# Feeding By-Products

Besides the milling products, already discussed, there are other commercial by-products of more or less importance and value. As most of these are concentrates, they are used as supplements to the main feeds, particularly corn, and in recent years several such have fully demonstrated that they are of worth, although formerly their constituents were not regarded as feeding material or practically of much value. The mills and packing houses have recognized in the hog's ability to make pork from waste and offal an opportunity to turn into money much that might otherwise be of little worth.

The main by-products from grains have been treated in Chapter XIV, and those coming from the dairy are discussed in Chapter XVII, so that, with a few exceptions, this chapter is given over to those from the oil mills, packing houses, sugar factories and breweries. Most of these have not had as long trials as the products of the flouring mills, but the volume of the latter previously available for swine has been lessened by the ingenuity displayed in the manufacture of foods and materials for consumption through other channels

### GLUTEN FEED

Gluten meal and gluten feed are accredited as inferior to corn meal, using skim milk as a feeding base,

but as somewhat superior to wheat meal. Gluten meal has neither the germ nor the hull portions of corn; it is the protein section of the grain, and contains more protein and fat than any other corn product, but is very low in mineral matter. Corn bran and gluten meal mixed and ground constitute gluten feed, which is rich in protein, but possesses more bulk than the gluten meal. Corn bran is the hulls of the corn grain, and, by itself, has little feeding value. Gluten meal is a very concentrated feed, not economically fed alone, and should form but part of a ration. It may be mixed with corn or corn meal for fattening, and, for growing hogs and brood sows, with some feed that will supply bulk, and should be soaked before using. Gluten feed may be used without other mixture as a growing food, but if given to fattening hogs, it should go with corn meal or other feed.

The Cornell University experiment station used gluten meal in comparison with corn meal, both with separator skim milk, on four lots of four pigs each, beginning in February. The following results were printed (Bulletin No. 199): "The object of the experiment was to determine the relative value of corn meal and gluten meal when fed along with separator skim milk. The pigs were so divided that two lots should contain the large pigs for comparison, and two lots the small pigs, so that the large ones should be compared with each other and the small ones with each other. In arranging the rations for the various lots those fed gluten meal were put upon a relatively narrow ration and those fed corn upon a ration which was very close to the theoretical standard. In both cases where corn meal was used with

the milk the cost per pound of gain was less than where gluten meal was used. The actual amount of dry matter consumed per pound of gain was less where corn meal was fed than where gluten meal was fed. These results, secured when corn meal was worth $14 per ton and gluten meal only $11.75 per ton, point very strongly to the conclusion that in feeding large quantities of separator skim milk to young, growing pigs, more economical gains can be made by using as a grain ration corn meal rather than gluten meal." Further experiments at the Cornell station (Bulletin No. 220) showed better results from corn meal and gluten feed mixed than from clear corn meal, both with skim milk.

Corn and gluten meal, as compared with wheat meal, entered into experiments with two lots of six pigs each at the same station (Report of 1894) in which, to make 100 pounds of gain, 292 pounds of wheat meal and 682 pounds of skim milk were required as against 272 pounds of corn meal and gluten meal with 621 pounds of skim milk. This would give the latter combination an advantage of a little more than 6 per cent over the wheat meal.

Experiments there have not led to gluten meal's having great favor in Canada, the judgment being that "it seems rather unpalatable and produces soft bacon" (Bulletin No. 51, Central experimental farm, Ottawa).

### HOMINY CHOPS

Hominy meal and hominy chops have been utilized to good advantage, but most feeds of this character have

been marketed with trade names, tending to give experiments with them more or less of an advertising nature.

### OIL MEALS

The residues from oil-bearing seeds, mainly the meal from flaxseed and cottonseed cake after extracting the oil, are sometimes used for making up swine rations. The value of the cottonseed product is much disputed, but that from flaxseed is used with good results. It is known as linseed-oil meal, "old process," and "new process," the "new" differing from the "old" in that chemical process instead of pressure has been used to extract the oil. The linseed-oil cake (afterward ground to make the meal) is produced by the old process. The dry matter in linseed-oil meal is about the same with either process, practically 90 per cent; the protein averages about 28 per cent, but the carbohydrates are usually greater in the new process meal. Unground flaxseed itself is not used as feed.

Linseed-oil meal is a supplemental feed, and aids by assisting digestion and improving the conditions and appearance of the animal receiving it. Its effect is especially noticeable in sleek and smooth skin and hair. It makes an excellent supplement to corn by reason of its stimulating and laxative tendency.

As a rule, it should be used in rather restricted quantity, some breeders maintaining that an overfeeding of linseed-oil meal to sows in pig will cause abortion. Used with discretion, however, it has much value. "Many a brood sow and litter, lost from feeding overheating

foods," says Prof. Thomas Shaw, "could have been saved by adding to the ration one-fourth pound of oil cake per day for some time before and after parturition. It is helpful to young pigs after they have been weaned, and when they are upon a diet of constipating tendencies, such as skim milk."

Experiments in feeding linseed-oil meal to swine were conducted at different times in a period of two years ending in the winter of 1905-06 at the Missouri station (Bulletins Nos. 65 and 67), which show linseed-oil meal more valuable than wheat middlings as a supplement to corn. The experiments were in charge of Prof. E. B. Forbes, who says:

"During the past two years the station has been feeding a large number of fattening hogs on experimental rations, and made considerable use of linseed-oil meal as a supplement to corn. The results indicate that this feed has a great usefulness for this purpose, and that its value is not half appreciated by practical pork producers. Linseed-oil meal was used because it is, at ordinary prices of grains, the cheapest vegetable source of digestible protein available as a complete supplement to corn for dry-lot hog-feeding.

"On account of its name this feed is popularly supposed to produce an oily grade of pork, but, as a matter of fact, the methods of extraction of the oil from the flaxseed of late have been so perfected that in the bulk of the oil meal now on the market there is much less oil than in either corn or oats. We have found by following through the packing house a large number of hogs

fed on this feed that no ration which we have as yet compounded produces thicker, firmer or whiter fat than does linseed-oil meal used with corn. In our slaughter tests of carload lots of hogs fed upon various grain rations the butchers very soon learned to distinguish by the appearance of the carcass between individuals which had received oil meal and those which had received other feeds; the former in general being characterized by such marked excellence, from the packer's point of view, as to place them almost in a class by themselves.

"The accompanying data summarize five tests of linseed-oil meal as a supplement of corn, and present some rather remarkable results:

RESULTS FROM USE OF LINSEED OIL MEAL USED AS A SUPPLEMENT TO CORN

| Rations. | Initial weight. | Days on feed. | Average daily gain. | Grain, 100 pounds gain. |
|---|---|---|---|---|
| | Pounds | | Pounds | Pounds |
| Corn alone | 115 | 90 | .75 | 556 |
| Corn, 5 parts; oil meal, 1 part | 116 | 90 | 1.48 | 377 |
| Corn, 20; oil meal, 1 | 118 | 90 | 1.16 | 430 |
| Corn, 5; oil meal, 1 | 130 | 60 | 1.62 | 384 |
| Corn, 5; oil meal, 1 | 160 | 29 | 1.78 | 385 |
| Corn, 5; oil meal, 1 | 120 | 60 | 1.68 | 358 |

"The first lot, fed on corn alone, produced 100 pounds of pork from 556 pounds of grain; that is, ten pounds of pork per bushel of corn. These figures coincide with the average of a large number of experiments in which corn alone has been used for pig-feeding. The second and third lots were fed at the same time as the above and differ only in the proportion of oil meal fed. Five parts

CHAMPION HERD OF HAMPSHIRE SWINE AT THE WORLD'S FAIR, ST. LOUIS, 1904

HAMPSHIRES: AT HOME IN THE BARN LOT

of corn to one of oil meal produced 100 pounds of pork from 377 pounds of grain, and, figuring the corn at 30 cents a bushel and grinding at 10 cents a hundredweight, a ton of oil meal as fed in this ration would save $49 worth of corn. In the third lot, where 20 pounds of corn were fed with one pound of oil meal, 430 pounds of grain were required to make 100 pounds of pork; and a ton of oil meal so fed would save over $90 worth of corn. The fourth and fifth lots agree closely with the second, while the last in the table indicates a still greater efficiency for this ration. All these hogs were fed in small pens having granitoid floors, and received only this grain ration and water.

"Rations containing linseed-oil meal are particularly palatable to hogs, being consumed in larger quantity than any other we have been able to compound. These rations also have a slightly laxative effect, and keep the hogs in the heartiest and thriftiest condition imaginable. It seems to us that this feed has a much wider range of usefulness for hog-feeding than is commonly appreciated. The results obtained in the third lot above, where, with corn at 30 cents a bushel and grinding at ten cents a hundredweight, the oil meal saved $90 worth of corn per ton, are exceedingly interesting as indicating the great usefulness of this feed when administered even in small quantities. Greater profit, however, results from using more oil meal with the corn. The five-to-one ration gives us about the correct proportion of protein to carbohydrates and fat, and is a practical feed for dry-lot pork production."

### COTTONSEED MEAL

Cottonseed meal fed directly to swine seems to cause fatal results in the large majority of cases, proving its use in that way unsafe, although it is a rich, concentrated food, adaptable over a wide range of territory. On this account it has been the subject of many experiments, with a view to establishing its desirability for swine, none of which, however, has so far secured results which would justify its general use. From some cause which chemists have been unable so far to determine, it has the effect of poison. This is cumulative; it is not apparent at first, but according to the recorded experiments, may be fatal at any time from three to ten weeks after its use has begun. The vital organs appear affected, but the digestive organs sometimes fail to reveal anything abnormal. The mortality is more or less dependent upon the quantity of the feed given, but usually more than half the pigs tested have died. Generally the fatal attack is sudden; a pig which seems in excellent health may be dead in less than 12 hours, and death is seldom delayed more than 48 hours at the longest after the first symptoms of poisoning are observed. In some cases no signs of disease are apparent; in others, there are indications similar to "thumps," with failing appetite, rapid breathing, and, as final symptoms, frothing at the nose and mouth.

Experiments have been made in feeding cottonseed direct, and cottonseed meal roasted, rotted, steamed, fermented, or otherwise prepared, but without satisfaction. The meal is more dangerous than the seed, and it has been established that the toxic agent is in the kernel or

meat and not in the oil or hull. A curious fact, which appears demonstrated thoroughly, is that the meal may be given safely, even in moderately large quantities, to cattle, and that the digestive processes are responsible for changes whereby hogs may work over the droppings of such cattle without danger. This is the testimony of many stockmen, but the extent of the gain which the hogs get from the cottonseed meal in the droppings is problematical.

If some practical means is found which makes cottonseed meal a safe supplemental feed, its value in pork production in the southern states will be immense, and mean the utilization at home of a product exported to the extent of a billion pounds annually to pay for feeding material bought largely from other sections.

This should not be construed to imply that cotton food products can be made to take the place of corn with the pork-maker of the South. This idea has been prevalent, but, to quote from Bulletin No. 85 of the Arkansas experiment station, it "may well be abandoned. They cannot replace, but may prove valuable adjuncts to corn or any other starchy or carbohydrate food which may be found available in the South for hog feeding. . . . At $1.25 per hundred, which is its least cost laid down here (Arkansas station, 1904), in half-ton quantities, cottonseed meal as a large constituent of any ration cannot be called a cheap feed. As an exclusive feed, if it could be used that way, it is more expensive than corn. Corn itself makes a one-sided or badly balanced ration for pigs, or any other kind of young stock. When fed alone to pigs, it results in stunted growth, unthrift and

disease, a fact which is well known to all observant and careful feeders, but too little appreciated by the general run of farmers. This is due to its high content of those elements of the food which develop fat and heat, and lack of those necessary for the development of flesh and blood, upon which the proper growth of the animal depends. Cottonseed meal, on the contrary, contains a great excess of these latter elements and a deficiency of those starchy constituents which are so much in excess in corn. Independent of any actual poison present in cottonseed meal, its exclusive or excessive use in hog-feeding would doubtless also result in unthrift and disease. But it supplies the nitrogenous or flesh-forming elements in the cheapest concentrated form in which it can be bought. For these reasons cottonseed meal and corn should supplement each other and be fed together."

### MUST BE USED CAUTIOUSLY

The experiments at the Arkansas station show that the question of poison is one of amount of feed to a considerable extent, and that "the toxic allowance is determined by the amount per day rather than by the absolute amount fed. Thirty pounds fed in 30 days may cause fatal poisoning, while amounts up to 150 pounds, in proper daily allowance, have been fed without harmful effects." This would suggest that, in sufficiently moderate quantity, and given with due discretion, cottonseed meal or cottonseed, might be fed with corn to hogs without danger. The "danger limit" has, in fact, been estimated by Prof. R. R. Dinwiddie of the Arkansas station, although he says (Bulletin No. 85): "According to our

experience, any economic advantages to be derived from feeding this material will be secured by amounts well under the danger limit, and that independent of its effects on health. The maximum safe allowance, if there is any such, should be determined with certainty by experiments more numerous and extensive than have so far been carried out, and the figures deduced from our own experiments are given with the knowledge that the next man's work, or even our own under different conditions, may necessitate their revision. For the benefit of those who may wish to 'take the chances' on feeding cottonseed meal or cottonseed to hogs continuously, the following allowances appear to be well within the danger limit:

"Pigs under 50 pounds, ¼ pound per day.

"Pigs from 50 to 75 pounds, 1-3 pound per day.

"Pigs from 75 to 100 pounds, 2-5 pound per day.

"Pigs from 100 to 150 pounds, ½ pound per day.

"If fed a full grain allowance, the dosage may be obtained by properly proportioning the cottonseed meal to the other components of the ration, namely: one to five, six, seven, or eight, according to the stage of growth. A meal ration containing cottonseed meal should also contain at least an equal amount of wheat bran to supply bulk. For the remainder, corn appears to be the only choice."

Experiments at the Texas station (Bulletin No. 78) conducted with a view to determining a line of safety in feeding cottonseed meal, resulted in 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 the 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 greatly to 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."

Numerous experiments have been made in the use of cottonseed meal for hog-feeding, but they are not detailed here, inasmuch as conclusions so far are not definite. Reports have been made in the following state experiment station bulletins: Alabama, Nos. 68, 122; Arkansas, Nos. 31, 76, 85; Iowa, Nos. 28, 32, 66; Kansas, Nos. 53, 95; Kentucky, No. 19; Mississippi, Nos. 13, 60; North Carolina, No. 109; Oklahoma, Nos. 51, 58; Texas, Nos. 21, 41, 78; Washington, No. 67; and in the following annual reports of experiment stations: New York (Geneva), Eleventh and Twelfth; Oklahoma, 1900-01, 1901-02; Wisconsin, Eleventh and Twenty-second.

John Fields, formerly director of the Oklahoma experiment station, says: "Cottonseed isn't good feed for hogs, and when you try to use it for that purpose you run the risk of heavy loss."

### RICE BY-PRODUCTS

Rice by-products have been satisfactorily used for feeding swine, and for this, rice meal, which includes all the by-products after cleaning the rice, has been found equal to corn meal. It is claimed by Southern feeders that exclusive or excessive feeding on rice meal has a tendency to weaken the intestines of hogs.

The South Carolina station conducted experiments in 1900 to determine the value of rice meal, using corn meal as the standard. Six Berkshire pigs, of uniform age and size, were divided into two lots and fed for 61 days, beginning early in July. The meal was mixed with separator skim milk, which contained but little fat, and they were fed all that they would clean up. This was four pounds of meal and 16 pounds of milk per head at the beginning, and increased as they would take it. One lot was fed corn meal and milk, and the other rice meal and milk for 39 days, when the feeding was reversed, and the lot which had previously received one kind of meal was given the other for the remainder of the period. Water was furnished at noon each day, but it was noticed that the pigs drank but little. Feed valuations were set at $20 per ton for corn meal, $15 per ton for rice meal, and 20 cents per 100 pounds for skim milk. The results for the entire experiment were tabulated as follows:

## FEEDING VALUES OF RICE MEAL AND CORN MEAL.

| | Pounds of food consumed. | | Value of food consumed. | | | Number pounds of gain. | Cost of 1 pound of gain. Cents. | Average gain per lot per day. | Average gain per head per day. | Food required for 1 pound of gain | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Meal. | Milk. | Meal. | Milk. | Total. | | | | | Meal. | Milk. |
| Rice meal, 1 part, Skim milk, 4 parts | 779.0 | 3116 | $5.84 | $6.23 | $12.07 | 314.5 | 3.84 | 5.16 | 1.72 | 2.48 | 9.91 |
| Corn meal, 1 part, Skim milk, 4 parts | 779.0 | 3116 | $7.79 | $6.23 | $14.02 | 303.0 | 4.63 | 4.97 | 1.66 | 2.57 | 10.28 |

By this table rice meal apparently has a feeding value for swine slightly above that of corn meal, and, allowing for the variations that will occur with different lots of pigs, it may be said to be of practically the same value as corn meal. An experiment at the Massachusetts station (Report of 1896) showed that when equal weights of corn meal and rice meal were fed with skim milk to different pigs of equal age the gain was exactly the same.

According to the bulletin of the South Carolina station, "the rice meal is a by-product of the rice mills, and consists largely of rice flour, rice polish, and rice bran. As yet the mills have no uniform way of putting it on the market, and in order that the reader may understand what we mean by rice meal as used in this experiment, we might say that it is all the by-product obtained in cleaning the rice grain for the market. Its chemical analysis shows that it has about the same amount of protein, carbohydrates and fat as corn meal."

Rice polish and rice bran return good results in feeding hogs, but are not always easy to obtain, as the millers prefer to mix them with the hulls, and the mixture has a materially depreciated feeding value. The practical value of rice meal is more or less dependent upon the amount of cheap by-product that has been mixed in it. The Alabama station reported in Bulletin No. 122 a number of tests of rice polish which showed its high feeding value when the quality is good. In these tests 100 pounds of gain were produced from an average of 373 pounds of rice polish, as compared with 474 pounds of corn meal. "At this rate," the bulletin summarizes,

"78.6 pounds of rice polish were equal to 100 pounds of corn meal, a saving of 21.4 per cent of the grain by the use of polish in lieu of corn meal." In 1900 the Alabama station paid $26 per ton for rice polish, and in 1902 it was quoted from the same source at $17.90 per ton.

Mr. E. J. Fellows made extensive experiments in 1906 with rice bran at Springfield, Missouri, where he maintained as many as 1,200 hogs at a time. The rice bran was made into a slop, mixed in large tanks, and used in connection with corn; at 200 pounds weight the hog was given three pounds of rice bran a day and two pounds of corn. Mr. Fellows says: "Rice bran, when pure, is a splendid hog feed, but in the last two years it has been impossible to get good goods on account of adulteration with rice hulls." Rice hulls contain about 13 per cent ash and 35 per cent crude fiber and are ground up so that they have the appearance of bran, and mixed with the pure bran to be sold as "rice feed" or "pure rice bran." As the hulls have little, if any, feeding value, such an adulteration materially reduces the worth of any rice by-product.

### PACKING HOUSE BY-PRODUCTS

Scraps and trimmings of meat and bone from the packing houses, which were formerly utilized in fertilizer manufacture, are now converted into an appetizing and protein-furnishing food for swine, for which there is developing a demand taxing the houses to supply. Dried blood and slaughter-house waste likewise come within this class of feeds.

Feeding of offal at local slaughterhouses has been a common practice, and meat scraps have been prepared for years in Europe, especially in Germany, as food for swine. It was not until 1901 and 1902, however, that American packers realized that from their meat residues could be prepared an economical hog food of high value to supplement the fat-making properties of corn. This was demonstrated by experiments at the Indiana station (Bulletin No. 90). The packers were quick to take advantage of new opportunities presented, and by 1904 practically every experiment station in North America had been supplied with, and made acquainted with the new food. The objectionable odor had been eliminated, and by cooking, pressing and grinding, the form was made attractive. Experiment station reports and the farm press have used the packers' various trade names of "digester tankage," "meat meal," "beef meal," etc., but the composition and preparation of these differently named feeds are essentially the same, and the results of an experiment with one are, in the main, applicable to the use of another in a like class of protein content. Most of this by-product is sold under the guarantee or claim that it contains at least 60 per cent of protein. As it usually contains from 12 to 20 per cent of mineral matter, its excellence for balancing a corn ration can readily be seen.

The following analysis was made by the Indiana station (Bulletin No. 90):

Water, 8.63 per cent; ash, 15.94 per cent; protein, 49.81 per cent; crude fiber, 4.78 per cent; nitrogen-free extract, 5.06 per cent; ether extract, 15.78 per cent.

Analyses of three different samples of varying quality made at the Iowa station (Bulletin No. 65) gave these results:

ANALYSES OF THREE SAMPLES OF PACKING HOUSE FEEDING STUFFS

| Water. | Ash. | Protein. | Crude fiber. | Nitrogen-free extract. | Ether extract. |
|---|---|---|---|---|---|
| Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. |
| 6.10 | 15.60 | 61.10 | 5.20 | 3.12 | 8.88 |
| 6.25 | 12.85 | 42.15 | 6.95 | 15.50 | 16.30 |
| 9.05 | 20.65 | 39.10 | 10.90 | 8.60 | 11.70 |

Two samples of "extra quality," representing the leading two brands on the market, were analyzed at the Iowa station (Bulletin No. 91) and gave this:

ANALYSES OF PACKING HOUSE FEEDING STUFFS

| | Water. | Ash. | Protein. | Crude fiber. | Nitrogen free extract. | Fat. |
|---|---|---|---|---|---|---|
| No. 1..... | 8.23 | 6.50 | 66.36 | 2.50 | 6.04 | 10.37 |
| No. 2..... | 12.61 | 9.62 | 53.54 | 7.24 | 9.54 | 7.45 |

The cost was $35 a ton for No. 1, and $33 a ton for No. 2, or $1.75 and $1.65 a hundredweight respectively, not including $1.50 a ton for freight.

The analyses give an idea of the range of value of this product, and that, theoretically at least, it should have high feeding value as a supplement in fattening. This has been confirmed in practice by both feeders and experimental workers.

This by-product is made of scraps and trimmings from meat and fat, and scrap bones, with sometimes pieces of intestines, hair and similar residue. It is cooked or steamed for several hours in pressure tanks, which is said to destroy any existing disease germs; its grease is afterward drawn off and the greater part of the moisture evaporated or pressed out. After being dried and ground it resembles rather dark wheat shorts. It is shipped usually in 100-pound sacks, and claim is made by the makers that it will maintain its quality indefinitely under ordinarily good storage conditions.

It should be used only in relatively small quantities, not over one-fourth to one pound a day to the animal, according to age and condition. It may be given dry or in slop, separate from, or mixed with, other feed, but the preferred method seems to be dry feeding in a trough and, if with corn, before that is given. Hogs sometimes require a day or so to become accustomed to the feed, but after that will usually eat it with much relish.

Experiments have shown that 20 to 40 per cent of corn meal is, or may be saved, by the use of this packers' by-product, and in addition, it aids in securing a quicker finish and a generally improved condition, particularly where feeds of a like character, such as skim milk or pasturage, to supplement corn, are not available. When balancing a corn ration, it has been found best to use the packers' product for not over ten per cent of the ration. Results of using it with corn meal at the Indiana station (Bulletin No. 90) and at the Iowa station (Bulletin No. 65) have been summarized by Rommel thus:

RESULTS WITH RATION OF CORN MEAL AND PACKING HOUSE TANKAGE

| Ration. | Number of pigs. | Average weight at beginning. Pounds | Total gain. Pounds. | Number of days fed. | Average daily gain. Pounds. | Feed eaten. | | Feed per 100 pounds gain. | | Cost per 100 pounds gain. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Grain. Pounds | Tankage. Pounds. | Grain. Pounds. | Tankage, Pounds. | |
| Indiana: | | | | | | | | | | |
| Corn meal 10<br>Tankage 1 | 4 | 59 | 589 | 127 | 1.16 | 1,982 | 197 | 337 | 33 | $3.80 |
| Corn meal 5.<br>Tankage 1 | 4 | 58 | 625 | 127 | 1.23 | 1,984 | 379 | 317 | 61 | 4.00 |
| Corn meal | 4 | 58 | 342 | 127 | .67 | 1,779 | .... | 520 | .... | 5.20 |
| Corn meal & shorts 10<br>Tankage 1 | 4 | 58 | 579 | 127 | 1.14 | 2,001 | 199 | 346 | 34 | 3.60 |
| Iowa: | | | | | | | | | | |
| Corn meal | 6 | 197 | 596 | 49 | 2.08 | 2,747 | .... | 461 | .... | 5.10 |
| Corn meal & tankage | 6 | 202 | 757 | 49 | 2.57 | 2,429 | 458 | 321 | 61 | 4.50 |
| Corn meal & tankage | 6 | 198 | 668 | 49 | 2.27 | 2,438 | 460 | 365 | 69 | 4.90 |

Market prices of feeding stuffs used in these experiments were $22 a ton for corn meal and $25 to $32 a ton for tankage.

From experiments in fattening on corn and tankage at the Nebraska experiment station in 1905 and 1906 (Bulletin No. 94) the following conclusions are drawn:

"A notable advantage in the feeding of tankage is seen in the more rapid gains made by the hogs and the consequent shortening of the feeding period. Another argument for tankage is that it is a concentrated protein food. Only a small amount is required to produce the result desired. In all the experiments made at this station the hogs fed tankage consumed more feed, made larger gains, and were not easily put 'off feed,' while the hogs fed on straight shelled corn were easily thrown off their feed after the first six weeks, consumed less feed

**PRIZE-WINNING HAMPSHIRE BARROWS**
At the International (Chicago) Show, 1907

**Group of Hampshire Gilts Eight to Nine Months Old**
Weight 250 pounds

**Champion Hampshire Boar, Long John 8011**
Weight 750 pounds

and made slower gains. The feeding of tankage or ground bone to young, growing pigs produces a very marked effect on the strength of bone when compared with a corn ration, and its influence is still marked when compared with corn and shorts on alfalfa pasture." In the Nebraska experiments tankage was figured at a cost of $40 a ton.

In one of the experiments reported by the Nebraska station (Bulletin No. 94), 30 hogs which had been with grain-fed steers were separated into three lots of ten each and placed in alfalfa pasture. They were fed on rations as indicated in the table following, from May to July, a period of eight weeks, each lot being fed practically all the hogs would eat. They were in good condition throughout the experiment. Results were as follows:

RESULTS FROM FEEDING SOAKED CORN AND TANKAGE

| | Lot 1. | Lot 2. | Lot 3. |
|---|---|---|---|
| Ration | Soaked corn. | Soaked corn, 95% Tankage 5% | Soaked corn, 90% Tankage 10% |
| Number of pigs on experiment | 10 | 10 | 10 |
| Weeks on experiment | 8 | 8 | 8 |
| Average last weight, pounds | 216 | 229 | 230 |
| Average first weight, pounds | 145 | 144 | 144 |
| Average gain, pounds | 71 | 85 | 86 |
| Average gain per day, pounds | 1.26 | 1.51 | 1.53 |
| Feed for 100 pounds gain, pounds | 416 | 371 | 366 |
| Cost of 100 pounds gain | $3.04 | $2.88 | $3.09 |
| Price received per bushel for corn eaten | .78 | .98 | .85 |

This was a return of nearly $1 a bushel for corn when fed with the addition of but 5 per cent of tankage.

### PACKERS' RESIDUE VS. SKIM MILK

Packers' "meat meal" and tankage make in a way an acceptable substitute for skim milk, and are accordingly

of value for growing pigs. Tests to determine the relative value of these by-products were conducted at the Michigan station (Bulletin No. 237), in which it was found that skim milk returned slightly larger gains, but that the cost was relatively more than with tankage. These results were obtained from skim milk at 20 cents per 100 pounds and tankage at $1.62½ per hundred.

One test was made through a period of 56 days in the winter, in which the ration for Lot I consisted of corn meal, three parts; middlings, three parts; and tankage one part, mixed with water. For Lot II, equal parts of corn meal and middlings, with an equal weight of skim milk. The results were as shown:

SKIM MILK VS. TANKAGE; TESTS WITH PIGS BETWEEN FOUR AND SIX MONTHS OLD

| Lot No. | Weight Jan. 25. Pounds. | Weight March 22. Pounds. | Gains. Pounds. | Food consumed. | | | | Total cost of food. | Cost per 100 pounds gain. | Food per pound gain. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Corn meal. Pounds. | Middlings. Pounds. | Tankage. Pounds. | Skim milk. Pounds. | | | Meal. Pounds. | Skim milk. Pounds. |
| 1 Five pigs.. | 313.3 | 621 | 307.7 | 420 | 420 | 140 | .... | $10.67 | $3.46 | 3.18 | .... |
| 2 Five pigs.. | 323.0 | 654 | 331.0 | 461 | 461 | .... | 980 | $11.18 | $3.37 | 2.78 | 2.96 |

The pigs in Lot I made a daily average gain of 1.09 pounds each with an average daily consumption of 3.5 pounds of feed per head, while those in Lot II increased in weight daily 1.18 pounds each, consuming on an average 3.29 pounds of meal mixture and 3.5 pounds of skim

milk each per day. No difference could be detected between the two lots as to thrift and feeding ability.

Two other tests were made in the summer, one with pigs between 50 and 120 days old (Lots V and VI in the following table; two barrows and three sows in each lot), and another with pigs between 58 and 128 days old (Lots III and IV; one barrow and three sows in each lot). These tests showed the following results:

SKIM MILK VS. TANKAGE; TESTS WITH PIGS BETWEEN 50 AND 128 DAYS OLD

| Lot No. | Weight May 16. Pounds. | Weight July 25. Pounds. | Gains. Pounds. | Food consumed. | | | | Total cost of food. | Cost per 100 pounds gain. | Food per pound gain. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Corn meal. Pounds. | Middlings. Pounds. | Tankage. Pounds. | Skim milk. Pounds. | | | Meal. Pounds. | Skim milk. Pounds. |
| 3 Four pigs.. | 159 | 443 | 284 | 266.7 | 533.3 | 80 | ..... | $9.30 | $3.27 | 3.09 | .... |
| 4 Four pigs.. | 152 | 463 | 311 | 245.5 | 491.0 | .... | 2209.5 | $11.78 | $3.78 | 2.36 | 7.1 |
| 5 Five pigs... | 183 | 478 | 295 | 282.4 | 564.8 | 84.8 | ..... | $9.85 | $3.33 | 3.15 | .... |
| 6 Five pigs.... | 184 | 523 | 339 | 262.7 | 525.3 | .... | 2,364 | $12.60 | $3.71 | 2.32 | 6.97 |

In order to verify results of the foregoing tests, two lots of pigs were given corn meal and middlings in the same proportion as the lots of the preceding table, but without skim milk or tankage. This served as an indication of the value of both skim milk and tankage. Results in the "check test" were made with pigs not used in the preceding tests, and somewhat older. The check test was summarized as follows:

SKIM MILK VS. TANKAGE; CHECK TEST

| Lot No. | Weight July 18. Pounds. | Weight Sept. 26. Pounds. | Gain. Pounds. | Food consumed. | | | | Total cost of food. | Cost per 100 pounds gain. | Food per pound gain. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Corn meal. Pounds. | Middlings. Pounds. | Tankage. Pounds. | Skim milk. Pounds. | | | Meal. Pounds. | Skim milk. Pounds. |
| 7 Five pigs... | 265 | 554 | 289 | 386.8 | 773.7 | .... | ..... | $11.60 | $4.01 | 4.01 | .... |
| 8 Five pigs.. | 258 | 535 | 277 | 386.8 | 773.7 | .... | ..... | $11.60 | $4.18 | 4.18 | .... |

General results are summed up in the bulletin as follows: "In the three tests including tankage and skim milk, the average cost of production per 100 pounds with the tankage rations was $3.35, with the skim milk rations $3.62, and with the check ration of middlings, corn meal and water, $4.09. In the three original tests the tankage ration pigs consumed an average 3.14 pounds of meal mixture per pound gain; those receiving skim milk in the ration required 2.48 pounds of meal mixture and 5.67 pounds skim milk per pound gain. In the check ration, consisting of corn meal and middlings, the average amount of meal mixture required per pound gain was 4.09 pounds. The average daily gains from the three tankage rations was .98 pounds; from the three skim milk rations, 1.08 pounds, and from the check ration, .8 pound; though the ration containing skim milk made a slightly greater gain than where tankage was used, the cost of producing this increased gain was somewhat greater."

Hogs following fattening steers have been greatly improved when given tankage in addition to the drop-

pings from the cattle. An experiment on this line conducted at the Ohio experiment station (Circular No. 73) showed that hogs which received one-third pound of tankage daily per head, made gains 52.22 per cent larger than those dependent solely upon the droppings. Six lots of steers were fed upon two different rations. There were seven head in each lot, and three lots were fed upon each ration. One ration consisted of shelled corn, cottonseed meal, corn stover, corn silage, and mixed hay. The other was shelled corn, cottonseed meal, corn stover, and mixed hay. At the end of 63 days the three hogs which had been placed with each lot of cattle were replaced by thinner hogs, four to each lot. All lots of hogs were supplied with a mixture of ashes and salt, but no other food save the droppings except the tankage. It was noticeable that the hogs fed on tankage had less desire for ashes and salt than the other lots. The gains made through the addition of tankage were not only much larger, but were found to be cheaper, with tankage figured at $37.60 a ton. A comparison of gains is shown in the table on the next page.

The Ohio experiment led to the following general observation regarding supplements to the feed of hogs following fattening cattle (Circular No. 73): "While, on account of its cheapness as a carrier of protein and ash and convenience for feeding, tankage was used in the work reported herein, it is believed that other feeds, such as linseed-oil meal, soy beans, skim milk, buttermilk, or middlings, would greatly increase the efficiency of the 'cattle hog' in making economical gains. Feeders need, however, to exercise keen discrimination in the purchase

## RESULTS OF FEEDING TANKAGE TO HOGS FOLLOWING SILAGE-FED AND DRY-FED LOTS OF CATTLE

I.—Hogs following steers March 20-May 21, inclusive. Three hogs in each lot

| Lot | Steer ration | Hog ration. | Initial weight. | Final weight | Total gain. | Daily gain per hog. |
|---|---|---|---|---|---|---|
| 1 | Silage | Grain from droppings and ½ pound tankage daily per hog in addition. | 290 | 565 | 275 | 1.46 |
| 3 | Silage | Grain from droppings. | 280 | 434 | 154 | .81 |
| 4 | Dry | Grain from droppings. | 305 | 530 | 225 | 1.19 |
| 6 | Dry | Grain from droppings and ½ pound tankage daily per hog in addition. | 331 | 655 | 324 | 1.71 |

II.—Hogs following steers May 22-July 16, inclusive. Four hogs in each lot

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Silage | Grain from droppings and ½ pound tankage daily per hog in addition. | 445 | 766 | 321 | 1.43 |
| 3 | Silage | Grain from droppings | 460 | 667 | 207 | .92 |
| 4 | Dry | Grain from droppings. | 470 | 692 | 222 | .99 |
| 6 | Dry | Grain from droppings and ½ pound tankage daily per hog in addition. | 445 | 755 | 310 | 1.38 |

of feedstuffs, for there is a likelihood of a heavy demand for certain feeds, making it possible for the manufacturers to raise prices beyond the amount justified by the feeding value. Hogs following cattle are often not supplied with the ration best suited for producing the greatest gains."

B. E. Carmichael, animal husbandman of the Ohio experiment station, exhibited at the Ohio state fair of 1908, five lots of five pigs each that had been fed for 52 days, three of the lots having tankage as part of their ration. These 25 pigs were all of the same age, type and condition when their feeding test begun. The details of the feeding and the results it brought are condensed in the following table:

| Rations | Corn meal, in dry lot | Corn meal, on pasture | Corn meal and tankage, on pasture | Corn meal and tankage, in dry lot | Corn meal and tankage in dry lot (¾ full feed) |
|---|---|---|---|---|---|
| | Pounds | Pounds | Pounds | Pounds | Pounds |
| Initial weight | 338.5 | 324.5 | 329. | 338.5 | 327. |
| Final weight | 547.5 | 69.6 | 831. | 826.5 | 689. |
| Gain in live weight | 209. | 371.5 | 502. | 488. | 362. |
| Average daily gain per pig | .67 | 1.20 | 1.62 | 1.57 | 1.17 |
| Feed consumed | 1062.5 | 1279.5 | 1613. | 1697.5 | 1273. |
| Corn " daily per pig | 3.4 | 4.1 | 4.6 | 4.9 | 3.7 |
| Tankage " daily per pig | | | .6 | .6 | .5 |
| Feed per 100 pounds gain | 508. | 344. | 321. | 348. | 352. |

The corn meal and tankage mixture fed to three of the lots consisted of eight parts of corn meal to one part of tankage, by weight. Each of the lots on pasture had access to one-fourth of an acre of blue grass and white clover; the lot fed corn alone on pasture ate notably more grass than did the lot fed corn and tank-

age on pasture. Accordingly the charges per lot for pasture are $1.50 and $1.00 respectively

The lot fed corn meal alone made relatively slow gains.

The use of pasture increased the rate of gain, and reduced the amount of feed required to produce a given gain.

The corn meal and tankage mixture proved more efficient than corn meal alone in producing rapid and economical gains.

Economy of gains depends very largely upon market prices of feeds. The following tables show the cost of gains with corn at 45, 60 and 75 cents per bushel,

| Rations | Corn meal, dry lot | Corn meal, pasture | Corn meal and tankage, pasture | Corn meal and tankage, dry lot | Corn meal and tankage, dry lot (⅔ full feed) |
|---|---|---|---|---|---|
| Corn, 45 cents per bushel; tankage, $42.60 per ton. | | | | | |
| Cost per 100 pounds gain..... | $4.09 | $3.17 | $3.25 | $3.31 | $3.34 |
| Profit on gain in live weight of 5 hogs at 5 cents per pound.. | 1.91 | 6.80 | 8.76 | 8.26 | 5.99 |
| Profit on gain in live weight of 5 hogs at 6 cents per pound. | 4.00 | 10.51 | 13.78 | 13.14 | 9.61 |
| Corn, 60 cents per bushel; tankage, $42.60 per ton | | | | | |
| Cost per 100 pounds gain..... | $5.45 | $4.09 | $4.02 | $4.14 | $4.18 |
| Profit on gain in live weight of 5 hogs at 5 cents per pound. | loss .93 | 3.37 | 4.92 | 4.22 | 2.96 |
| Profit on gain in live weight of 5 hogs at 6 cents per pound. | 1.16 | 7.08 | 9.94 | 9.10 | 6.58 |
| Corn, 75 cents per bushel; tankage, $42.60 per ton | | | | | |
| Cost per 100 pounds gain.... | $6.81 | $5.02 | $4.78 | $4.96 | $5.02 |
| Profit on gain in live weight of 5 hogs at 5 cents per pound. | loss 3.78 | loss .06 | 1.08 | .17 | loss .07 |
| Profit on gain in live weight of 5 hogs at 6 cents per pound. | loss 1.69 | 3.65 | 6.10 | 5.05 | 3.55 |

and the profit on each lot of five hogs with gain in live weight at 5 and 6 cents per pound. Market conditions should be carefully considered in this connection.

### FERTILIZER "TANKAGE" NOT A FOOD

The use of the term tankage should not lead to the idea that the concentrated tankage used as a fertilizer is suitable for feed, for such is not the case. The packing-house residues prepared for feeding purposes, from which the objectionable odors and disease germs have been eliminated, and which have been ground almost to the fineness of middlings, constitute an entirely different article. The analyses given in preceding paragraphs show considerable diversity in their quality, but most satisfactory results have been obtained with the better grades, and of late the largest demand has been for those that by reason of their protein content are termed "60 per cent" product.

### OTHER PACKING-HOUSE BY-PRODUCTS

Packing-house by-products of minor importance in swine-feeding are dried blood and ground bone. These are sold under various names, such as "blood flour," "blood meal," and "bone meal."

It is claimed that the dried blood offered commercially contains about 85 per cent of protein. Its value is greatest for very young and unthrifty pigs. Professor Henry recommends feeding two ounces of dried blood per 100 pounds of pig. The price of dried blood is relatively high considered as a feeding stuff.

Records of feeding ground bone in comparison with other rations at the Nebraska experiment station (Bulletin No. 94) show the following results for five weeks' feeding, beginning early in January, 1905, with corn and shorts, each figured at 80 cents, and tankage and ground bone each at $2 per 100 pounds.

COMPARATIVE RESULTS FROM FEEDING GROUND BONE

| | Lot 1 | Lot 2 | Lot 3 | Lot 4 |
|---|---|---|---|---|
| No. in lot | 8 | 8 | 8 | 8 |
| Ration | Corn | Corn 90%<br>Tankage 10% | Corn 90%<br>Gr'd bone 10% | Corn 75%<br>Shorts 25% |
| Average weight at close, pounds | 171 | 229 | 221 | 191 |
| Average weight at beginning, lbs. | 152 | 184 | 173 | 154 |
| Average gain, pounds | 19 | 45 | 48 | 37 |
| Feed for 100 pounds gain, pounds | 920 | 530 | 490 | 700 |
| Cost of 100 pounds gain | $7.26 | $4.87 | $4.50 | $5.60 |

This was followed by tests to determine the relative strength of bones as developed by the different feeds. Bones from hogs referred to in the foregoing table were broken in a testing machine with the results as shown on the next page.

### SUGAR FACTORY BY-PRODUCTS

The principal feeding by-product of the beet sugar factories is the beet pulp, fresh or dried. Pulp is the wet, shredded mass remaining after extracting the sweet juices for sugar manufacture, and is frequently obtainable at the factories at a low price. Its use has in many instances been highly satisfactory in feeding horses, cattle and sheep, but tests of it for swine have not been numerous.

BREAKAGE-WEIGHTS ON BONES OF SWINE ON VARIOUS RATIONS

*First Test*

| | Lot 1 | Lot 2 | Lot 3 | Lot 4 |
|---|---|---|---|---|
| Killed Feb. 10: | | | | |
| Number in lot | 3 | 3 | 3 | 3 |
| Ration | Soaked corn. | Corn 90% Tankage 10% | Corn 90% Gr'd bone 10% | Corn 75% Shorts 25% |
| Average live weight | 192 | 247 | 257 | 210 |
| Breaking strength of radius (fore leg) | 723 | 1308 | 1561 | 891 |
| Breaking strength of tibia (lower hind leg) | 607 | 825 | 732 | 641 |
| Average of two bones in each leg (eight bones) | 714 | 1007 | 1081 | 783 |

*Second Test*

| | | | | |
|---|---|---|---|---|
| Killed March 14: | | | | |
| Number in lot | 4 | 4 | 4 | 4 |
| Average live weight | 171 | 286 | 242 | 204 |
| Breaking strength of radius (fore leg) | 768 | 1254 | 1044 | 835 |
| Breaking strength of tibia (lower hind leg) | 542 | 834 | 779 | 662 |
| Average of two bones in each leg (eight bones) | 634 | 1057 | 942 | 801 |

This pulp, as it comes from the factory, is about 90 per cent water, consequently low in nutrients and not of practical value as a food by itself, but it may be used advantageously with grain or concentrated feed to furnish succulence, promote digestion and increase the appetite. Herbert Myrick in "The American Sugar Industry" gives an analysis of beet pulp, showing the following percentages of digestible nutrients:

Protein, 1.3; carbohydrates, 6.7; ether extract, 0.4.

### BEET PULP AS FEED

The Colorado station compared the feeding value of sugar beet pulp for swine with sugar beets, and in connection with wheat and barley (Bulletin No. 74). The

hogs did not relish the pulp by itself, but " in a few days they were eating greedily a pulp and grain mixture." Conclusions reached were as follows: "Sugar beets and sugar beet pulp proved equally valuable in our experiments, and because of its cheapness and effect on growth we believe pulp may be profitable to feed to growing pigs in connection with a grain ration, or during the first part of a fattening period. The pulp gave a return of $1.50 per ton when fed in combination with grain, and served the same purpose in our hog rations at less expense. It was necessary at first to mix the pulp with the grain to induce the pigs to eat it. We would not recommend feeding more than two pounds of pulp with a pound of grain in a ration for pigs from 100 to 200 pounds in weight." Comparative results in the Colorado experiments were summarized by Rommel in the following table:

FEEDING VALUE OF SUGAR-BEET PULP WITH GRAIN AND SUGAR BEETS

| Ration. | Number of pigs. | Average weight at beginning, pounds. | Average gain, pounds. | Number of days fed. | Average daily gain, pounds. | Average amount feed eaten. | | | Feed per 100 pounds gain. | | | Cost per 100 pounds gain. | Average profit at 7 cents per pound. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Grain, pounds. | Pulp, pounds. | Beets, pounds. | Grain, pounds. | Pulp, pounds. | Beets, pounds. | | |
| Grain | 4 | 95 | 120 | 104 | 1.16 | 546.50 | ... | ... | 450 | ... | ... | $4.50 | $3.90 |
| Beet pulp and grain | 4 | 97 | 88 | 99 | .89 | 343 | 706 | ... | 390 | 800 | ... | 4.30 | 3.35 |
| Sugar beets and grain | 4 | 101 | 98 | 104 | .94 | 416 | ... | 391 | 420 | ... | 400 | 5.00 | 2.93 |

### DRIED BEET PULP AND MOLASSES

Dried beet pulp is of two sorts, the plain or white, which is usually meant when dried beet pulp is referred

to, and dried molasses beet pulp. Neither has been found of much practical value for swine. Dried sugar-beet chips have been shown in German experiments (Milchwirtschaftliches Centralblatt, Leipsic, 1905, No. 12) to give less satisfactory results when added to a barley and skim milk ration than when the latter was given without them. In this test the fat of the pigs was examined, but no material difference was observed from use of the dried sugar-beet chips. Beet molasses has been found unsatisfactory for swine. Cane molasses is thought to have a tendency to induce sterility in breeding animals. Where sorghum molasses is manufactured the skimmings from the vats or evaporating pans, mixed with other foods, make a most acceptable relish for fattening pigs.

A few experiments have been made in feeding beet-sugar molasses to hogs. Apparently the only one with favorable results is that in Sweden by I. Insulander (Kunglia Landtbruks-Akademiens Handlinger och Tidskrift, Stockholm, 1895, p. 246) in which the molasses was mixed with skim milk fed to young pigs. On the other hand, German experiments have indicated that beet molasses may possess poisonous qualities for pigs, and this has been confirmed in the United States by an experiment at the Cornell experiment station (Bulletin No. 199), reported as follows: "On January 2, a lot of five pigs weighing 435 pounds, was put upon a ration of which molasses from a beet sugar factory formed a part. The daily ration was corn meal, eight pounds; molasses, 12 pounds, and skim milk, 20 pounds. This quantity was given in two daily feeds, and although the pigs apparently did not relish the molasses, they ate it. On January

5 the pigs all came to the trough in the morning apparently in their usual health. Within an hour one was dead, and another within a few hours. A post-mortem examination was made by Drs. Law and Moore of the veterinary college, and there were found strong indications of poisoning. The pigs remaining were immediately put upon a ration of corn meal and skim milk. The pigs in this molasses-fed lot were the most expensive of any in the experiments conducted at the time."

In experiments at the Utah station (Bulletin No. 101), no indications of poisoning were discovered from using a limited quantity of beet molasses, but it was necessary to observe care in its feeding to prevent scouring. "The pork from the pigs in this trial was sold in the vicinity of the station, and all except that from the molasses-fed pigs was pronounced fine in every respect. The pork produced on molasses was objected to on the ground that it had a peculiar, unsavory taste."

No such results from using either sorghum or cane molasses appear to be reported. "Unlike the bitter beet molasses," says Henry, "that from the cane plant is palatable and much relished by all farm animals. Cane molasses contains about 50 per cent sugar and 12 per cent gums. The nutrients it contains are about equal to those in corn, and since starch and sugar have practically the same nutritive value, cane molasses has the same feeding value as an equal weight of corn. Molasses is used to some extent for preparing animals for show or sale. Its good effect for this purpose is doubtless due to its palatability, including large consumption of the feed substances with which it is mingled. Flesh put on by molas-

ses feeding is not considered substantial, and this substance is said to be deleterious to breeding animals, leading to sterility, especially with males."

Miss Mary Best of Barber county, Kansas, who has had considerable experience in the manufacture of sorghum molasses and in swine raising, reports the satisfactory feeding of sorghum molasses to hogs. She says (Eleventh Biennial Report of the Kansas State Board of Agriculture, p. 275): "We have had on hand a good many barrels of sorghum molasses, and have fed it to the hogs, a few gallons at a time, all winter. They like it immensely."

For other live stock mixtures of molasses with dried brewers' and distillers' grains, malt sprouts, hulls and other grain offal, ground cornstalks, waste from flouring mills, and like material have found more or less favor, and it is not improbable that they may in future be adapted for a wider use with swine, profitably utilizing in this way much by-product not popular before. In all of these preparations, as with packers' residues, a high degree of heat is used in drying, to prevent fermentation likely to occur in warm weather. The proportion of molasses used is generally about 10 per cent.

### BREWERS' AND DISTILLERS' GRAINS

Around a brewery or distillery the by-products known as brewers' or distillers' grains or slop are available, and sometimes in a limited way are fed to hogs, but not ordinarily with much satisfaction.

Professor Henry says: "Wet, fresh brewers' grains are useful mainly as a feed for milch cows, and in this

particular there is none better. The writer doubts whether any large use can be made of the grains for feeding pigs. When we remember that practically all of the starch has been taken out of the grain and that there is left the husk and cellular parts, together with most of the protein, we will see that such material is hardly suited for utilization in any large measure by the digestive apparatus of the pig. No doubt some of the grain can be used as 'filling,' the same as bran might be."

In case it is deemed best to utilize material of this kind care should be taken to prevent souring either of the feed itself or of drippings through or under floors or elsewhere.

CHAPTER XVI.

# Water, Slop and Swill

Water, while not a food, is no less a necessity for swine, and the hog, having a small stomach, requires water at frequent intervals. It is a requisite to digestion and health, and the method of its supply is of great importance, especially where a variety of succulent feeds is not included in the ration. The quantity of water which swine consume varies according to their ages and the character of their feeds. This was indicated by experiments at the Indiana station, reported (Bulletin No. 70) as follows: "Our experiments to determine the quantity of water consumed by pigs were conducted during the month of March. Four lots were fed. Lot one received corn; lot two, wheat; lot three, corn and wheat; and lot four, soaked wheat. Each pig also received 3 pounds of skimmed milk per day. Each pig in lot one drank 2.65 pounds of water; in lot two, 5.2 pounds; in lot three, 3.9 pounds; and lot four, 5.3 pounds of water per day."

### DANGER IN SURFACE WATER

As a general rule, all surface water is more or less unhealthful and is liable to convey disease. This is true even of running water, if the stream crosses a road or another farm before reaching the hog lot. Cholera

has frequently been spread in this manner, as has been strikingly demonstrated by the Indiana station in the bulletin already quoted. The loss from cholera in the state of Indiana for the year ending June 30, 1897, was reported as practically 900,000 head. The Indiana station made an analysis of the figures for the years 1882-1897, showing the losses for each township in the state, which quite fully demonstrated that cholera was spread by the streams. It was found that "the territory involved makes three long narrow strips in the state at distances sufficiently removed from each other, so that only a positive factor could show the marked differences that exist." These strips were on the Wabash and the north and south forks of the White river. The losses in the townships bordering on the rivers were found to be 33 per cent to 112 per cent greater than in the townships of the second tier from the river, and from 83 per cent to 208 per cent greater than in those of the third tier. A significant fact gleaned from investigations made in 1895 and 1896 by the station was that nearly everyone of the breeders of pure-bred swine whose herds escaped cholera were users of well water, and that one of the surest means of preventing the distribution of hog cholera is the use of deep-well water.

The Indiana station has made a number of investigations into the losses of swine arising from access to a water supply of unhealthful or otherwise improper character, and the conclusion reached from these was that such losses are greater by far than those which come through an insufficient supply of water. Bulletin No. 70,

commenting upon this, says: "The life cycle of the parasites that affect animals, nearly always includes a stage of development outside of the body. Moisture is a necessary factor in their existence outside of the body and hence it is that they are found in large number in surface water, and are ingested (taken up) with it. Bacteria can stand drying better than parasites, but must have water in which to multiply. It follows, then, that fewer parasitic diseases of stock will occur upon high pasture land when well water is furnished than upon bottom land where they must depend upon a supply from other sources. Such parasitic diseases as worms in hogs are largely due to surface water.

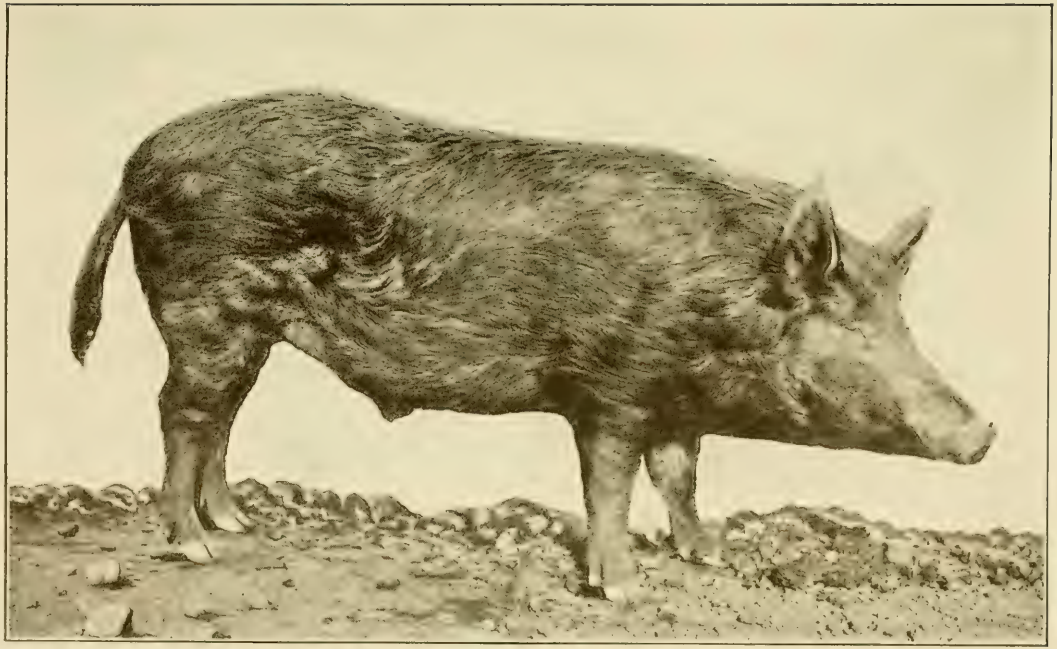
"Whether water will act as an agent for the carrying of the germs of disease, the ova, larvæ and special stages of parasites, will depend upon the sources from which the water is obtained. If it comes from a deep well that is properly protected, these organisms will not be present. If it is obtained from the surface, as small ponds, ditches and streams, they may be present. Not all surface waters are dangerous, but all are more or less exposed to infection and may become dangerous at any time. The time it becomes dangerous cannot be detected by the eye and may not be detected by laboratory tests.

"The earth acts as a filter for all germs that fall upon it, no matter what may be their character. Only a small per cent will pass through the first inch of soil, and a very small number will pass through the first 10 feet. In the first few feet of soil most disease germs are destroyed by other forms of life that inhabit it, but should

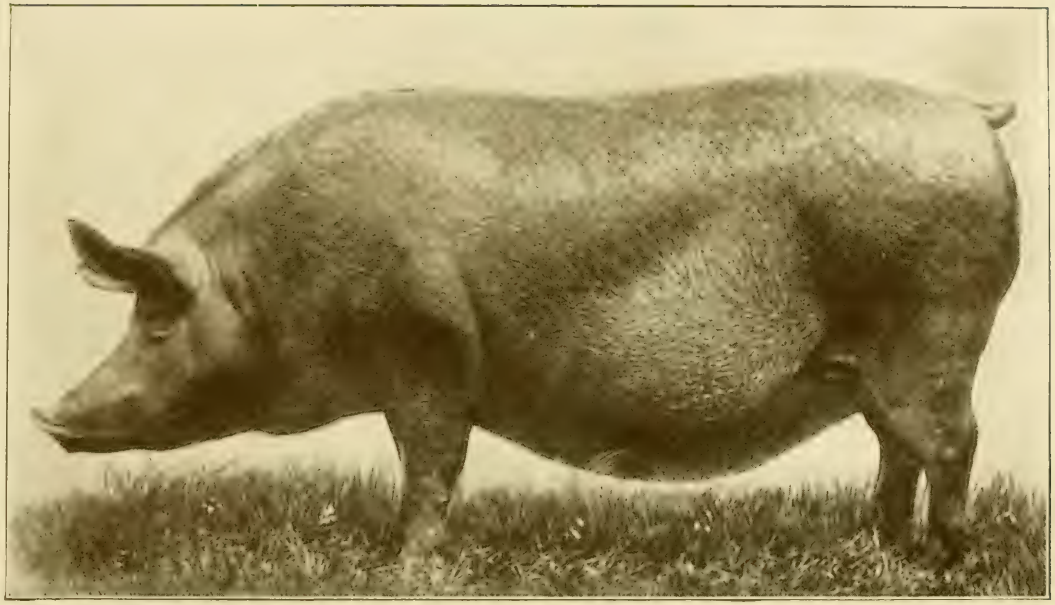
they pass further down they are restrained only by the mechanical action of the earth. If, however, a soil becomes saturated with germs, as for example in a barnyard, or if the pollution is delivered below the surface, as in a cess-vault, little purification will take place and the germs may find their way into nearby wells. In order to be certain of the water supply, wells should penetrate an impermeable layer of earth, and the sides be perfectly sealed, as with the iron tubular forms, so that no water can gain entrance except from below. A tubular well 20 feet deep is a much deeper well, from a sanitary standpoint, than a dug well of the same depth. It is also true that a shallow well may produce pure water at one time and afterwards become contaminated because of the saturation of the soil with germs, either by the barnyard or vault."

The Indiana station has made tests to obtain an idea of the number of germs which may be found in water, and the following table (Bulletin No. 70) shows the range in number of germs found in a cubic centimeter, which is about one-half thimbleful:

| SOURCE. | NUMBER OF GERMS PER CU. CM. |
|---|---|
| Very filthy hog wallow | 2,680,000 |
| Ordinary hog wallow | 730,000 to 1,420,000 |
| Wabash river about LaFayette | 12,000 to 32,000 |
| Wabash river below LaFayette | 112,000 to 390,000 |
| Clean looking pond | 290,000 |
| Filthy watering trough | 248,000 |
| Stock troughs | 5,000 to 21,000 |



**A TAMWORTH BOAR**
Owned by the Kansas state agricultural college



**TAMWORTH SOW, SPRINGBROOK NELLIE 2102, AT SEVEN YEARS**
Winner of sweepstakes prizes at many state fairs in 1906. Weight 800 pounds

| SOURCE. | NUMBER OF GERMS PER CU. CM. |
|---|---|
| Tile drains | 8,000 |
| Six cisterns without filters | 5,000 to 91,000 |
| Four cisterns with filters | 580 to 3,000 |
| Dug well receiving surface drainage | 420,000 |
| Dug well 14 feet deep in corner of unprotected barn lot | 398,000 |
| Eight tubular wells 60 to 150 feet deep | 4 to 16 |

### PONDS AND WALLOWS

Where it is found desirable to use water from a surface source, the best plan is to construct a pond which will afford a minimum of danger, and to fence it so that the stock cannot get at it directly. The water may be supplied in a trough, through a pipe in the dam.

Stockmen differ widely as to the advisability of hog wallows, some of the most successful breeders heartily favoring them, while by others they are vehemently opposed. Some maintain that a wallow is a benefit and almost as necessary as the feed trough, and others would not permit one on their farms. W. H. Haskell, warden of the Kansas State Penitentiary, says that 25 years' experience in raising hogs in large and small herds has convinced him that the first step to take in arranging a hog lot or pasture, is to fence out any running or pond water so securely that the hogs cannot get to it. A herd of 600 hogs is maintained at the Kansas Penitentiary, and Mr. Haskell says that prior to

the adoption of this plan, considerable loss was experienced from cholera and other diseases, and that exclusion from all surface water apparently put an end to such losses. A. J. Lovejoy says: "I have a good many lots and not a water hole in them. Hogs will stand more traveling if kept dry. They may be kept from getting overheated by having good shade. We use temporary sheds 16 feet square, covered with brush so the water may leak through, but they never get muddy."

On the contrary, N. H. Gentry says: "Creating a breed of hogs that do not like to wallow is going outside of nature. People take mud baths for rheumatism. You may have a clean brook, but the hogs won't like it. I built boxes for them to bathe in, and 5 minutes after the hogs got out they would be dry. Earth is a good disinfectant. I do not believe in a filthy place, but I never saw a hog that did not like a mudhole, and when he gets in it he does not want water but wants to wallow in the mud. It cleans the scurf from his skin. If before taking him to an exhibition you let a hog wallow in mud, you secure a skin finish you cannot obtain in any other way. Nothing is more soothing than mud. I tried to believe for years that it was not for the hog's good, but I tell you that depriving a hog of this mud bath is against nature. Nature is a pretty risky thing either to play or fight with. I do not believe all stiff hogs have rheumatism. I had an imported sow that had never eaten corn in her life, and she foundered and to her death was stiff; as plain a case of foundering as I ever saw. I do not believe in fighting with nature. What is better than to have the hogs go to a shady place

and wallow, without too much water? I believe in mud baths, but I keep my hogs away from manure heaps, and always have shade over the wallows."

### PROVIDING PONDS

A plan for a pond to furnish drinking water has been suggested by the Oklahoma experiment station (Bulletin No. 66) as follows:

"A pond that is to furnish drinking water for stock should be fenced and the stock be kept out. They should drink from a tank supplied with water from the pond through a pipe under the dam and leading to the bottom of the pond. In building a pond, one of the first steps is to place the pipe that is to conduct the water from the pond to the tank where the stock is to drink. This pipe should be put into the ground about two feet and extended 12 or 15 feet beyond the line where the bottom of the dam will come on the inside. Special pains should be taken to pack the earth well in the trench around the pipe, for if this is not done, water is very likely to seep out under the dam through this ditch, and a seep like this, once started, is almost impossible to stop. A 1¼ inch pipe should be used. On the end in the pond, an upright piece of pipe that will extend two or three feet above the bottom of the pond should be attached. A substantial screen of some kind should be put over the end of the upright pipe. A cast guard such as is used on the bottom of a pipe in a well is good for the purpose, but should not have the gauze screen inside that is commonly used in the well. The guard may be wrapped outside

with coarse galvanized wire screen. It is well to further protect this outlet pipe and screen by setting four posts in a square around the pipe and about two feet from it. Coarse wire screen may be used to inclose the space between the posts, or old boards may be put on if good-sized cracks are left. This will prevent the outlet from being covered so soon when the conditions are such that the pond fills in with the wash brought down with the water. The pipe should extend 20 to 30 feet outside of the dam, to enable placing the watering tank away from the soft, seepy ground that is often found just below the dam. It is well to put in a cut-off valve near the tank.

"After the form and location of the base of the dam have been determined, the area of it should be plowed. If the soil is full of roots, or covered with grass, it is best to scrape it off as deep as the plowing and plow up the area again, leaving the base loose and rough before earth for the bank is put down. This will aid in preventing seeping at the bottom of the dam. To make a good strong embankment for a pond, the sides should slope about 45 degrees, or in other words, one foot in width to every one in height. If the labor is not very expensive and other work not crowding, 1½ to one will be a better pitch for the bank, particularly on the slope on the inside of the pond. The top of the dam should be three to four feet wide and after the dam has settled, one to three feet above the level of the pond when full. The height of the top above this level should be such that the water will not go over the dam during a freshet except at the spillway, as that is what washes

many dams out. The necessary height of this will depend upon the size of the spillway and the volume of the water going into the pond at any time. When figuring on the height, allowance must be made for the embankment settling six to ten inches where the bank is eight to 12 feet deep. In building up the embankment the earth should be put on in uniform layers regularly placed, keeping the bank about level. This will insure more uniform settling or packing of the earth and the dam will not be as apt to leak. While the embankment is new it is easily washed down on the inside of the pond by the waves. In a few months, half of a good-sized dam has been cut down and washed back into the pond in this way. It is true that this washing down by the waves continues year after year, so the inside of the dam should be set to Bermuda grass and water sedges and willows at once. But to protect the bank until the willows and grass get a start it should be riprapped with brush or old boards, if possible. The Bermuda grass will make a fine covering for the top and outside of the dam as well, and should be put on when the dam is built.

"The spillway or overflow should be large enough to insure the water in the time of a freshet being taken care of without going over the top of the dam. Where possible, the spillway should be on the undisturbed soil, so as to prevent as much as possible, washing out. Wherever placed, it should be well sodded with Bermuda grass or some other plant that will bind the soil and keep it from eroding. Where ponds are located below cultivated fields, considerable difficulty will be experienced

because of the soil washing in and filling up the pond. Such trouble may be obviated to a large degree by so constructing the pond that the spillway will be at the back end of the pond where the water enters it. This can be done by extending wings out on either or both ends of the dam. A pond so constructed does not allow the current of water carrying the wash to flow into the pond and deposit the soil there. Instead, the current flows around the pond and carries the sediment with it or deposits it at the mouth of the pond, where it does no harm.

"Generally the pond should be fenced as soon as completed and all stock kept out. The pond fence should be such that it will turn all kinds of stock, including little pigs, if the pond is near the barns. It is advisable to leave quite a margin between the pond and the fence, which can be set to trees. In such a location, the trees will make a fine growth.

"In locating a pond, many think it must be in a ravine where a torrent of water runs when it rains. Really, a better place is where there is a gentle swale in the field. It may require handling a little more earth in building in the latter place, but it will not be as apt to fill up and can be better controlled. By taking the earth out of the bottom to build the banks, a deep pond can be made, which is desirable. The tank should be supplied with a float valve so that the tank is kept full at all times. For such a place an eight or ten-barrel tank is large enough."

### A CHEAP HOG WATERER

James A. Pulley, an Iowa hog raiser, uses a home-made device for watering, which he describes as follows:

"I have a galvanized sheet iron pan 2 feet square and 6 inches deep, flaring a little at the top. Take a tight oil barrel and with a 5-8 inch bit, bore two holes in the side so that when the barrel is placed in the pan the holes will be 1 inch below the pan's top. Bore a 2-inch hole in the top of the barrel. Place the barrel in the pan, cork tightly the two holes at the bottom, and fill the barrel with water. Then cork the hole at the top and pull out the corks below. The water will run into the pan, cover the holes at the bottom, and will then stop until lowered by drinking again. The pan should sit level on a platform five or six feet square. The hogs will drink at the corners. I have used three different kinds of patent hog waterers, but this is better than all, and cheaper."

### SLOP, AND ITS ADVANTAGES

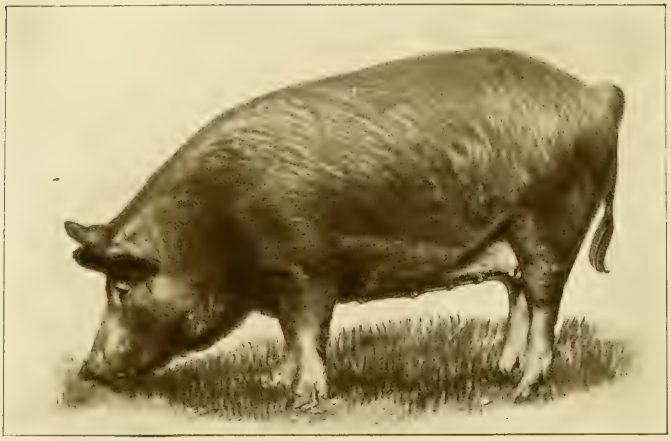
There is a wide difference between slop and swill. Slop is properly a hog's relish, while swill is too frequently nothing more than water polluted with unhealthful refuse. The term swill may embrace a wide variety of feed or drink, ranging from ordinary dishwater to a mixture of milk, table scraps, soapsuds and other kitchen refuse, while slop is a combination of a ground feed or feeds, with water or milk. A supply of wholesome swill in connection with other feeds may be extremely valuable, but in a condition of decay, rancid, and mainly filth, it may result in a loss of high-priced animals. Slop, however, may be considered as always in order.

As a rule, a thick slop is in various ways of greater feeding value than that which contains a large proportion of water. "We favor the practice of feeding thick slop to hogs," says James Atkinson, "for the reason that there is no special advantage in compelling a hog to take a lot of water into his system in order to get enough food. One is more apt to throw a hog's digestive system out of order feeding thin slop than is the case where the slop is thick, for the reason that there is not the same opportunity for the fluids of the mouth to act on the starchy part of the food. In cold weather it is especially desirable that only thick slop be fed, because nothing can be worse than to fill a hog up with a lot of water for which his system has no use."

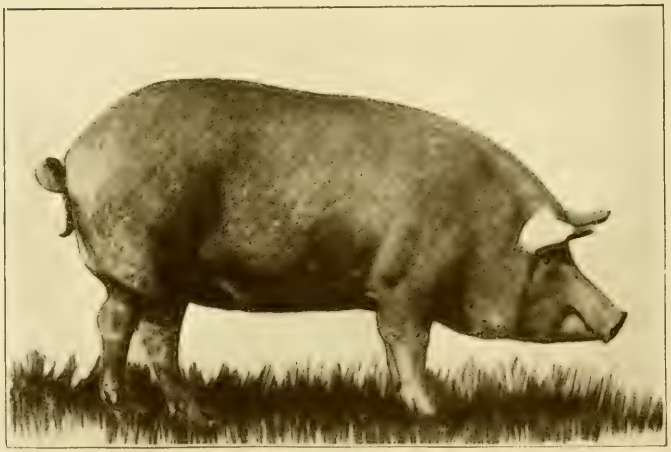
### EFFECT OF WATER IN SLOP

The question as to how thin slop should be made was taken up in an experiment at the Indiana station (Bulletin No. 86), in which 16 pure-bred Chester White and Berkshire pigs were divided into four lots of equal number and fed varying rations. Lot one was given the food dry in the trough; lot two the grain mixed with its weight of water, and lots three and four were given grain mixed with twice and three times its weight of water respectively. Each lot was also provided all the additional water they would drink, and was furnished salt and ashes. The feed used was a mixture of equal parts of corn meal and shorts for the first of the experiment, and hominy feed was substituted for the corn meal in the last month. The experiment began in January and was continued 146 days. The average weight of

**TAMWORTH BOAR, ENGLEWOOD'S FIREMAN 1864 AT FIVE YEARS**
Grand champion at World's Fair, St. Louis, 1904. Weight 1,000 pounds



**Tamworth Sow, Verty Queen 3901**
Grand champion at World's Fair, St. Louis, 1904



**A Tamworth Gilt**

each pig in the beginning was about 60 pounds. The average daily gain and feed per pound of gain was as follows:

| | Average daily gain, pounds. | Feed per pound, pounds. | Cost per pound of gain, cents. |
|---|---|---|---|
| Lot 1 | 1.08 | 3.59 | 2.87 |
| Lot 2 | 1.10 | 3.80 | 3.04 |
| Lot 3 | 1.10 | 3.74 | 2.99 |
| Lot 4 | 1.05 | 3.75 | 3.00 |

In summarizing results, the report on this said: "There was no material difference in the appearance of the pigs in either lot, so far as quality is concerned, and so far as this one experiment goes the use of about twice the amount of water to grain indicated a satisfactory proportion. In view of the fact that the pigs fed dry grain made slightly the best gains, it would appear that there is really no gain in feeding the pigs a slop instead of a dry grain, excepting as the feeder may regard it a matter of convenience."

### DANGER IN HOTEL AND KITCHEN SWILL

If refuse from the kitchens of hotels, restaurants, and such places is available, the hog raiser who desires to utilize this as a feed should remember that it is of value only when care is taken that it contains no material which will unfavorably affect his hogs. Broken dishes or glass and other dangerous substances are frequently thrown in with kitchen scraps and if the dishwater is not kept separate, the washing powders and cheap soaps so often used in it are likely to have harmful effects. These are

sometimes serious enough to suggest an outbreak of cholera, and instances are referred to in a bulletin entitled "Powdered Soap as a Cause of Death Among Swill-Fed Hogs," issued by the Cornell experiment station (Bulletin No. 141). These cases led to experiments with powdered soap, which showed conclusively that swill-fed hogs were poisoned by being given dishwater containing washing powders used in kitchens. The soap powders contain from 50 to 55 per cent carbonate of sodium, or what is known to the trade as sal soda or washing soda.

The following conclusions were reached: "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.

"It is not presumed that the poisoning by carbonate of sodium is the only cause of death among swill-fed hogs. Other destructive agencies are liable to be found in the decomposing garbage and swill collected from the sources mentioned. This is significant and it points to the undesirableness of feeding garbage to animals. In fact, if the total losses it occasions are counted, it is questionable if anything is gained in this attempt to save waste products. Again, it has long been recognized that

the feeding of garbage to hogs furnishes one of the most favorable channels for the introduction of hog cholera and swine plague bacteria. As a rule, wherever we find hogs in clean, well-ventilated pens and fed upon wholesome food, we find thrift and health, and, conversely, where these animals are surrounded with disgusting filth and fed upon decomposing swill or other unwholesome food, we expect to, and often do, find disease."

### SUCCESS WITH HOTEL REFUSE

There are, nevertheless, authorities who believe that hotel and restaurant refuse may be so carefully sorted as to be valuable. This is the opinion of L. N. Bonham, who says:

"The table and kitchen waste of hotels and restaurants contains so much valuable feed that may become a real bonanza to one who has the skill to handle it successfully, that we have taken some pains to look up the experience of several feeders. In each case their first efforts were discouraging. One man has been in the business five years; he began by hauling the refuse from hotels and restaurants in a water-tight tank. This he abandoned for covered barrels, that he might better assort the feed. He also paid the cooks and dish-washers to induce them to throw the dishwater, broken glass, empty cans, lye and the like into one barrel and the table scraps and kitchen trimmings into another barrel. He carefully examined all, and used only that which he deemed suitable, and the rest was thrown into a sewer. He was exceedingly careful in the beginning to feed newly purchased animals only a small quantity of the

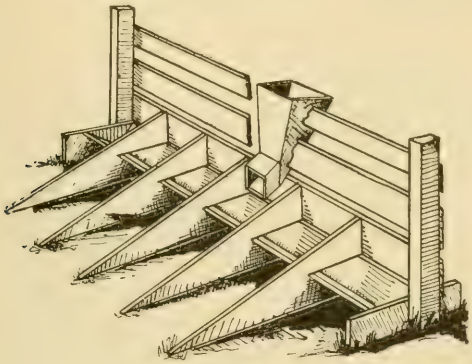
hotel refuse, along with dry corn. After ten days or two weeks they were given no corn. He found that even brood sows on this feed farrowed strong litters and suckled them well. If a sow gets too much, the pigs scour in a day or two thereafter. By good judgment and care not to overfeed, and to see that the feed is not too washy, his sows turn off strong litters. He supplements the hotel feed with bran or middlings and corn, as needed. He saves the best for the sows and pigs.

"The feeder in question is careful to have plenty of trough room, and advises a board or cement floor about the troughs, as the hogs will even eat the earth saturated with the juices of meat. In winter he feeds clover hay, and in very cold weather adds some corn. He advises finishing by feeding both corn and hotel refuse the last four weeks. In winter the swill is fed warm. In summer all slop is kept well covered from flies. He gets three to four barrels of swill a day, turns off 125 fat hogs annually, and buys only one boar each year. He is careful to watch for paper, strings, broken glass and crockery that might be in the swill. He says his hogs never choke on bones. He finds he does not need to feed salt and ashes or use any lice-killers. The alkali and the grease in the slop keep down vermin."

### SWILL FOR BROOD SOWS

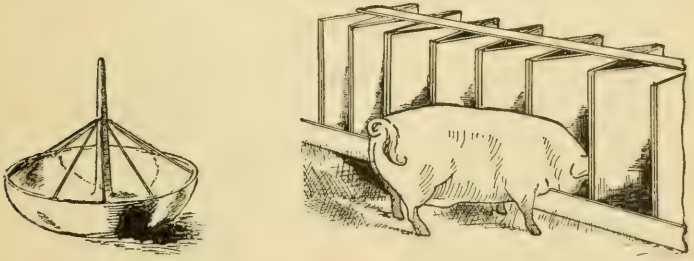
Danger to pregnant sows sometimes lurks in swill and kitchen refuse. A. J. Lovejoy says: "I have known of cases where sows during the breeding season were fed such refuse and not one of them could be got in pig."

Here is a trough, with guards, described in the Iowa *Register and Farmer*. It is made preferably of 2-inch planks, 12 to 14 inches wide. For the guards, planks



ONE STYLE OF PARTITIONED TROUGH

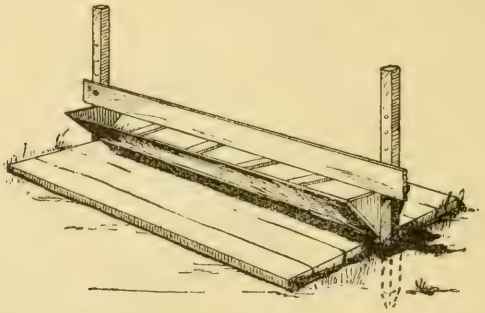
are cut to 4 or 5 feet in length, and the proper slant obtained by sawing from the corner edge of one end to the



OTHER STYLES OF PARTITIONED WOOD AND CAST IRON TROUGHS

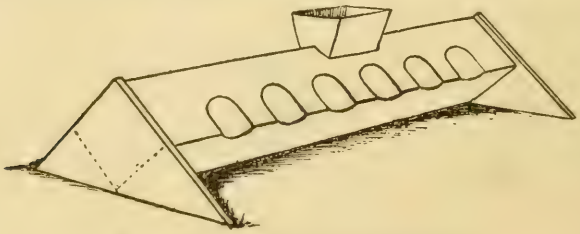
opposite corner edge of the other end, after which the wide end is cut out as shown, to fit the shape of the trough, to which it is securely toe-nailed. The front is

fastened to a plank or heavy board, running full length of the trough, and against which the guard-ends face. The spout through which slop is emptied into the trough



A GOOD STATIONARY TROUGH WITH PLATFORM

is made of one-inch boards, with the upper, or receiving, end large enough to take the three-quarter circle of a large bucket. This rests on the top of the guard face-board, which is slightly notched to receive it, and is held up by legs nailed to the side, and reaching to the floor.



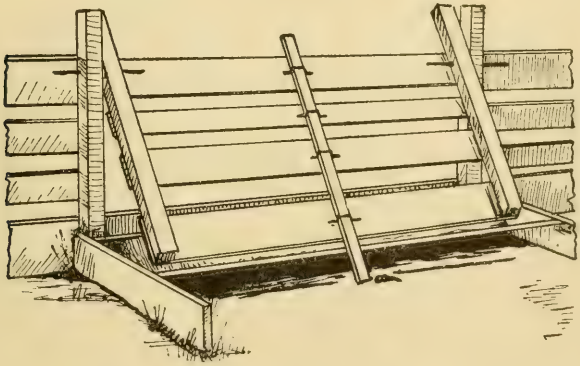
A WELL-PROTECTED TROUGH

The sketch illustrated above shows a very simple but useful stationary trough, with a three or four-foot feeding platform adjacent. It is nailed to the 4x4 posts,

which have holes in them for bolts, and a hole in each end of the six or eight-inch partition board for the bolts, which will hold it higher or lower as may be necessary according to the size of the hogs, to preven their climbing over.


AN INVERTIBLE TROUGH

The trough shown above is one that is firmly fastened in place and at the same time it can be turned over for cleaning. It can be made of two planks, one 6 inches wide and the other 7 inches, each 6 feet long, and for the ends two 6-inch boards each 2½ feet long. Fasten these between two stakes with a bolt. Cut the lower side of one of the ends off round, so that it can be

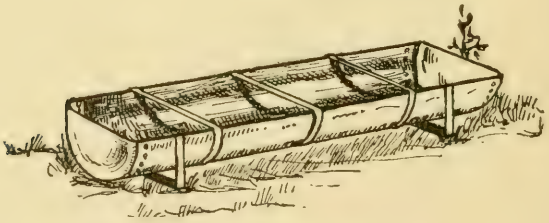


A HANGING GATE OVER A TROUGH

turned over readily. For large hogs this trough should be made larger and heavier than for pigs or shotes.

The next figure illustrates a useful hanging gate to prevent hogs from clambering into the trough and buckets when being slopped. The gate and trough can be placed between two panels of fence, and will serve in lieu of a panel.

This illustration is of an unbreakable, indestructible trough made of 1-8-inch-thick boiler steel. It is made 5 feet long, 13 inches wide and 7 inches deep, or larger. It is kept on sale by dealers in such goods.



AN UNBREAKABLE TROUGH

CHAPTER XVII.

# Swine Rearing with Dairying

Where dairies or butter factories are, or where the milch cow is a factor for other purposes than the sale of milk as such, the pig is a most useful and profitable adjunct. Upon the skim milk, judiciously used with other and more substantial foods, he thrives, grows and fattens, utilizing a by-product of tremendous volume which without the pig would represent little of available value. It is said that the skim milk from the butter factories of New York alone amounts to nearly a billion pounds in a single year. The use of this skim milk does much to give relief from monotony so common in the hog's feeding, besides adding to the returns from the other or main foods with which it is given, and every hog raiser is glad to have it.

### VALUE OF SKIM MILK AND BUTTERMILK

The editor of *Hoard's Dairyman* has formulated a simple rule for estimating the value of skim milk. He says: "To get at the value of skim milk in pig feeding, if used alone, multiply five pounds of gain by the price of live weight pork in the local market; or if fed in conjunction with corn or barley meal, credit one pound of the increased gain to the skim milk. If pork is worth five cents a pound on foot, we have 25 cents a 100 pounds

for the skim milk when fed alone; or, if fed in conjunction with corn or barley meal, six pounds of gain, or 30 cents a 100 pounds."

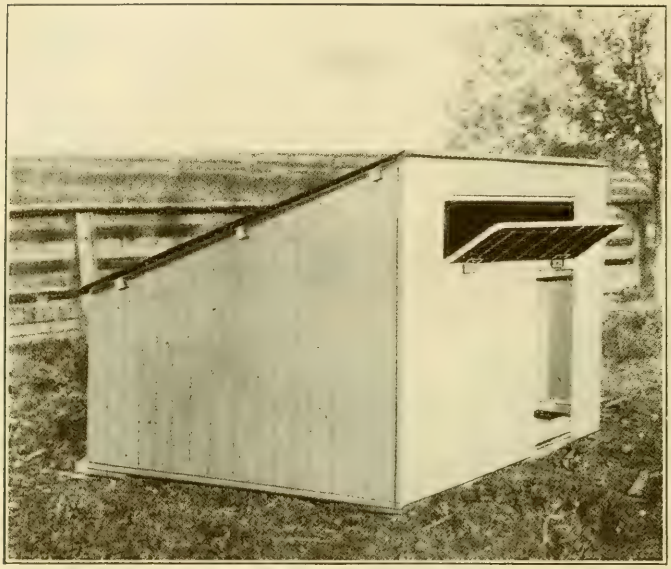
This is based on the estimates that a bushel of corn meal or corn will return ten pounds of pork and that 20 pounds of skim milk, fed alone, will yield one pound of pork. It takes into consideration also the interesting fact that if a bushel of corn alone will make ten pounds of pork, and 100 pounds of skim milk by itself will give five pounds of pork, the two combined will, on an average, produce 18 pounds instead of 15 pounds of pork. This peculiar and valuable effect has been noticed by many feeders, but has never been precisely explained. It is surmised, however, that the combination acts to stimulate the appetite and digestion so that, in the end, a larger proportion of the feed is digested or assimilated.

Skim milk and buttermilk are considered of practically equal feeding value except for extremely young animals. The prices at which they are sold by butter factories and skim stations depend much upon locality and conditions, and range from about seven to 25 cents per 100 pounds. Aside from the fat, the quantity of digestible nutrients in either is about equivalent to that in the cow's milk, which, when of average quality, contains 3½ per cent of protein and 5 per cent of carbohydrates.

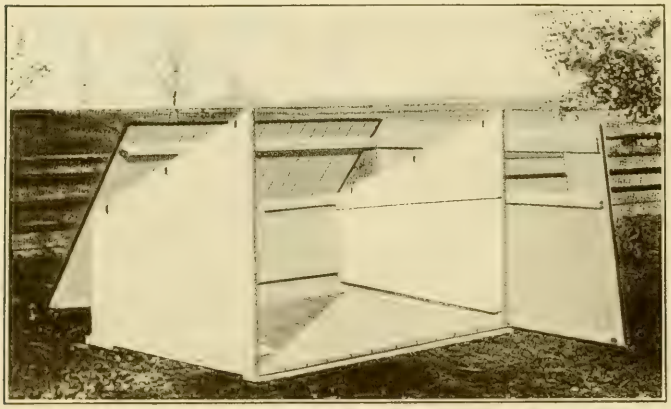
It will be seen that as skim milk affords less than ten per cent of digestible matter, it must, by itself, be an unsatisfactory and insufficient food. This has been proved by numerous experiments. Those made at the Utah station (Bulletin No. 57) showed that "from the standpoint of quick returns, the milk and grain ration

Illinois Experiment Station Hog House—Exterior

Illinois Experiment Station Hog House—Interior



Individual Hog House at the Illinois Experiment Station—Set Up



Individual Hog House at the Illinois Experiment Station—Taken Down

would enable a person to turn over two crops of hogs to one when the hogs were fed on milk alone." The Utah station made seven experiments comparing grain and milk rations with others of milk alone and grain alone, embracing tests with grain in several combinations with the milk. The grain used was equal parts of corn and wheat, corn meal and wheat bran, wheat and bran, barley and wheat bran, and also ground wheat alone. The grain or meal used alone was made into a thin slop with water. The experiments were conducted at different periods of the year, mainly in summer and autumn. In addition to the grain or milk rations, the hogs had plenty of water, with access to charcoal and wood ashes; they were fed twice daily. A comparison of the various rations of skim milk alone, milk and grain together, and grain alone is given in the following summary of the Utah experiments:

COMPARISONS OF SKIM MILK FEEDING

| Ration | Number of tests. | Number of pigs. | Average weight at beginning. | Average gain. | Number of days fed. | Average daily gain. |
|---|---|---|---|---|---|---|
| | | | Pounds | Pounds | | Pounds |
| Milk and grain | 8 | 27 | 40 | 169 | 133 | 1.27 |
| Grain | 5 | 15 | 63 | 110 | 121 | .91 |
| Milk | 4 | 11 | 39 | 74 | 108 | .68 |

| Ration | Feed eaten per 100 pounds gain. | | Dry matter per 100 pounds gain. | Digestible dry matter per 100 pounds gain. | 100 pounds milk equal pounds gain. | Average amount feed eaten per day. | |
|---|---|---|---|---|---|---|---|
| | Grain. | Milk. | | | | Grain. | Milk. |
| | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds |
| Milk and grain | 292 | 768 | 334 | 258 | 23.2 | 3.73 | 9.74 |
| Grain | 470 | .... | 421 | 319 | .... | 4.41 | .... |
| Milk | .... | 3,312 | 298 | 285 | 14.2 | .... | 22.28 |

Regarding the feeding of skim milk on the farm, J. H. Denham, a Michigan farmer, has made the following suggestions: "Hog farming in connection with dairy farming, when the skim milk can be kept at home, is a wonderfully remunerative side line for the farmer, especially where careful methods of feeding are practiced. When skim milk is carried out promiscuously and thrown in a trough and the hogs are allowed to fill themselves with the sweet, pure skim milk, I do not esteem it of much value, probably ten cents per 100 pounds would be the limit, while I feel sure from my own experience that with about 30 cents' worth of good judgment along with the 100 pounds of skim milk, it is worth 40 cents. Now 30 cents' worth of judgment without the skim milk would not do any better than ten cents' worth of skim milk without the judgment—they should be mixed, and how to mix them is what every farmer should try to get at.

"For feeding, say, 12 head of 100-pound shotes, I take a 50-gallon barrel, well protected from the weather—which it can be by setting it either in the cellar or the ground, or encasing it with a box filled around the barrel with sawdust—and well covered. The latter way I like well in the summer season. Now take a ten-gallon can of milk—either skim milk or buttermilk will do—and to this add one bushel of white (wheat) middlings, and after stirring well, add about 20 gallons of water.

"To get the best results, keep warm in winter and cool in summer. Feed to 12 100-pound shotes about five gallons of this three times a day, with a little corn, night and morning—and be sure after each feeding to replenish the barrel with middlings and milk and water, to keep

the mess of about the same consistency as at first. At the noon hour, water and middlings alone may be added, unless you have plenty of milk. Regularity in feeding hours and in quality and quantity of feed should be observed.

"I have no hesitancy in saying that the skim milk used in this mixture will return to the feeder 40 cents for every 100 pounds of skim milk or buttermilk used, more than the other ingredients would without it."

### DAIRY BY-PRODUCTS AND CARBONACEOUS FEEDS

A steady routine of carbonaceous feeding stuffs produces listless, unthrifty pigs. When skim milk or buttermilk is at hand a means of offering variety is afforded which will give the pigs a better appetite and induce them to eat more fat-making food than would otherwise be the case. If skim milk is available to form a ration with corn meal, either with or without other feeds, it will make a valuable and economical addition. This has been confirmed by numerous tests at the agricultural college experiment stations, some of which have extended through a number of years.

The relation between corn meal and skim milk in rations with and without the addition of wheat middlings was brought out in experiments at the Cornell station (Bulletin No. 199), covering a period of four years. The amount of feed required for 100 pounds of gain was as follows:

FEEDING RELATIONS OF SKIM MILK, CORN MEAL AND MIDDLINGS

| Ration. | Number of tests. | Number of pigs. | Feed required for 100 pounds gain. | |
|---|---|---|---|---|
| | | | Grain. | Milk. |
| | | | Pounds | Pounds |
| Corn meal and milk | 17 | 81 | 273 | 1,016 |
| Corn meal, middlings and milk | 12 | 52 | 223 | 1,069 |

In two years of experiments comparing the feeding of corn meal alone and with skim milk, the Tennessee station found (Bulletin No. 3, Volume XVI) that the profit when skim milk was used with corn meal was much greater than without it, despite the fact that the first cost was larger when the skim milk was added. In the following summary of the Tennessee experiments, corn meal is figured at an average price of $23.50 per ton, and skim milk at $4 per ton:

RESULTS FROM CORN MEAL WITH AND WITHOUT SKIM MILK

| Ration. | Number of pigs. | Total gain. | Average daily gain. | Total feed eaten. | |
|---|---|---|---|---|---|
| | | | | Grain. | Milk. |
| | | Pounds | Pounds | Pounds | Pounds |
| Corn meal | 7 | 119 | 0.50 | 489 | .... |
| Corn meal and skim milk | 7 | 309 | 1.35 | 481 | 3,686 |

| Ration. | Feed per 100 pounds gain. | | Total cost of feed. | Cost of feed per 100 pounds gain. | Profit per group.[1] |
|---|---|---|---|---|---|
| | Grain. | Milk. | | | |
| | Pounds | Pounds | | | |
| Corn meal | 410 | .... | $5.75 | $5.80 | $1.05 |
| Corn meal and skim milk | 160 | 1,190 | 12.95 | 4.60 | 4.96 |

[1] Value of manure and cost of care not considered.

Previous experiments at the Tennessee station (Bulletin No. 1, Volume XV) had been made to compare corn meal with other rations involving skim milk and whey. The first lot in the following table was fed a ration of 12 pounds of corn meal and 20 pounds of water, which was increased to 16 pounds of corn meal and 32 pounds of water later on. The second lot was given 12 pounds of corn meal and 36 pounds of skim milk a day at first, and 16 pounds of corn meal with 80 pounds of skim milk toward the end of the experiment. The third lot was given a daily ration during the early part of the test of eight pounds of corn meal and 24 pounds of skim milk, which was later changed to 3½ pounds of wheat meal, 12½ pounds of corn meal and 80 pounds of whey. The first ration of the last lot was composed of 5 1-3 pounds of corn meal, eight pounds of cowpea hay, and 16 pounds of skim milk; this was changed to 11 pounds of corn meal; three pounds of chopped cowpea hay, and 53½ pounds of skim milk. The last lot proved an unprofitable one, but the experiments demonstrated the high value of dairy by-products in connection with corn and wheat meals. The pigs averaged about 135 pounds at the beginning of the tests, when they were bought on the market at 4½ cents a pound. They were sold for 5½ cents a pound, and at that price it was estimated that 66.7 cents per bushel was received for the corn used. In the following summary of results, skim milk was valued at 22 cents per 100 pounds, and whey at half that sum, with the following prices per ton for the other feeds: Corn meal, $17; wheat meal, $25; cowpea hay, $13.50.

RESULTS WITH SKIM-MILK AND WHEY

| Ration. | Number of pigs. | Total gain. | Number of days fed. | Average daily gain. | Total dry matter eaten. | Dry matter per 100 pounds gain. |
|---|---|---|---|---|---|---|
| | | Pounds | | Pounds | Pounds | Pounds |
| Corn meal | 3 | 186 | 60 | 1 | 775 | 416 |
| Corn meal and skim milk | 3 | 414 | 60 | 2.3 | 1,213 | 293 |
| Mixed grain, skim milk and whey | 3 | 402 | 60 | 2.2 | 1,090 | 271 |
| Corn meal, cowpea hay and skim milk | 2 | 246 | 60 | 2.0 | 1,017 | 414 |

| Ration. | Total cost of feed. | Cost of feed per 100 pounds gain. | Net profit.[1] | Slaughter test. | |
|---|---|---|---|---|---|
| | | | | Dressed weight. | Intestinal fat. |
| | | | | Per cent | Pounds |
| Corn meal | $7.39 | $3.90 | $7.69 | 73.6 | 13 |
| Corn meal and skim milk | 17.61 | 4.20 | 12.06 | 78.5 | 16 |
| Mixed grain, skim milk and whey | 13.84 | 3.40 | 14.89 | 76.2 | 16 |
| Corn meal, cowpea hay, skim milk | 12.97 | 5.20 | 4.12 | 77.7 | 9 |

[1] Value of manure and cost of care and feed considered.

American experimental work with skim milk for swine, as conducted up to 1903, is treated at length in Part II of Bulletin No. 47 of the Bureau of Animal Industry, United States Department of Agriculture, and the four foregoing tables are the results of summaries made by Rommel for that bulletin.

### SKIM MILK WITH OTHER FEEDS

The beneficial effect of skim milk on digestion is observed when it is made a ration with other feeds than corn. Numerous experiments on this line have been conducted at the Central experimental farm of Canada (Bulletin No. 33), and these are summarized in the following tables on pages 435, 436 and 437.

View of A. T. Garth's Cement Block Hog House

Illinois Experiment Station Hog House with Sloping Roof

INDIVIDUAL HOG HOUSES SCATTERED IN A PASTURE

The meal referred to in the foregoing table was equal parts by weight of ground wheat, barley, rye and wheat bran. One of the conclusions from these experiments was that "skim milk is a most valuable adjunct to the grain ration when hard flesh is desired." It was found "in practically every case that the swine which had skim milk as a part of their ration were healthier and more vigorous than those which had grain without the skim milk."

Trials at the Hatch (now the Massachusetts) experiment station (Eleventh Annual Report) resulted in the following recommendations of desirable rations in which skim milk is used for growing swine:

DESIRABLE RATIONS FOR GROWING PIGS USING SKIM MILK

| Weight of pigs. | Rations. |
|---|---|
| 20 to 60 pounds | 3 ounces of corn meal to each quart of milk. |
| 60 to 100 pounds | 6 ounces of corn meal to each quart of milk. |
| 100 to 180 pounds | 8 ounces of corn meal to each quart of milk. |
| 20 to 60 pounds | Milk at disposal, plus mixture of one-third corn meal, one-third wheat bran and one-third gluten meal, to satisfy appetites. |
| 60 to 100 pounds | Milk at disposal, plus mixture of one-half corn meal, one-quarter wheat bran and one-quarter gluten meal, to satisfy appetites. |
| 100 to 180 pounds | Milk at disposal, plus mixture of two-thirds corn meal, one-sixth wheat bran and one-sixth gluten meal, to satisfy appetites. |

### SKIM MILK VS. LINSEED AND GLUTEN MEAL

The comparative values of skim milk and linseed and gluten meals were tested in feeding swine at the Maryland station (Bulletin No. 63). A lot of six pigs was fed hominy chops, ground corn fodder, gluten meal and "old

TABLE SHOWING RESULTS FROM VARIOUS FEEDS WITH AND WITHOUT SKIM MILK

| Feeds. | How prepared. | No. of swine. | Average weight at start. | Average weight at finish. | Average net gain. | Number of days fed. | Average daily gain. | Average amount of feed eaten. | Average amount feed for 1 pound gain. | Per cent dressed weight. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pounds | Pounds | Pounds | | Pounds | Pounds | Pounds | Per cent |
| Oats | Whole, soaked 54 hours | 4 | 97 | 170 | 73 | 84 | .87 | 307 | 4.21 | 74.67 |
| Skim milk | | | | | | | | 252 | 3.45 | |
| Oats | Ground, soaked 54 hours | 4 | 54 | 184 | 130 | 126 | 1.03 | 424 | 3.26 | 74.87 |
| Skim milk | | | | | | | | 756 | 5.81 | |
| Barley | Ground, soaked 54 hours | 4 | 73 | 184 | 111 | 112 | 1.00 | 483 | 4.35 | 74.56 |
| Barley | Whole, soaked 54 hours | 4 | 99 | 199 | 100 | 84 | 1.19 | 364 | 3.64 | 74.19 |
| Skim milk | | | | | | | | 252 | 2.52 | |
| Peas | Whole, soaked 54 hours | 4 | 100 | 207 | 107 | 84 | 1.27 | 356 | 3.33 | 75.43 |
| Skim milk | | | | | | | | 252 | 2.35 | |
| Peas | Ground, soaked 54 hours | 4 | 62 | 224 | 162 | 126 | 1.28 | 446 | 2.76 | 76.07 |
| Skim milk | | | | | | | | 756 | 4.68 | |
| Oats and peas | Ground, soaked 54 hours | 3 | 61 | 226 | 165 | 126 | 1.31 | 503 | 3.00 | 75.15 |
| Skim milk | | | | | | | | 756 | 4.51 | |
| Oats, barley and peas | Whole, soaked 54 hours | 3 | 71 | 176 | 105 | 91 | 1.15 | 306 | 3.20 | 79.08 |
| Skim milk | | | | | | | | 273 | 2.60 | |
| Peas, barley and rye | Whole, soaked 48 hours | 5 | 69 | 156 | 87 | 119 | .73 | 386 | 4.45 | |
| Peas, barley and rye | Whole, soaked 48 hours | 5 | 69 | 204 | 135 | 119 | 1.13 | 330 | 2.46 | |
| Skim milk | | | | | | | | 1,869 | 13.92 | |
| Peas, barley and rye | Ground, soaked 12 hours | 5 | 69 | 173 | 104 | 119 | .87 | 455 | 4.36 | |
| Peas, barley and rye | Ground and soaked | 4 | 76 | 210 | 134 | 119 | 1.12 | 464 | 3.46 | |
| Skim milk | | | | | | | | 645 | 4.81 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Wheat | Ground, soaked 12 hours | 5 | 61 | 165 | 104 | 120 | 0.87 | 441 | 4.23 | |
| Wheat | Ground, soaked 12 hours | 4 | 104 | 192 | 88 | 56 | 1.57 | 233 | 2.65 | |
| Skim milk | | | | | | | | 1,011 | 12.51 | |
| Barley, rye, wheat and bran | Ground, soaked 12 hours | 36 | 54 | 108 | 54 | 105 | 0.51 | 207 | 3.85 | |
| Barley, rye, wheat and bran | Ground, soaked 12 hours | 31 | 108 | 191 | 83 | 83 | 1.00 | 268 | 3.23 | |
| Skim milk | | | | | | | | 250 | 3.00 | |
| Meal | Soaked 30 hours | 5 | 60 | 175 | 115 | 84 | 1.37 | 349 | 3.10 | 77.76 |
| Skim milk | | | | | | | | 504 | 4.35 | |
| Meal | Soaked 30 hours | 5 | 61 | 154 | 93 | 84 | 1.11 | 179 | 1.92 | 74.40 |
| Skim milk | | | | | | | | 504 | 5.40 | |
| Sunflowers | Soaked | | | | | | | 197 | 2.11 | |
| Shorts | Soaked 36 hours | 4 | 72 | 156 | 84 | 112 | .75 | 372 | 4.42 | 77.76 |
| Potatoes | Raw | 3 | 56 | 153 | 97 | 140 | .70 | 133 | 1.37 | 76.58 |
| Meal | Soaked 30 hours | | | | | | | 363 | 3.72 | |
| Skim milk | | | | | | | | 105 | 1.08 | |
| Potatoes | Cooked | 3 | 56 | 171 | 115 | 140 | .82 | 831 | 7.18 | |
| Meal | Soaked 30 hours | | | | | | | 177 | 1.52 | |
| Skim milk | | | | | | | | 315 | 2.72 | |
| Potatoes | Raw | 3 | 55 | 192 | 137 | 140 | .98 | 98 | .71 | |
| Potatoes | Cooked | | | | | | | 332 | 2.41 | |
| Meal | Soaked 30 hours | | | | | | | 314 | 2.28 | |
| Skim milk | | | | | | | | 210 | 1.52 | |
| Potatoes | Cooked | 3 | 55 | 195 | 140 | 140 | 1.00 | 712 | 5.06 | |
| Meal | | | | | | | | 289 | 2.05 | |
| Skim milk | | | | | | | | 105 | .74 | |
| Potatoes | Cooked | 3 | 50 | 192 | 142 | 140 | 1.01 | 1,034 | 7.29 | 78.39 |
| Meal | | | | | | | | 140 | .98 | |
| Skim milk | | | | | | | | 420 | 2.96 | |

process" linseed-oil meal. Another lot of the same number was given the same ration, except for the substitution of skim milk for the gluten and linseed meals. The nutritive ratio was practically the same in the two rations, but in the ration in which skim milk was mixed 25 per cent less grain was required than in the other. With the skim milk ration the average daily gain was 1.54 pounds, and with the other 1.12 pounds.

### SOUR MILK

Skim milk which has soured may be fed with good results, and experiments seem to show that if there is any difference in the feeding value of sweet and sour skim milk, it is probably in favor of rather than against the latter. This was the case in tests at the Vermont station (Sixth Annual Report, p. 49), where an experiment concluding two years of investigation was summarized as follows: "Four pigs on sweet skim milk during the growing period, from May 23 to October 13, gained 172, 177, 179 and 187 pounds respectively, a total of 715 pounds. During the same time the four pigs on sour skim milk gained 171, 173, 166, and 178 pounds, a total of 688 pounds. Thus, in each case the pig on sweet milk gained more than its mate on sour milk; an average of 6¾, and a total of 27 pounds. If the experiment had stopped here, the verdict would have been decidedly in favor of sweet milk, but when the crowding for market began, results were just reversed. During the finishing-off process, from October 13 to November 11, the pigs on sweet milk gained 77, 65, 55 and 43 pounds, a total of 240 pounds; while the pigs on sour milk gained 82,

72, 70 and 51 pounds, a total of 275 pounds, and a gain over the pigs on sweet milk of 35 pounds. It follows, then, that at the time of killing, the two sets of pigs had made substantially the same gain. A queer fact developed when the pigs were killed, and one for which no satisfactory explanation has been given. Each pig that had been fed sweet milk shrank more in dressing than its mate on sour milk. The percentages of shrinkage for the sweet milk pigs were 21, 16, 18 and 19, an average of 18 per cent. The sour milk pigs shrank 16, 14, 17 and 11 per cent, an average of 14, or 4 per cent less than the pigs on sweet milk. This 4 per cent, or about eight pounds per pig, represents the total gain of the sour skim milk over the sweet skim milk. The difference in the results obtained from feeding sweet skim milk and sour is so little that not much can be claimed in favor of sour milk. Nor do we desire to claim any advantage from its use. The object of the experiment has been attained when it is shown, as these two years' work do show most conclusively, that sour skim milk is at least equal in feeding value to sweet skim milk."

### BUTTERMILK

Skim milk and buttermilk are considered of equal value for swine. This was proved in tests by the Massachusetts experiment station (Bulletins Nos. 13 and 18), as has been the case wherever tried elsewhere. The comparison, however, refers to pure buttermilk, and not the diluted or oversalted product which sometimes comes from the creamery. Buttermilk mixed with washings or

other water is naturally of less value. An example of this is had when, as is sometimes the case, it is run into a tank and afterward pumped out or drawn from the bottom, for in that event the casein will be nearer the top and the buyer will obtain more water than he desires. Some creameries use washing powders which are almost certain to have a poisonous or other harmful effect. In buying buttermilk, the swine raiser should be sure he is getting that which is undiluted and not unwholesome.

"To brood sows in pig," says Professor Henry, "do not feed over one pound of buttermilk for each two pounds of grain. For sows after farrowing, feed three or four pounds of buttermilk for each pound of corn meal given. For young pigs, feed the same proportions. For fattening hogs, do not feed over two or three pounds of buttermilk for each pound of corn supplied. Of course, if the buttermilk is abundant, one need not worry about utilizing it so closely as he would if it cost more, but, on the other hand, it will pay to keep a larger number of hogs and thus get better returns than would follow with a limited number of animals and an excessive use of buttermilk."

### WHEY

In the manufacture of cheese, most of the casein and fat are kept in the cheese and the whey is therefore of less value for feeding than kindred by-products. It is generally considered about half as valuable as skim milk. In Henry's "Feeds and Feeding," Danish experiments show 1,200 pounds of whey as equal to 100 pounds of

meal, but the whey used was from the manufacture of cheese from skim milk, and accordingly, of about as poor a quality as could be obtained. Professor Henry has averaged results at the Wisconsin experiment station and the Ontario agricultural college showing that 785 pounds of whey will equal 100 pounds of grain. In these experiments it was found that 481 pounds of grain produced 100 pounds of gain and 303 pounds of grain with 1,398 pounds of whey produced 100 pounds of gain, so that 178 pounds of grain was saved by the use of 1,398 pounds of whey.

As to the composition of whey, and its use, Henry said: "Where full cream cheeses are made, 100 pounds of whey contain about .7 of a pound of mineral matter, .3 or .4 of a pound of fat, .5 of a pound of albumen, a little casein, and between three and four pounds of milk sugar, the remainder being water. This shows the food to be very watery. One great difficulty in using whey arises from the fact that it ferments easily, and the barrels or tanks in which the whey is handled become very foul and often very dangerous to the health of the animal so fed. Overfeeding will generally be indicated by the pigs scouring; this should be avoided, even though whey be wasted. With whey, feed corn or corn meal and middlings. Do not grind the corn if the pigs handle it well otherwise."

When whey is hauled to the farm, it is not advisable to use milk cans for that purpose, but barrels instead. Whey that has fermented, but has not become what is known as "rotten sour" may often be used as profitably as sweet whey. This should not be taken as a general

rule applicable to whey that is foul and manifestly unfit for any use as food. According to analyses at the Ontario experimental farm (Twenty-third Annual Report), fermentation in whey is solely at the expense of the sugar content, and merely a trace of sugar is found in sour whey. Five experiments gave almost equally as good results with sour whey as with sweet, when fed to the hogs. A summary says: "A general review of the work, taking into consideration the health of the animals, their gains, the quality of their flesh, and the composition of the sweet and sour whey, seems to point to the conclusion that fermentation does not seriously detract from the value of whey for pig feeding."

Further experiments at the Ontario experimental farm (Twenty-fourth Annual Report), gave evidence of the value of whey in producing firm bacon, leading to this statement: "The evil effects arising from lack of exercise can be overcome by the judicious use of skim milk and whey. The amount of whey recommended is from two to 2½ pounds to a pound of meal. Whey and skim milk appear to have a greater influence than exercise in producing firm bacon." This last statement, however, was not offered as a definite conclusion.

A disadvantage remarked in the use of whey lies in the danger of lameness or crippling of hogs through overfeeding. In such cases the joints become stiff and the lameness is serious. In an experiment at the Ontario experimental farm (Twenty-third Annual Report) three shotes, averaging about 130 pounds each, were brought gradually to a full feed of two pounds of sweet whey to one of meal. The meal consisted of equal parts by

weight on ground peas, barley and shorts. The animals became lame when full feed was reached, but recovered quickly when the quantity of whey was decreased. A similar lot given a like ration, except that the whey was sour, showed no lameness. However, it has been learned by years of experience that whey used intelligently has a high feeding value, and that hogs fed upon it produce a high quality of bacon. A very satisfactory method of feeding whey is to soak shorts or finely ground chop in it and feed three times a day. Shorts forms the best grain part of the ration until the hogs weigh about 80 pounds; after that, ground barley, corn and oats, with the coarsest of the hulls removed, answer well. Many 100-acre dairy farmers in Ontario sell from $500 to $800 worth of hogs annually and purchase comparatively little grain. These farmers sell practically no grain in its raw state, with the result that their land is becoming more productive year by year, which enables them to keep more cows and feed them better and thus secure an increasing annual revenue from their farms. Farmers who send milk to a cheese factory and receive no revenue for the whey, either directly, or from the hogs fed upon it on their own farms, miss a considerable profit that rightly should be theirs.

### CHANGES SHOULD BE GRADUAL

Any change from one kind of dairy by-product to another should be gradual, notwithstanding their being derived from the same base. This is particularly true when buttermilk is substituted for skim milk. Because equally good results may be obtained from either, it does

not follow that a sudden change may be made from one to the other without risk. When deemed economical to substitute buttermilk for skim milk the change should be watched carefully. In considering the economy of such a change, it should be taken into account that if the skim milk is pasteurized, its value may be greater thereby through lessening the danger of tuberculosis.

### QUANTITY IN FEEDING

No economy results from giving hogs all they will drink of any dairy by-product. There is, in fact, considerable danger of giving too much, especially to young pigs, aside from the wastefulness of the practice. "We had the best returns," said Professor Henry, commenting on experiments at the Wisconsin station, "when we fed the hogs not over three pounds of skim milk for each pound of corn meal. On the limited supply there was a larger profit from the feed than if more of the skim milk was given. The same will be true of buttermilk."

### CLEANLINESS IMPORTANT

Cleanliness is a requisite of success in using the by-products of dairy, creamery or cheese factory. If care is not exercised the results are sure to be unsatisfactory, and when so much liquid of this character is used, greater caution will be necessary than would otherwise be needed to maintain healthful quarters and feeding conveniences.

A feature of hog feeding which has been assuming serious proportions in dairy sections is the tendency toward the spread of tuberculosis. This has become so marked that packers have refused to buy hogs known to

be shipped from sections where tuberculosis was prevalent. The hog with this disease is to all outward appearances healthy, and may be the plumpest in a lot; his real condition can be discovered only after killing, and for these reasons packers are suspicious of hogs marketed from dairying communities. When they trace affected shipments in a marked degree to certain localities, their recourse lies in placing a ban upon hogs from those localities. This problem of tuberculosis is being extensively investigated in the hope that some practical means of preventing the resulting losses may be discovered.

Where refuse, grease, milk, whey and other things that go to make up swill are left in the barrel day after day, bacterial growths develop, fermentation occurs, and chemical changes take place which oftentimes more than counteract by their detrimental action any value that the swill might have. Such filthy barrels are the most natural breeding places for disease germs. Scours is often caused by such uncleanliness. A breeder with a filthy swill barrel need not consider it an act of providence if his pigs suddenly sicken and die. It is his own willful act that is responsible. A filthy swill barrel is not alone unsightly, but dangerous. It should not have a place on any farm. Boiling water and an old broom applied once a week will do much toward keeping it sanitary, and to an extent presentable.

### DAIRYING AND WINTER PORK MAKING

Leo C. Reynolds, a well-known Michigan swine grower and writer, even so far north as he is, is partial

to winter pork making, and says that especially where winter dairying is carried on it can be made a very profitable business. He writes. "If the milk is separated at the farm and the cream is sent to the factory, the by-product can be fed to the hogs with a good margin of profit. No calf has the ability to convert skim milk into profitable meat as readily as a thrifty pig. The pig, properly handled, will be ready for market in six months. Comfortably housed and well cared for, hogs can be forced to make better gains during cold than warm weather, thus causing a more profitable consumption of the food supplied.

"During the winter months, when the field work is not pressing, pork making furnishes an opportunity to utilize the farm labor to advantage. Where winter dairying is carried on, laborers must be constantly maintained to do chores and care for the milk. There are always several hours between milkings when the labor needs to be otherwise employed. Most dairymen keep one or two barn hands to do the chores and care for the dairy herd, exclusive of the milking. As the hogs can be fed between the hours in which the herd demands attention, we find that it is very profitable to follow winter pork making as an adjunct to the dairy, because we can furnish steady employment to the necessary farm labor. It requires only a few minutes for one or two hands to feed 50 or 75 hogs, and this in no way need interfere with their regular work.

"Attention should be paid to compounding as nearly as possible a well balanced ration to promote rapid and profitable gain. For slops we have never found anything

equal to skim milk and wheat middlings. If the milk is fed directly from the separator, the temperature is yet above normal, thus supplying the hogs with warm slops. This is very essential during cold weather. In case the milk cannot be used directly from the separator, it is advisable to employ some means of warming the slops. We have found that both growing and fattening hogs do much better when fed warm rather than cold slops, and especially during cold weather. For grain rations we endeavor to use farm-produced grains as far as possible; they are not only nearer at hand, but they compound a cheaper ration. Corn should compose the larger portion of the grain for the fattening stock.

"Attention should also be given to supplying the animals with plenty of corroborants (tonics or correctives) to promote health and stimulate assimilation. Hogs when confined to limited quarters are unable to obtain mineral matter, and unless supplied, will soon become diseased. Charcoal is one of the best corroborants available, and should always be kept within easy reach of the animals. Salt is also an essential, and should be supplied daily in the slops."

A Dakota student of pork-making problems declares that "no combination on earth will cause a farmer's mortgage to tremble and turn pale like the cow and the brood sow hitched up together. It is my opinion that the first cost of hogs, properly bred, properly pastured and properly fed, with corn costing not more than 35 cents per bushel, does not exceed three cents per pound."

CHAPTER XVIII.

# Hog Houses and Pens

Probably every swine grower, and especially of purebreds reared for breeding purposes, has had dreams of some time possessing a model hog house; one so capacious, so complete and so nearly meeting every requirement that labor and further expense would be almost unnecessary, while the convenience, better health, freedom from losses, economy in feed and increased profits resulting from an equipment so perfect would make the breeder's progress toward fortune little less than a triumphal march along an asphalt highway, shaded by sighing elms and perfumed by flowers. Properly ambitious, and with such ideals in mind, breeders have planned, erected and equipped what were intended to be such buildings; many expensive, elaborate and ornate, with "all modern conveniences," and others less so in varying degrees, but all intended to insure economy by accommodating a large number of animals under one roof and in restricted yards or pens adjacent.

So far as mere theory disclosed, many of these, of moderate, as well as of high cost, were admirable, if not perfect, and their owners for the time fancied they possessed a sort of Aladdin's lamp, by means of which they would find a larger measure of success than was or would be vouchsafed to their less discerning and less enterprising fellows. In practice these structures have

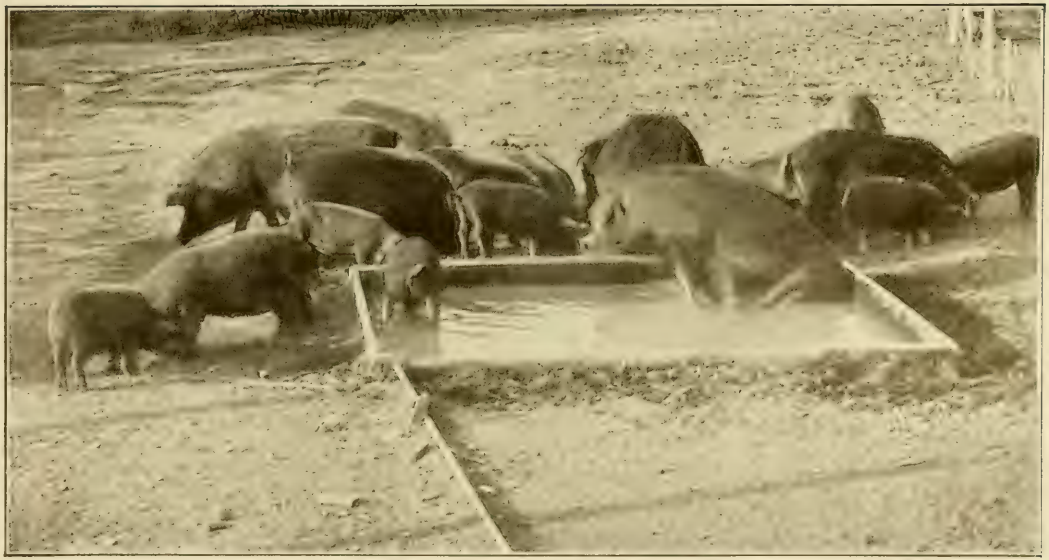
been, generally speaking, a disappointment. The author has never seen one that was found by its owner more than partially satisfactory for permanent use. Two principal defects seemed to be that animals confined in such quarters had insufficient warmth and light from the sun and too little exercise for health and wholesome flesh-making. The *Breeder's Gazette* says, "Good hog barns are as rare as angel's visits. Most of the elaborate 'hog palaces' are inconvenient, unsanitary, uncomfortable, costly and nearly worthless. . . . Yet the writer believes that a good one is a possibility."

On its face it does not seem difficult to construct, with reasonable expenditure, a habitation for swine so convenient and comfortable that all their days from first to last may be spent in it in that thrift which is supposed to come of comfort, along with enhanced profit to their owners; but, as a matter of fact, the hog does not seem to do well under such supposedly perfect conditions. For his best prosperity and prolificacy, he seems to require more light, more liberty and closer contact with fresh earth than he finds in any palace, however well equipped or furnished. Nature seems to have decreed that treated as a song bird and kept in a gilded cage he shall not be his real or better self.

This, however, is not said to dissuade from doing so those who desire and are able to build elaborate structures, needed for housing their swine at most but a few months in a year, but rather to reassure breeders that safety and success in their business are not really dependent upon the possession of such buildings. It is safe to say that those who have attained either fame or

fortune by aid of these accessories are few in number, if, indeed, there are any such, and the men who have succeeded best in a financial way, or who have left the impress of improvement upon any breed, have done so without the aid of expensive buildings or fittings. A happy medium, somewhere between the too elaborate hog house on one hand and the filthy hovel on the other—quarters clean and comfortably bedded, where sunlight and ventilation can come, and wholesome water, pasture and exercise, with shade in summer, are convenient—is likely to give the largest measure of satisfaction and profit to the vast majority, whether their shibboleth be pedigree or pork. The hog does not need a palace or an upholstered cage, nor does he prosper in a dungeon. The forest and its range were his natural habitat from earliest history and living in close confinement or an environment of filth were as foreign to his instincts as to those of numerous other animals erroneously rated as greatly his superiors in cleanliness.

The farmer will do well to give the matter of building a large hog house careful thought before he begins it, not alone on account of the expense, but for various reasons. The difficulties in keeping the sanitary conditions of such a structure as they should be are not a few. When disease attacks the animals in a large house, the problem of ever thoroughly disinfecting the building becomes a serious one, and few have the knowledge or skill to accomplish it. Unless this is done, the owner can have no assurance that he will be safe from further loss when hogs again occupy the building.



PROF. J. H. SHEPARD'S SELF-DIPPING HOG TANK

A PEN OF PURE-BRED POLAND-CHINA BARROWS UNDER SIX MONTHS OLD

The illustrations, plans and descriptions in this chapter are not presented with the idea that any one of them will be found exactly suited to all the needs of any one individual, for the situation of each breeder or farmer is in some respects different from that of every other. Each plan is believed or has been found by its author to have points of excellence, and by adaptation of suggestions afforded in some one, or all of these, the reader may, it is not unlikely, have his requirements met.

Discussing hog houses, more particularly those of considerable size or expense, William Dietrich, the swine husbandman of the Illinois experiment station, points out that such buildings, if most serviceable, should be constructed so that they can be used every day in the year. If this can be done, it is permissible to spend more money in the construction than would be warranted were the buildings to be used only a few months during the year. In order to be an economizer of labor, the houses should be planned so that the largest amount of work may be accomplished with the smallest expenditure of labor, which is a very important factor. Dryness should be afforded by thorough drainage; freedom from dust by sprinkling with water, and the rays of direct sunlight should be prevented from entering the pens during the hot part of the summer days, by the manner of constructing the buildings. To be sanitary the houses should admit the direct rays of the sun to the floors of all the pens and exclude cold drafts in winter, be dry, free from dust, well ventilated and exclude the hot sun during the summer.

In providing shelter for swine, as well as for other classes of live stock, surroundings should be furnished that conform as nearly to nature as the improved condition of the animals and circumstances of the owner will permit. Swine, when wild, inhabit the forest, where shade, water, protection from cold winds, and natural soil are abundant, and where they may select dry or damp localities as they please. The best surroundings, then, for swine, are those that will satisfy their natural desires, but so modified and improved as to promote the largest financial results. The choice location for a hog house is one that is well drained and well lighted, and that will permit access to pasture, to good shade and to water that is free from disease germs, where also there are opportunities for making wallows in clean mud.

If the building can be placed on a sandy or gravelly soil better drainage will be afforded than by a clay, silt, or peaty soil. Light and shade are desirable for reasons that are apparent to everyone. Pasture should be accessible, as considerable food is obtained from the soil in the form of roots, worms and insects, as well as other substances that are not foods, but necessary to health. A limestone soil is preferable, because the water from such a soil, as well as the soil and stone themselves, furnish the lime that is so essential in building up bone. A rolling pasture is preferable, because it affords better drainage and a form of exercise that is conducive to the production of a large percentage of lean meat. It also tends to produce strong legs with upright pasterns, which, from the breeder's standpoint, are among the first essentials of a good hog. If there is no

natural stream, water pumped from a well by a windmill or other power, can supply the need. "A clean mud wallow is enjoyed more by swine in the summer time than any one other condition that may be furnished them. It keeps them cool, destroys lice and keeps the skin in a good healthy condition."

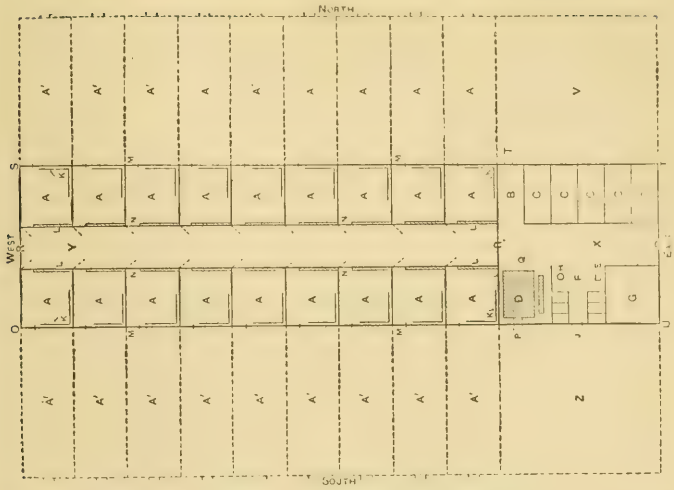
In the first illustration at the beginning of this chapter is shown the exterior of a hog house at the Illinois experiment station (Bulletin No. 109), constructed with such ideals in mind, and described by Mr. Dietrich:

"The building as a whole is 30 feet wide, with an eight-foot alley running lengthwise through the middle, between two rows of pens. It stands lengthwise east and west, with the windows on the south. The important factor to consider in this connection is the height of the windows represented at E and D in connection with the width and manner of construction of the building. The window E is so placed that at noon of the shortest day of the year, the ray of light which passes through the upper part, will fall upon the floor of the south side pen on the opposite side from the window. This allows the total amount of light coming through the window at this season of the year and this time of the day to fall upon the floor within the pen. In the morning and in the afternoon, when the sun is not at its highest point, a part or all of this beam of light will pass beyond the pen. Consequently, during the later winter months, there will be a maximum amount of sunlight on the floor of the pen.

"The lower part of the window D in the upper part of the building performs the same function for the pen

on the north side of the alley as does the window E for the pen on the south side. By this arrangement of windows, there is possible a maximum amount of sunlight on the floor of the pens in winter, which will serve to warm the interior of the house and especially the beds during the later months of winter, thus making it possible to have pigs farrowed very early in the season. Sunlight not only warms and dries the building, but destroys disease germs, thus making the building both warm and sanitary. Sanitation is further augmented by the upper part of the window D, which, when open, acts as a ventilator. It is supplied with weights, so that it can be opened and closed at will by the attendant while standing on the floor of the alley.

"To have this arrangement of windows in the latitude of, say, central or northern Illinois, it is necessary to have the top of the window E, which throws light into the pen on the south side, 5 feet 6 inches from the floor. The upper window, which throws light into the pen on the north side, is longer, but a point in this window, the same distance above the lower end as the height of the window E should be 9 feet 8 inches from the floor. This necessitates a flat roof for the part of the building south of the alley, which must necessarily be made of some material that will shed water at a slight pitch. The wall on the north side of the building is made as high as that on the south side, but the roof on the north side and alley is made steeper, so as to give more air space and good ventilation. This part of the roof, then, may be made of shingles.




GROUND PLAN OF THE ILLINOIS EXPERIMENT STATION HOG HOUSE

"In the figure above is shown the ground plan of this house. It is 120 feet long by 30 feet wide, and is represented in the figure by O, S, T, U. X, Y is the alley which runs lengthwise through the middle of the building and is eight feet wide. This permits of driving through with a wagon, which allows the feed and bedding to be hauled in where it is needed and the manure to be loaded on the wagon directly from the pens and hauled to the fields.

"The doors at either end of the building and one across the alley, shutting off the pigs from the rest of the building, are shown by R. The pens A are ten feet wide and 11 feet deep. Each pen has a doorway, M, leading to the outside, which is opened by a door sliding upward.

There is also a door, N, opening to the alley on the inside. This door is hung so that when it is open it will turn the pigs toward the front end of the house where they are to be weighed. It also permits of changing pigs from any one pen to any other pen, and easy access for the attendant. L represents the trough, which is placed on the side of the pen next to the alley and which with the arrangement of a swinging panel above this trough, as is shown in the illustration at the first of this chapter, makes feeding a very easy and convenient operation. The fender in the pen is shown by K in the plan. This consists of a two-inch tubular iron bar, placed on iron posts of the same dimension, and set in concrete in the floor. This bar is placed eight or nine inches above the floor and about six inches from the wall, and is to prevent the sows crushing the pigs at farrowing time. The sow will necessarily make her bed in this corner, as the other three corners are occupied, two of which have doors and the other the feed trough.

"D in the plan shows the platform scale on which the pigs are weighed as desired. This scale is fitted with a frame, and the door on the side next to the alley, shown at Q, opens so that when the pigs come down the alley, it will facilitate turning them upon the scales. At the other end of the scale platform is a smaller door in the frame which opens through a door, P, of the building, thus allowing the pigs to pass from the scale room directly to the outside, where there may be a loading chute leading to a wagon.

"F is the feed-mixing room in which are bins for feeds of various kinds represented by I. There is also a

door, J, leading to the outside from this room. H shows the hydrant, from which water is obtained for mixing slops, watering hogs, and for attaching the hose to sprinkle the floors. E shows the stove that is used for heating water in winter for mixing slops.

"G shows the office, and C the bins in which the feed is stored, as it is hauled to the hog house. The opening to these feed bins is from the main alley of the hog house, from which they are filled directly from the wagon as the feed is brought in. The feed is then taken out in smaller quantities as needed and put into the small bins in the mixing room from which it is weighed out to the pigs at feeding time.

"B shows an alley which leads through the door, T, to the yard, V, on the outside. Opposite this is the yard Z. These two yards are not connected with pens on the inside of the building, but are used as boar pens and are supplied with separate cots and feed troughs on the outside. The rest of the pens on the outside, shown as A, are of the same width as the pens inside, and 28 feet long. They are connected with the pens on the inside by means of the doors above mentioned, the outer end opening to the lane which leads to the pastures. The partitions between these pens on the outside are made of two lengths of common fencing, one 16 feet and the other 12 feet long. The 12-foot length is next to the building and may be made into a gate so that it will swing. By opening all these gates and swinging them one way, and away from the building, an alley is made along the outside of the building in case it is not desirable to use the alley in the building for taking out the manure. But

this is not so convenient as driving through the alley on the inside.

"There is a four-inch drain tile laid from each pen in the building to the main lines on either side, which are placed on the outside of the pens, leading to a ravine. The tile opens up through the floor of the pen by means of a perforated iron disk, which is laid in the bell end of a length of sewer pipe. The floor is made to slope toward the drain, so that it can be flushed with water.

"The second illustration at the beginning of this chapter shows the interior section of the house containing the pens. All the gates and partitions of the interior are made of wire netting panels. Wire is considered better for this purpose than lumber for several reasons, as follows:

"(1) There are no obstructions to light. The rays of light coming through the windows are not prevented from reaching the floor where they are most needed; they keep the floor or bed in which the pigs sleep dry, warm and disinfected.

"(2) By this means there is no opportunity for disease germs to lodge in cracks and crevices or to be harbored in the shadow of solid fences. In case the hog house should ever become infected with disease germs of any kind it can be disinfected much more easily and thoroughly.

"(3) Wire partitions allow the hogs always to be within sight of each other and of the attendant. By this means the sows, when they are shut up to farrow, will not become estranged from one another, and will not be so likely to fight after returning to a common pasture.

"Part of the floor is made of hard brick, laid flat in the pens and laid on edge in the alley; the remainder is of cement. Lumber is not used, because, being necessarily laid on the ground to prevent cold air or cold drafts getting beneath the floor, it would rot out too quickly, making it very expensive. Brick is thought to be a little warmer in winter than cement, and not so slippery, but both are being tried. Brick, of course, is colder in winter than is lumber, but this can be obviated by using bedding or by making an overlay (portable floor) of one-inch lumber for the corner of the pen where the bed is made.

### COST

"The house is divided into unit lengths of ten feet each, this being the dimension of the pens parallel to the long dimension of the building. Where there is proper drainage, an earth floor is probably the best kind of a floor in a hog house, although it is a little harder to keep in repair. Therefore, by omitting the floor, tile drain and eaves-troughs, the building still contains all the essential features, and costs approximately $122 per unit length of ten feet, which contains two pens. If the carpenter work and painting can be done with the regular farm help at odd times when there is no other employment at hand, the building can be constructed for approximately $100 per unit length of ten feet. This includes the labor as well as the material on the tar-and-gravel roof, which is the flat roof on the part of the building south of the alley, a two-foot brick wall underneath the structure and the iron posts, gates, panels and fenders, which cost at the rate of $13.60 per pen.

"The cost of the house with all the accessories as outlined is as follows:

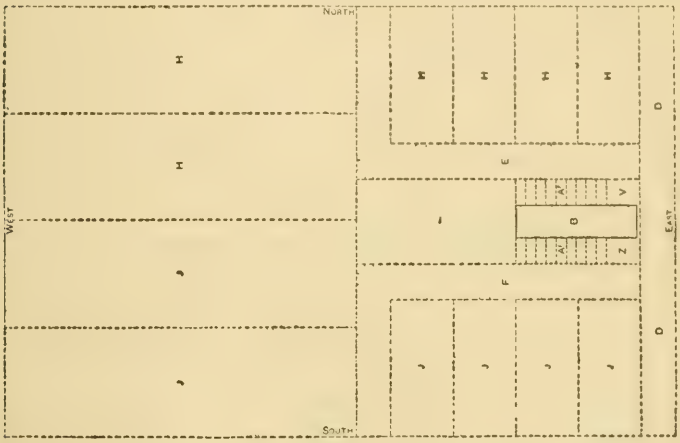
| | |
|---|---|
| Foundation, tile drain, floor and chimney | $649.25 |
| Lumber and windows | 639.70 |
| Iron posts, gates, panels and fenders | 244.80 |
| Hardware | 53.65 |
| Paint and painting (two coats) | 54.00 |
| Labor (carpenter) | 290.00 |
| Tar-and-gravel roof | 79.15 |
| Scales | 100.00 |
| Total | $2,110.55 |

"The cost of the foundation, tile drain, floor and chimney seems rather high, but, due to the slope of the land in this particular instance, the foundation at the west end of the building is three feet higher than would be necessary had the building been placed on a level spot The foundation wall at the east end of the building is two feet high.

"The cost of the brick floor with cement filler when the brick is laid flat, as in the pens, is 80 cents per square yard and when laid on edge, as in the alley, is $1.12 per square yard. The four-inch cement floor in the pens cost $1.00 and the six-inch cement floor in the alley cost $1.35 per square yard. This is exclusive of the cinders used for the foundation in both the brick and the cement floors.

"The lumber and windows form a considerable item of expense, but this includes the lumber in the fence of

the outside pens. A good grade of lumber was used throughout and the shingles used were the best on the market. The walls of the building are made of one thickness of lumber, viz., the drop siding on the outside of the studding. It was found, however, that for the




LOCATION OF THE ILLINOIS STATION HOG HOUSE WITH REFERENCE TO PASTURES

coldest weather of this locality, the building is not quite warm enough. The cost of the scales includes the work of installing by an expert. The total cost of $2,110.55 does not take account of grading, hauling cinders, nor of the fence posts."

### LOCATION AS TO PASTURE

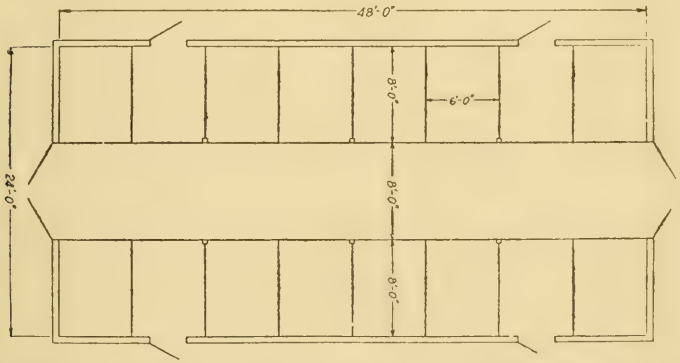
As said, the house should be located so that it will give access to pasture. The next illustration shows an arrangement by which this can be accomplished.

"In this sketch, B represents the house, A the small pens on the outside adjacent to the pens on the inside, and V and Z the boar pens mentioned. L represents a small pasture that may be used for a boar or any other hog or pigs. D is the lane by which the hog house is approached. E and F are lanes leading from each side of the hog house to the pastures. H represents the pastures for the hogs that have access to the north side of the building, and J the pastures for those on the south side. This arrangement is not absolute, but may be made to suit the location or the fancy of the builder."

### A WISCONSIN COMBINATION HOUSE

A plan for a house 24 feet wide, 48 feet long, any height desired, useful a part of the year for other purposes than hogs, if needed, is given (in the next sketch) by Prof. J. G. Fuller, in Wisconsin experiment station Bulletin No. 153. As he suggests, it can be used entirely for hogs and kept divided into pens, or part of it can be used for other purposes, such as stabling cattle or sheep, or for storing machinery. If desirable to feed cattle when the building is not required for hogs, the partitions can be removed and leave an ideal place to shelter cattle and hogs. Later on, it can be cleaned out for farrowing time and the partitions let down as needed. "In explaining this house no mention is made of feeding troughs, it being presumed that small troughs would be used for individual pens, and feeding floors provided for general use on the outside. It is generally desirable to provide room for fodder and bedding above, especially

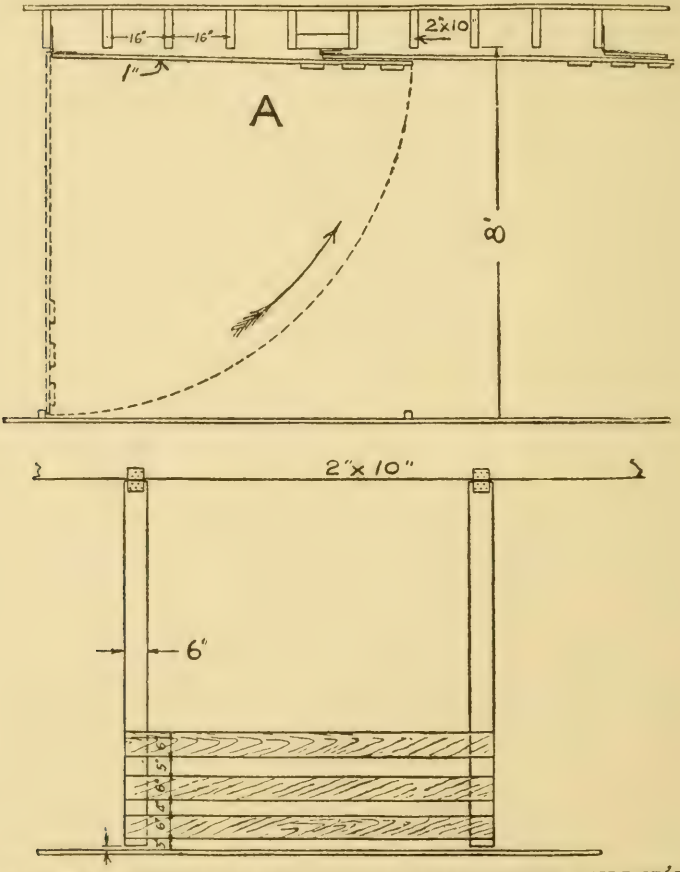
if the building is to be used for other purposes than for sheltering hogs. The alley through the middle is 8 feet wide, which gives ample room to drive through with a wagon or a manure spreader. This leaves eight feet on either side of the alley, and by dividing the space up into pens it is possible to have eight pens 6x8 feet on each side of the alley, which altogether would make 16 pens, and if more were temporarily needed, a part of the alley could be partitioned off.




GROUND PLAN OF COMBINATION HOG HOUSE MADE BY PROF. J. G. FULLER

The next sketch shows a scheme for suspending partitions between the pens. These partitions are made from one inch by six inch 16 foot fencing and are suspended from the joist by hinges. The upper half marked a, shows the partition swung to the ceiling and out of the way. It will be found necessary to remove the first partition at the end toward which the partitions are to swing, since the space is not large enough to allow it to

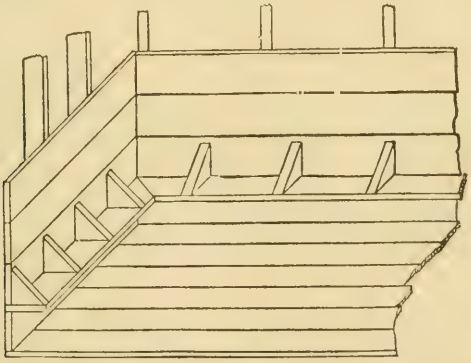
swing upward to meet the ceiling. Then, in beginning to divide up the floor space into pens, the first partition is let down and a panel placed next to the alley, thus completing a pen 6x8 feet. By continuing in this order




PLAN OF SWINGING PARTITIONS FOR PROFESSOR FULLER'S HOG HOUSE

on both sides of the alley, the building can easily be divided into 16 single pens. As there is no post in the outside corner of the first pen, some provision must be made for staying it. This can be done by driving a stake in the ground or by having a small block in the floor. Such a provision would have to be made for every pen where there was not a post to steady the partition.

Below is shown the interior view of the corner of a farrowing pen. It is provided with a fender around the inside of the pen which keeps the sow from lying up against the partition and killing young pigs, which a large sow will often do. The fenders should project at least eight inches into the pen and allow eight inches in the clear between the fender and the floor."

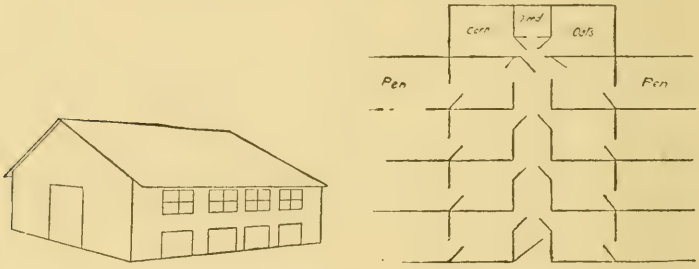


CORNER OF FARROWING PEN IN PROFESSOR FULLER'S HOG HOUSE.

### AN ILLINOIS BREEDER'S HOG HOUSE

A prize was awarded to an Illinois breeder for a hog house plan, the description and outlines of which are

shown herewith: The house is 16 feet wide, 8 feet high at the eaves, and may be built as long as needed. It has a 3½-foot alley lengthwise through the middle, between the pens, and is floored throughout. The pens are 6x5 feet. Partitions between pens are set in grooves, so they can be slipped out at will,




EXTERIOR AND PLAN OF ILLINOIS BREEDER'S HOG HOUSE.

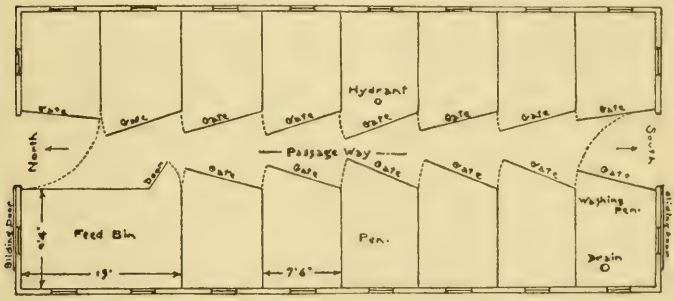
to make room for a larger number of hogs together if desired. It is much more convenient to have the partitions so they can be slipped out rather than hung on hinges, and stored when not needed in place. Each pen has a small door opening into the inside passageway for convenience in changing hogs from one pen to another. It should also have a small outside door, opening into an outside pen the same width as the inside pen. The north end of the house is for a corn crib and feed bins, accessible from the passageway; also a hydrant connected with an elevated tank, supplying water for drinking, mixing slop, cleaning floors, and other purposes.

The house has a small loft convenient for storing straw or bedding of any sort. A movable chute placed

at the outer end of the passageway is handy when the hogs are to be loaded into a wagon.

### A KANSAS BREEDER'S HOG HOUSE

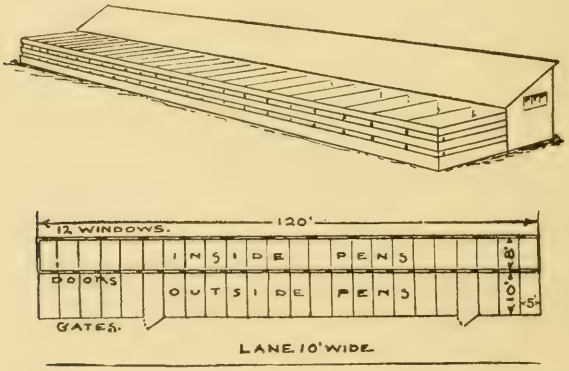
A. T. Garth of Pawnee county, Kansas, has a hog house he likes, the walls of which are hollow concrete blocks. This was described and illustrated by the *Kansas Farmer,* and is shown in the illustration on this




GROUND PLAN OF A. T. GARTH'S CEMENT HOG HOUSE

page. It is 28x60 feet, outside dimensions. The concrete blocks are 8 by 18 inches and the side walls are ten blocks high above the foundation, which is also of concrete, built solid. Above the walls the building is of framework and includes a loft for storage. The passageway is 8 feet wide. The pens are each 7½ feet by 9 feet 4 inches and the gates are hung so they may be swung across the passageway and thus form auxiliary pens for temporary use. Each pen has a window set high enough for proper ventilation and light. Each corner pen has two windows. The feed bin is 15 feet by

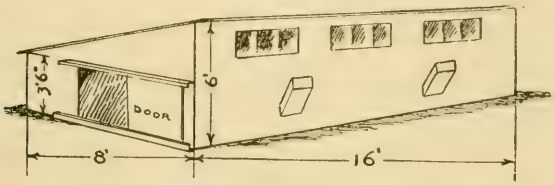
9 feet 4 inches. In the middle pen and close to the gate is a hydrant for the supply of water to the entire building. This hydrant is fed from a windmill tank which also supplies the house and the feed lots with water. The entire building has a cement floor, with a gentle slope from side wall to center and from north and south end, so that the entire house may be washed out with the aid of the hose, and the waste water will flow to the sink hole and thence away.




GROUND PLAN AND EXTERIOR OF AN INDIANA HOG HOUSE AND PENS

The illustration above shows a house and pens for brood sows found satisfactory by an Indiana breeder during several years of use. The house fronts south, is 120 feet long, 8 feet deep, 8 feet high at the front and slopes to 3½ feet in the rear. It contains 24 pens 5 by 8 feet, and to the rear are 24 outside pens 5 by 10 feet. Each room has a rear door for letting the sow into her outside pen, and each outside pen has a gate opening into a lane 10

feet wide, which is convenient for getting the sows into their pens. The walls of the house are double-boarded with building paper between. Pens inside and out have cement floors, and all partitions are so constructed that they can be taken out—those inside can be hung up overhead—and all the space converted into one big pen or several pens, for fattening hogs, or otherwise, as desired. There are 12 windows in the front (south) of the house, each letting light and sunshine into two rooms. There

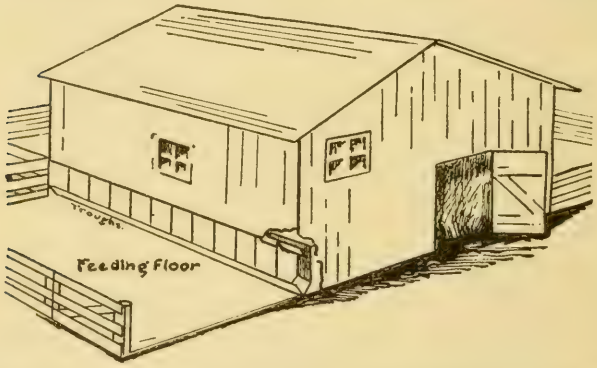



AN INEXPENSIVE STYLE OF HOG HOUSE

are four lots of 1½ acres each connecting with these quarters each suitable to accommodate six sows when their pigs are small.

The above illustration represents a very useful and at the same time inexpensive house, 8 feet wide, which can be extended to any length desired. If 16 feet long it will accommodate ten grown hogs for fattening or two or three not so large. Movable partitions can be placed at such distances apart as suits, and an outside pen or pens built at the rear. A cement floor is advantageous in such a house; the posts can stand on the cement, and no other foundation is needed. Joists 2x6 inches, spiked to the posts, will take the place of sills. Board up and down.

Herewith is a feed house 14 feet square and 11 feet high to the eaves, with an ordinary comb roof of desired pitch. Its builder, W. A. Hart of Jay county, Ind., says it will afford room in the loft for 450 bushels of corn, and bin room in the center of the floor for nearly two tons of ground feed, and convenient trough space for 50 hogs. The hogs do not go inside the building,




A CONVENIENT FEED HOUSE AND FEEDING FLOOR

but eat slop from a partitioned V-shaped trough extending along three sides of the house, the outer edge of the trough coming out even with the outer edge of the building. Outside of the building, and fitted to it at each of the sides, where there is a trough, is a feeding platform eight feet wide, extending the whole length of the trough. This platform is inclosed with an ordinary board fence, with the bottom board fitted down upon the floor to prevent ear corn from being rooted off the platform. A gate in the fence shuts the hogs on or off the platform. The house on the three sides at which

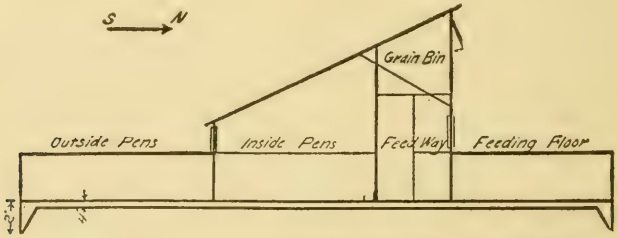
troughs are placed is weather-boarded up and down, but the siding only extends down eight feet from the eaves, this leaving a space of three feet between the bottom end of the siding and the ground, through which space the hogs eat out of the trough. The openings on the sides above the troughs are sliding windows for throwing ear corn to the platform. If shelled corn is used it can be fed in the troughs. With this arrangement as described the feeding can all be done from inside the house and it is impossible for the hogs to dirty or waste the feed; besides, the partitions in the troughs prevent the hogs from fighting and pushing one another, and it is much less work to clean the feeding pens when they are outside of the building.

### A NEBRASKAN'S HOG HOUSE

The description herewith and two illustrations it contains pertain to a house and adjacent feeding pens built by W. E. Tobias of Custer County, Nebraska, as published in the *Nebraska Farmer*. The house is 14 feet 8 inches wide by 100 feet long, with 5-foot posts on the low side and 12-foot on the high side. There is a ventilator in the roof every 8 feet. The building is all floored with 2-inch plank. There is a side door 2 feet wide in each pen to open into outside pens which are of the same width as the inside pens. The inside pens are 4x10 feet; outside pens, 4x12 feet. These outside pens also have a slide door 2 feet wide which opens into a large yard. These inside doors slide up and down by means of a small rope and a pulley fastened to the plate above the door. The other end of the rope is

fastened to a hook in the alleyway. The house is built of drop siding with shingle roof. The alley, or feedway, is 4 feet 8 inches wide. There is also a door the full width of each pen opening into this alleyway; also a trough full width of the pens built in the floor 8 inches wide, just inside these 4-foot doors.

Water is piped from a tank at the house into barrels shown in the diagram. The barrels each have a waterer attached and hogs have access to them at all times ex-

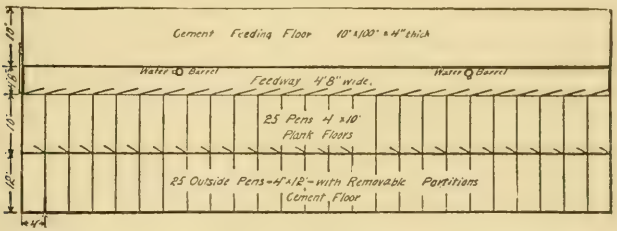



END VIEW OF THE TOBIAS HOUSE AND PENS

cept when sows are in the pens during the farrowing period. Then the troughs are used. The building faces south with the high side to the north. There is a half window in the south side of each of the 25 pens, which gives abundant light. There are also six of these small windows in the north side of the house.

The plan shows the pitch and shape of the roofs, with ventilators, and the location of the grain bin. This bin has doors at the top 2 feet 6 inches wide, hinged at the top or bottom as preferred. Each of these is 10 feet long, thus making it more convenient to fill the bin than if the doors were smaller.

The floor of the house is laid on cement piers, 4 inches high by 6 inches wide, extending crosswise of the building where they connect with a cement feeding floor on the north side which is 10x100 feet, 4 inches thick; and on the south side by another feeding floor 12 x100 feet. This south floor, by removing partitions, can be used also as a feeding floor in winter or when not used for farrowing sows. The outer edge of the cement work extends into the ground 2 feet all around. This is to keep the hogs from rooting under the floor and to keep rats from working under it.




GENERAL PLAN OF THE TOBIAS HOUSE AND PENS

### CONCRETE FLOORS

Upon the question of which is the best floor for a hog house, or whether cement or concrete makes a desirable floor, especially for a farrowing pen, men differ, as they do upon most other questions. As an example, the experience and observations of Prof. Robert S. Shaw of the Michigan experiment station prompted him to declare against the concrete floor thus:

"At the present time there is no floor in use in piggeries more desirable or inexpensive, considering durability, than one properly constructed of concrete, nor can

as good sanitary conditions be maintained by the use of any other. And yet, notwithstanding these good qualities, cement floors are strongly objected to, and justly so, too, on the ground that pigs become crippled if required to nest in beds on them during the winter season. Even though an abundance of bedding is used on cement floors, bad results seem to follow just the same. There are few worse places for a brood sow to farrow than on a cement floor. She gathers the small amount of bedding allowed her into a small pile, beds on it and the newly born pigs wriggle off on the bare floor, which, being slippery, prevents them from getting on their feet, the cold floor soon exhausts them, and they perish. It was with the object of overcoming these objections to the cement floors that overlays were used."

Of much the same mind is an Indiana breeder who writes: "I do not like a cement floor, for it is always damp. Then, too, it is too cold and hard and the pigs will always have the rheumatism, and a cold and cough. Give me a warm house on runners, one for each sow when it is time for her to farrow. Before that time two or three can occupy one house and be warmer."

Examples of opposite estimates of the same proposition are afforded in letters from three Iowa farmers and breeders. One writes, saying:

"Two years ago I put down a floor in the center of my barn and used it for farrowing pens. The sows raised an average of a fraction over seven pigs each and I saw no sign of rheumatism. Last fall I floored all my pens with cement, and have over 180 young pigs and no rheumatism. My hogs have slept on cement every

night since they were farrowed, and I think the cement floor has far more good qualities than bad. There is, however, considerable difference in the method of building floors which must be taken into consideration. First, there should be at least two or three inches of coarse gravel as a foundation, so it will not draw dampness, and especially where it will freeze under the floor. Second, the floor must have a top coat made rich and put on very thin. The thickness of cement makes no difference as to moisture. Third, the concrete must be thoroughly mixed dry, then sprinkled with water (not drowned with water) and shoveled immediately where wanted and well rammed down until water will rise to the top. The top coat must be put on before the bottom becomes dry. The cost is less than half that of wood, the work of cleaning is only about a third as much, and one has a much better chance to disinfect and to kill lice and ticks or germs. These will not breed in cement and many will in wood; then again, in case of disease it is much easier cleaned, as it can be all washed or scrubbed with a disinfectant, which would be a job with the majority of wooden floors. I say learn to work with cement and lay your own floors."

Another says: "From my experience there is no better floor than cement. It can be kept dry where a board floor would be damp much of the time. If I were to build a hundred hog houses I would put cement floors in every one. To the objection that the little pigs get cold on cement floors, I will say if the cement is put in right it is warmer than any other floor, for the cold air cannot

get under it. There is nothing in the theory that cement floors cause rheumatism. There is no better floor than cement; it is easy to keep clean and to disinfect."

Still another writes by the same mail: "I have used a cement floor in my hog house for a number of years and I have never had a hog with rheumatism. My entire hog house is made of cement except the doors and windows and roof. It is 20x30 feet, with two cement platforms to feed on. The main thing is to build them high enough so the water will run away in all directions, and be sure to have a solid foundation, well set in the ground so rats cannot dig under. Use nothing but the best cement and sand. I have tried board floors, but they soon rot and are rat harbors. If I had to build again it would be with cement. There is no danger of the little pigs dying or ailing if they are properly bedded."

The concrete floor, in the farrowing pen or out of it, may fall short of perfection, and have defects which prevent its being entirely satisfactory, particularly in cold weather, for sows and young pigs—or, in fact, any other swine—without sufficient bedding material to prevent the necessity of their lying in immediate contact with the floor. It is, however, the author's opinion that on the whole the merits of both the concrete and brick floors, properly constructed and used, far overbalance their defects, and that the interests of swine growers would be tremendously promoted by having in use ten thousand times as much such flooring as is now in existence. The satisfaction of having dry, draftless, ratless sleeping floors, or clean, wasteless feeding yards or platforms, such as can be inexpensively made from concrete

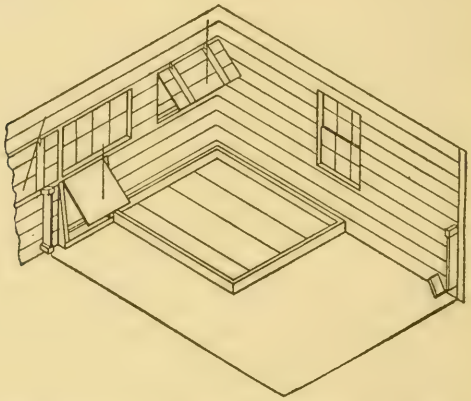
or brick, is so great that having once possessed them few breeders will be willing to forego their use afterward. The sleeping floor should be readily accessible to sunshine in the fall, winter and spring months, and the feeding floor sufficiently elevated that mud or manure will not be collected on it from the surroundings, and if it slopes slightly in one or more directions it can be far more readily cleaned; in fact, the rains alone will do much toward its cleansing. As lumber becomes more expensive and difficult to obtain the subject of floors and fencing made of other materials must inevitably grow in importance.

### AN OVERLAY

A second movable floor or overlay 6x8 feet, is shown herewith, in one corner of a pen, described by Professor Shaw, and sufficient as a sleeping place for eight or ten 150-pound shotes. This is hinged to the wall, so that when the pen is to be cleaned the overlay is tipped up, bedding and all, and any filth which may have accumulated underneath is cleaned out. After the floor is cleaned the overlay is let down, the bedding thrown off on the floor for absorbent, and replaced by fresh bedding at least once a week. When the overlay is placed in the corner of the pen, that portion of the floor should be raised somewhat.

The overlay is raised off the floor by inch cleats which hold the bottom boards or floor together, and a 2x4 or 2x6 is fastened to the outer edges to hold the bedding in place.

Because the bed of the pig on a cement floor becomes damp and befouled so easily it is excellent to use overlays, which can be regularly and thoroughly cleaned, especially during the winter season. Whatever its faults may or may not be, the concrete floor permits of the maintenance of better sanitary conditions than any other yet used.



PLAN AND LOCATION OF A MOVABLE SECOND FLOOR.

"In the use of overlays," says Professor Shaw, "three facts have been strikingly noticeable, viz.: First, swine invariably use the overlays, by preference, sleeping on the bare boards if there should be no straw on them; second, of the three or four hundred hogs that have been housed in our piggery, there are few instances where the bedding on the overlays has been fouled by excreta, and the tendency to this is much less if the overlays are in the pen corners, where the pigs are not trampling over them; third, we have not had a crippled hog in our piggery since these devices have been in use. We dislike

the plan of boarding or planking over the entire cement floor surface of a pen during the winter, even for farrowing, as dung and urine work in between and under the boards or planks, producing very unsanitary conditions."

## INDIVIDUAL HOG HOUSES

In later years so called individual houses "wigwams," or "cots," of different forms, but all to serve the same purpose, portable, and adapted to accommodate a sow with pigs, or two or three hogs, are finding much popular favor, and those who know them best appear to like them most. The experiment station of Wisconsin is one that has issued a bulletin (No. 153) chiefly devoted to their construction. In enumerating some of their advantages Professor Fuller, the author of the bulletin, says: "The portable hog house is easily and economically constructed; it can be easily moved and located wherever desired; it is useful both to the general farmer and to the breeder of pure-bred stock; and of all systems for housing swine, it is the most natural and sanitary. Only the simplest workmanship is necessary to build the portable house, and much odd lumber can be worked into it. It is peculiarly advantageous since it can be readily moved. The renter who finds it impossible to provide expensive quarters for his hogs can well afford to construct portable houses, which can be retained as personal property. Many farmers construct hog houses without considering the importance of sanitation, ventilation and drainage. A hog house of any kind should be located on

a high, dry site, and, if possible, on soil containing sufficient sand to drain well. A house located on an elevation may be somewhat colder in winter, but it is much cooler and more comfortable in summer. Hogs suffer greatly from the extreme heat of summer, and it is equally as important to keep them cool in summer as it is to keep them warm in winter.

"The portable houses are useful on any sized farm, as the number can be regulated to the size of the herd. With separate paddocks to accommodate swine of different ages and sexes, the portable house is practically a necessity. Swine will never pile up in a damp, poorly-ventilated quarter and come out steaming in the cold morning air unless compelled to do so. Where a large number of animals are continually housed in one hog house and fed in or around the house, the surroundings are sure to become more or less filthy and unsanitary. If feeding is done on the inside it keeps a portion of the floor wet, and gives the entire building an offensive, disagreeable appearance. On the other hand, by using the portable house, moving it occasionally to a fresh piece of ground, and feeding the hogs at a different place, one avoids these unsanitary conditions. These portable houses can be built to accommodate from four to six mature animals or ten to 20 shotes. This method of housing keeps them much cleaner and more thrifty than when allowed to congregate in larger numbers, and individuals of a herd showing evidences of a contagious disease can be readily isolated."

The illustrations at the first of this chapter include two of the individual hog houses at the Illinois experi-

ment station. One of these is set up and in position, and another illustration represents the same building taken apart. Mr. Dietrich, in charge, says: "Some of these individual houses or cots are built with four upright walls and a shed roof, each of which (the walls and roof) being separate, can easily be taken down and replaced, making moving an easy matter. Others are built with two sides sloping in toward the top so as to form the roof. These are on skids, and when necessary, can be moved as a whole by a horse. In fact, they are built in several different styles; some have a window in the front and above the door, while all may have a small door in the rear end near the apex for ventilation. They are also built in different sizes. Indeed, there are about as many forms as there are individuals using them. The form in which these houses are built is of little significance so long as the general principles pertaining to the health of the animals and the convenience of the breeder are observed.

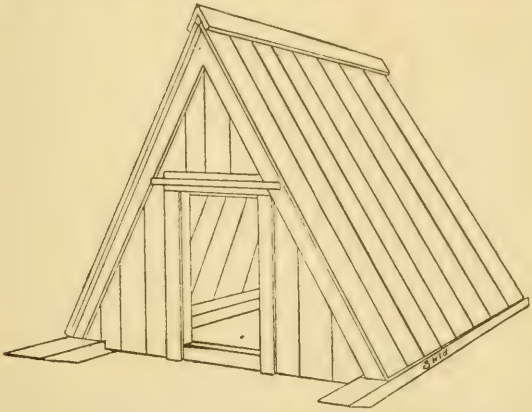
"The arguments in favor of this type of house are that each sow at farrowing time may be kept alone and away from all disturbance; that each litter of pigs may be kept and fed by itself, consequently there will not be too large a number of pigs in a common lot; that these houses may be placed at the farther end of the feed lot, thus compelling the sow and pigs to take exercise, especially in winter, when they come to the feed trough at the front end of the lot; that the danger of spreading disease among the herd is at a minimum; and in case the place occupied by the cot becomes unsanitary, it may be moved to a clean location."

The three figures which follow show forms of cots in use at the Michigan agricultural college, and described by Prof. Robert S. Shaw, in station bulletin No. 223. The first two are forms in use at the institution for some years. The small A-shaped cot is desirable in that it is warm in winter, but objectionable in that it provides little protection against the extreme heat of summer. It is considered a good form of cot for the brood sow to farrow in in moderate weather, as she cannot lie down close enough to the sloping roof to crush her pigs against a wall. A common mistake is made in fastening this form of cot permanently to the skids, or runners, on which it is built. These are the first to decay and along with them the lower ends of the boards, thus making repairs impossible, even though the balance of the structure remains sound.

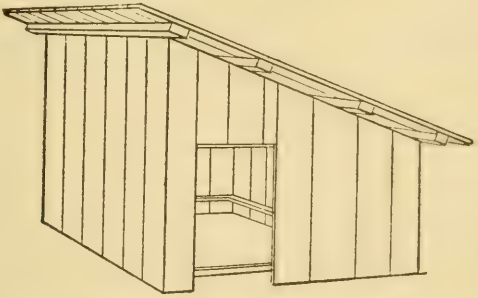
The second form of hog cot, 6x8 feet, with perpendicular sides and a flat, though slightly sloping roof, is made in five separate pieces, the four sides and top so constructed as to bolt together at the four corners. This form of cot is warm in winter but too warm in summer, with its flat top exposed to the sun's rays, and though it may be planned so that the top can be raised in summer, there is trouble from the wind occasionally unroofing it. It is also objectionable in that the sections are too heavy for one man to move and as a result it is not moved as frequently as hog cots should be. Cots should be constructed so that they can be moved frequently by a team and one man without taking the cot to pieces.

The third represents a form of cot more recently designed. It is six by eight feet at the foundation, with

the sides rising perpendicularly three feet before receiving the half-pitch roof boards. The center boards



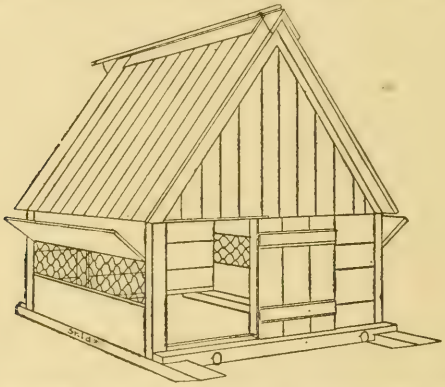
MICHIGAN EXPERIMENT STATION INDIVIDUAL HOG HOUSE WITH SLOPING SIDES



MICHIGAN EXPERIMENT STATION INDIVIDUAL HOG HOUSE WITH PERPENDICULAR SIDES

on the sides are hinged so that they can be swung open in hot weather; the opening thus made is covered with strong woven wire, clamped above and below between

inch boards; the inner clamp boards project an inch beyond the outer ones, thus breaking the joints and preventing any draught when the openings are closed. The two ridge boards are also hinged so that they can be opened during hot weather. These openings permit a free circulation of air, which not only lowers the temperature, but greatly relieves the oppression of the pigs seek-

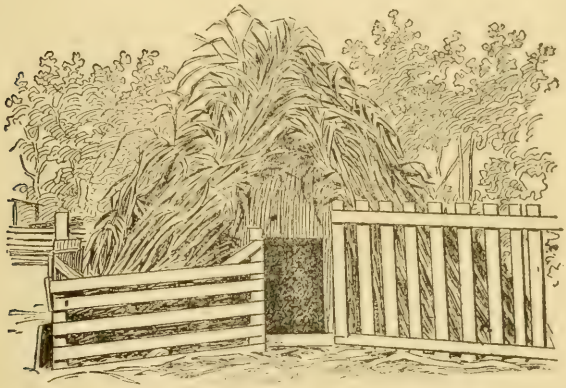


A MORE ELABORATE MICHIGAN EXPERIMENT STATION INDIVIDUAL HOG HOUSE

ing shelter. The hinged ridge boards close down tightly, giving warm quarters during the coldest weather. The cots proper are supported on skids, to which they are not attached, being held in place by the blocking of the ties across both ends. A two-inch bottom is used or not, as desired; this flooring is cut in lengths to fit crosswise and rest on the skids, which are wider than the sills. This cot is not desirable for the farrowing sow without the addition of a railing around the perpendicular walls a few inches from the floor to prevent overlaying her pigs.

"Probably the chief objection to this structure is the expense of material and cost of construction. It contains 160 feet of stock lumber, 60 feet matched, 20 feet four-by-six, 12 feet four-by-four, and 44 feet two-by-four, and required two days' labor in construction."

An Ohio breeder, writing of his experience in the construction and use of the individual hog house or cot,

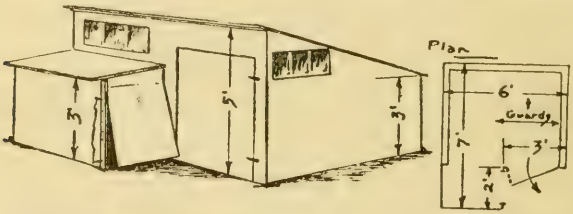


AN INDIVIDUAL HOG HOUSE PROTECTED IN COLD WEATHER

says: "A small house, easily handled, large enough for one sow when she farrows, or for several shotes or feeders, according to size, is much better than a large permanent house. When a sow farrows in zero weather, we cover the house with straw or fodder to make it absolutely safe against the frost and cold that destroy young pigs so quickly. The best door, when one is needed, is a gunny sack, or something of that kind, fastened above the doorway, and allowed to hang over it. It is only in

extreme cold weather that any door is needed. We always have the house set with the doorway in the direction from which comes the least wind.

"When the surface is rolling, floors to these houses will seldom be needed. The ground is the best floor, under most conditions; but when the weather is very wet and the ground muddy, a plank floor comes in excellent play. The floor should be made separate from the house, and the house placed over it, the floor fitting neatly inside the sills When a plank floor is used, care



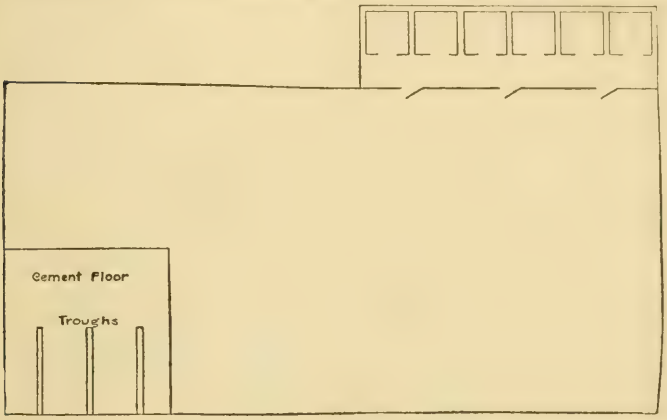

A GOOD HOUSE FOR A SOW AND YOUNG PIGS

should be taken to prevent the wind driving under it. One man can turn one of these houses over on to a sled and move it when desired, which should be done when the ground floor is used and becomes filthy. If disease strikes the herd, the houses can be turned upside down that the sun and weather may disinfect them.

"A few years ago we had sows farrow the last of January, when the mercury was below zero. We covered their houses with fodder, nailed a sack above the doorway, and hung a thermometer inside of one to observe what effect the heat of the sow's body would have on the temperature. We found, when the mercury registered eight degrees below zero outside the house, that the heat

from the body of a sow weighing 400 pounds would raise it to 26 degrees above, inside. We found, further, that, by going into the house with a common lantern, we could raise the temperature ten degrees."

On page 486 is shown a house especially adapted to accommodate a farrowing sow and her young pigs. In

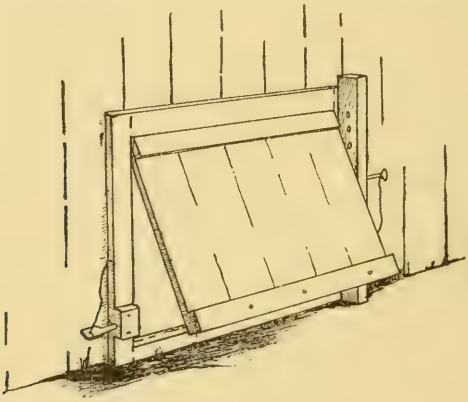



YARD PLAN FOR PORTABLE HOG HOUSES IN CONNECTION WITH PASTURE OR FEED LOTS

pleasant weather the doors can be left open. If stormy or cold, the larger door can be closed, and with the smaller one open, the animals may still be comfortable.

The next sketch, from Wisconsin bulletin No. 153, illustrates a plan in which the small hog houses can be made of much practical value to the ordinary farmer in providing shelter for the herd. By locating these houses adjacent to the main farm barn yards, says Professor Fuller, the animals have freedom for exercise and exclusive shelter from the other farm stock. Six to eight

of the 8x8 A-shaped houses will easily accommodate a carload of shotes. A feeding floor can be conveniently arranged in some protected quarter, so that the work in caring for the herd is reduced to a minimum. It will be found that by locating the houses in a high and dry place, they will keep in good condition if thoroughly bedded once a week. But in damp and muddy seasons it is better to bed them oftener. The beginner in plan-



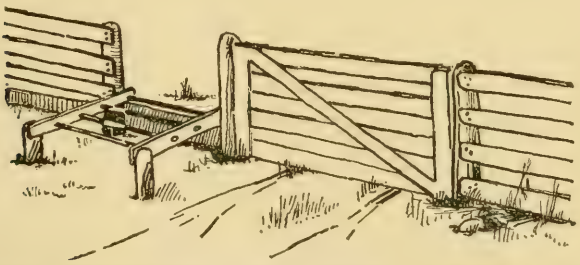
A TWO-WAY DOOR FOR HOG HOUSES

ning accommodations for swine should thoroughly compare the merits and the economy of this system with the conditions and expense connected with maintaining a large hog house.

A two-way door for hog houses or pens is often a great convenience. It may be made of inch lumber, and 2½ or three feet square. The hinges are at the top and are so constructed that the door may swing either out or in. Bolted to the lower part of the door should be

a piece of 2x4 scantling to hold it in place when the wind is blowing. On one side of the door may be placed, upright, a piece of 2x4 in which are bored several holes so the door can be fastened open as desired, or it can be adjusted so it will go only so far, excluding the passage of older hogs and at the same time admit small pigs and shotes. On the other side may be placed a cleat through which a pin may be inserted to fasten the door shut.

Herewith is shown a means of keeping hogs in one lot or pasture, while cattle with them are allowed to use the same pasture and one or more adjacent.



DEVICE FOR KEEPING HOGS SEPARATED FROM CATTLE

CHAPTER XIX

# Sanitation in the Hog Lot

A practical understanding of the best general methods in sanitation and disinfection is as important as any other feature of profitable swine husbandry. The hog raiser who neglects to care for the health and cleanliness of his animals is likely to see his own profits vanish and to affect those of his more careful neighbor as well. He owes it to his community, as well as to himself, to be alert and energetic in preventing and eradicating diseases of vermin.

A great danger to hogs exists in specific germ diseases distributed by bacteria and which cannot be directly caused by either breeding or feeding. Such diseases are encouraged by filthy and carelessly kept houses and feed lots, and constant cleanliness is the most effective means of preventing their dissemination. Where the bacteria have been established, an absolutely thorough disinfection will usually be successful in eradicating them. A good rule, in any case of doubt, is to disinfect as a preventive measure, and some large feeders take it for granted that every new animal purchased may be an infected one and treat it accordingly.

## QUARANTINING

A farm from or to which much traveling of swine is common should have a regular system of quarantine.

Show hogs ought to be kept in isolated quarters for at least 20 days after returning to the farm. The same practice should apply when newly purchased hogs are brought in, and especially those coming from or through stock yards or from considerable distances. Isolation for this length of time will determine whether disease exists in any of the animals and prevent its spread to others.

In case of an outbreak of "cholera" or swine plague, too rigid a quarantine cannot be established against all neighboring farms. This should apply to dogs and poultry, as well as neighbors or casual visitors. The contagion is easily carried, even from a road, and may be brought, as has been well established, by dogs going from one farm to another, or by crows, and on the shoes of visitors or the wheels of vehicles that have been in the infected district. The bacteria are very easily carried and too much caution cannot be observed when cholera is known to be in or near the neighborhood. The farmer himself should not visit the farms of others where disease is known to be prevalent.

### METHODS OF DISINFECTION

When one of the serious contagious diseases appears, the methods to eradicate it should not be half-hearted. The best methods are condensed into the following paragraph from Farmers' Bulletin No. 205, issued by the United States Department of Agriculture:

"The quarters in which the sickness first appeared should be thoroughly cleaned, all bedding and rubbish burned, and loose boards and old partitions torn out

and burned. If the pen is old, knock it to pieces and burn it. Disinfect pens and sleeping places, using air-slaked lime on the floors and the carbolic acid solution on the walls and ceilings. Whitewash everything. If a hog dies, burn the carcass or bury it deeply out of the reach of crows, buzzards, or dogs. If possible, do not move the carcass from the place where it falls; but if this cannot be done, the ground over which it is dragged should be disinfected. Hog cholera bacilli can live in the ground for at least three months. Care must be taken to maintain an absolute quarantine between the sick and well hogs. The same attendant should not care for both lots unless he disinfects himself thoroughly after each visit to the infected hogs. Dogs should be confined until the disease is stamped out."

Approved methods, particularly as relating to hog cholera, are treated further under Chapter XXIII, in the section relating to cholera.

### DIPPING AND SPRAYING

It is sometimes found more convenient to spray hogs than to install a dipping vat for them, but spraying is likely to leave untouched some portions of the animal, particularly behind the ears and in wrinkles, and may not always be effective. Immersion in a vat, however, is thorough and preferable, particularly for lice or fleas. Most of the prepared dips have some advantageous qualities when swallowed, and dipping is said on that account to be additionally effective for intestinal worms. Dr. A. T. Peters of the Nebraska experiment station

makes the following strong statements (Bulletin No. 74) relative to dipping swine for lice: "It has been known to the intelligent hog breeder that the presence of insects on the hog is a very serious matter. It is a fact that very few hogs are free from lice, and that breeders have been accustomed to use various remedies for the destruction of the pest. The favorite seats of lice on the hog are back of the ears, along the neck and under the breast. These vermin are bloodsuckers, and they produce in a short time a very weak, debilitated condition of the animal, making him far more susceptible to other diseases that the animal is heir to. The louse has not been credited with occasioning serious loss, but of late years more attention has been given to this. We have found that the hog louse becomes a more serious enemy when hogs are out of condition. If the accompanying conditions are bad, especially if the pens are excessively dusty, and through the inhalation of an excessive amount of dust there should be a slight pneumonia of the lungs, the animal badly affected with lice will be all the more apt to die.

"We have found also that where animals affected with cholera were free from lice, there was a much smaller percentage of loss. This has been brought to our attention after examining numerous herds during the last five years. The first rule that we now insist upon when we visit an outbreak of cholera is to examine for lice, and, if present, to thoroughly destroy these vermin. The breeding pens and hog houses are also thoroughly disinfected. All the bedding that is found in pens and hog houses at time of disinfection is burned. The method

that we have for disinfecting the pens and houses is as follows: For the stables we prefer to use hot water and any of the coal tar preparations, such as zenoleum, chloro-naphtholeum, and similar preparations. This is done by making a three per cent solution of either of these preparations and using it liberally with broom and brush and also with a spray pump. Spray pumps used for spraying trees answer the purpose admirably.

"After the stables and pens are thoroughly disinfected, the animals should be disinfected also. This can be done by dipping them, which is a far easier method than any other. Of course it necessitates a dipping tank. These dipping tanks can be bought on the market very reasonably. If one is not in favor of using the dipping tank, or does not feel warranted in spending the amount that it would cost to purchase one, a spray pump will do the work; but in spraying hogs one should have them on a wooden floor, and must have quite a large and forcible pump, so that they can be thoroughly saturated with the liquid. If sprayed, they should also be rubbed with a broom immediately, so that the fluid will soak well into the skin. The solution that we recommend is from three to four per cent for grown hogs and about three per cent for small pigs. In our experience we have not found any harm resulting from dipping very young pigs.

"Spraying and dipping for lice can be highly recommended, as it is the only safe, rational thing to do if hogs are infested; and, as stated above, there is not a breeder who has not been troubled with these vermin. The remedy is to dip, and dip often. It aids the very best

balanced ration that can be given to a hog, by enabling him to thrive and assimilate the food administered. Breeders who have begun to dip their hogs find it very economical and a very efficient method of ridding the animals of vermin. The coal tar preparations—chloronaphtholeum, zenoleum, Lincoln dip, and Lee's carbolic dip—leave the skin in a very soft, pliable condition, and I believe that it is a very economical and sensible way out of this difficulty.

"I do not wish to convey the idea that it is absolutely necessary to procure a dipping tank. I have known instances where our American farmer, with his genius for making the most of his surroundings, has soon improvised a proper tank with very little cost. It is the purpose to urge every grower of swine to dip his hogs at least every three to four weeks to have the very best success, and also to use liberally any of these dips in his hog pens; by doing this he will attain the best results and in a great measure prevent infectious diseases from gaining a foothold on his premises."

Rommel (Farmers' Bulletin No. 205) says: "One of the most effective and cheapest preparations to use as a dip is a two per cent solution of creolin. The common tobacco dips used for sheep scab are also efficacious. If the hogs are washed, apply the solution with a broom; if they are sprayed, use an ordinary spray pump; for dipping, use a dipping tank. When being washed or sprayed, the hogs should stand on a tight board floor. Newly purchased hogs should be carefully examined for vermin, and they should not be turned with the herd until they are known to be free from these pests."

### A SELF-DIPPING DEVICE

Prof. J. H. Shepard of the South Dakota experiment station, and a practical breeder of swine on his own account, has devised a means whereby his hogs shall dip themselves. He has found that by having in the hog lots or pasture a bath tank filled or partly filled with water, in which has been stirred a quart or two of good dip, the hogs will do enough bathing in this mixture to keep them free from lice and their skins in the very pink of condition. It seems that the addition of the "dip" does not make the water objectionable to the hog for bathing purposes, and in warm weather time that might otherwise be given to filthy wallows will be spent in this valuable disinfecting mixture.

He writes the author, saying: "The tanks are eight feet square and ten inches deep, built of two-inch planks, and they are all connected with a large water tank by pipes fitted with valves. I use about one quart of dip to a tank three-fourths full of water. This is renewed about once in two weeks, depending on the weather. The water is supplied as necessary. All that is needed is to open a valve and let it run in. In muddy times it is best to clean out the tank and take a fresh start. This can be done in five minutes with a scoop shovel. I have used Kreso dip with excellent results, and I can say the same of zenoleum. I have noticed when the tanks are first filled with fresh water, and after the dip has been added, that the pigs will keep taking small drinks of the mixture as if they liked it. I have an idea, too, that this helps to keep worms out of my herd. Of course I also have slaked lime and coal ashes where the hogs can help

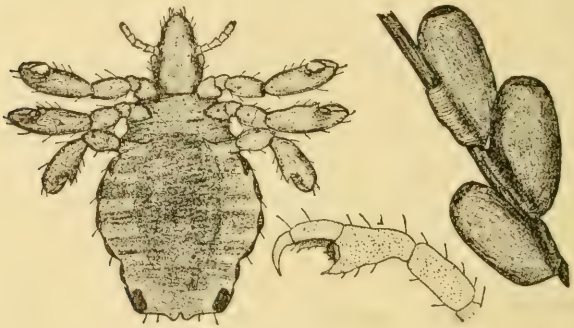
themselves. The results obtained from the tanks are so good that I could not think of getting along without them. My herd is now ten years old, and a record of no lice or skin disease and no cholera in all this time ought to satisfy any reasonable man. It is no uncommon thing to see one of these bathtubs crowded full of pigs bathing and disinfecting and cooling themselves."

The *Farmer's Voice* describes the most primitive and simple dipping or self-cleansing device yet suggested, as follows: "Dig a hole in the hog lot or pasture, and fill it several inches deep with water on a hot day. Pour into this half a gallon of coal oil or some other good lice-killing liquid such as zenoleum, call the pigs to the water hole and they will soon do the rest. This coal-oil-water-mud bath should be repeated at intervals of about a week, two or three times, when the lice will all disappear. It is so easy and inexpensive that no pig grower should be troubled with lice in hot weather when pigs will so readily wallow in any water or a mud hole in the ground."

### THE HOG LOUSE

The illustrations on page 498 show, much magnified, a half-grown hog louse, and the eggs from which the lice are hatched. The following information and description are by Prof. C. P. Gillette, entomologist at the Iowa experiment station: "In the center is shown a portion of the leg of a mature louse. It differs from that of the half-grown specimen, by showing plainly a second joint in the claw. A full-grown louse is three-sixteenths of

an inch long. The color is a dirty, bluish gray. The sharp claws seen in the illustration are not used to hurt the pig, but are for the purpose of clasping the hairs tightly, from which it is not easy to remove the lice. The food is taken through a sharp rostrum or beak, which is thrust into the skin of the host. The beak is not shown in the illustration here, as it is always retracted when not in use.



HOG LOUSE HALF GROWN, AND EGGS

"The sketch represents three eggs. From one to a half-dozen eggs may be found in this way fastened to a single hair. They are three sixty-fourths of an inch in length, and the lower or inner end is always attached by means of a tough, gluey substance that usually incloses the hair. The upper or outer end of the egg is the one from which the louse makes its exit. This end has a somewhat darker colored cap, which is pushed off by the young louse before coming forth. The egg is white in color, and is covered with small, regularly arranged pits

or punctures, giving the surface a honeycomb appearance. These lice are often spoken of as occurring only upon poor animals, but those that I have seen have been equally numerous upon the fattest and best pigs. It would be more correct to say that pigs upon which lice have long been abundant are always poor, which would make the presence of the lice the cause of the poor condition of the animal, and not the poor condition of the animal the cause of the lice.

"Uncleanliness is often spoken of as the cause of vermin upon man and beast. Filthiness may furnish the conditions under which these insects increase more rapidly, but nothing in the world can produce a louse but the egg of a louse, hence, the only possible cause of lice is lice. It is not because of uncleanliness that a child gets lousy, but it is because of uncleanliness and unpardonable shiftlessness that he is permitted to remain lousy and to scatter the infection among his associates, and exactly the same rule applies in the case of domestic animals. So, if one has stock of any sort free from vermin, it is of prime importance that it be not allowed to associate with animals that are not also known to be free from such infection. Before a strange animal is allowed to enter a herd it should always receive careful inspection, and, if found to have lice, it should be kept by itself and treated until entirely freed from them.

"If it is not thought best to use kerosene emulsion, a strong tobacco decoction, a strong soap suds, or an oiling with kerosene and lard mixed, in the proportion of one part of kerosene to three or four parts of lard, would

probably prove effectual and would not be harmful to the animal."

### DISINFECTING INFECTED PREMISES

Dr. W. B. Niles says: "It is a well-known fact that yards or other inclosures in which hogs have died of cholera, remain, for a time at least, infective, and will communicate the disease to susceptible swine placed therein. Consequently if new animals are brought on the farm, new yards must be provided for them, or the old yards, sheds, etc., must be made safe by a thorough disinfection. Owing to the difficulty attending thorough disinfection, and the impossibility of determining when the premises are rid of all cholera germs, it is always advisable to provide new quarters, if possible, when restocking the farm. In doing this, however, the mistake must not be made of using the same troughs, buckets, etc., for the new animals.

"It often occurs, however, that new yards cannot be provided, and the old premises must be used if new animals are introduced. The length of time necessary for the natural disinfection of the place—that is, for the destruction of the virus by means of sun, air, etc.—is not definitely known, and no doubt varies, depending upon the season and condition of the yards. The writer has noted several instances where the virus seemed to have retained its infective nature over winter, and, on the other hand, has seen yards refilled the same summer without a recurrence of the disease.

"Having satisfactorily disposed of the dead animals, it is necessary to destroy all troughs used by the dis-

eased swine. All recovered swine, and especially those that have been very sick, should be kept apart from the new hogs brought on the place. Before attempting disinfection, all manure and other litter must be removed, and scattered on some part of the farm not accessible to the hogs.

"Experiments have shown that many of the disinfectants in common use, have the power to destroy the cholera virus, and that, consequently, if the nature of the place to be freed from infection is such that the cleansing agent can come in contact with the virus, disinfection is easy. For example, in the hog cholera experiments conducted by the government, closed pens with board floors are easily and successfully cleaned, but swine pens with dirt floors and yards present an entirely different problem, as the virus penetrates the soil and litter, is not readily reached, and can only be destroyed by a large quantity of the preparation used, thus rendering the operation impracticable.

"In the disinfection of buildings, sheds, floors, etc., the idea is to use some solution destructive to the virus and in such a way that it will come in contact with, and saturate, all parts of the pen. There must be no untouched places where the germs may escape destruction. For the application of the disinfecting solution nothing is so effective as a good spray pump, the nozzle being adjusted at times so as to throw a solid stream for penetrating cracks and crevices. A sufficient quantity of the solution must be used to thoroughly soak through any litter on floors, all dirt in the cracks between the

boards, etc. In the absence of a spray pump, the application can be made with a whitewash brush or by means of a broom. By this process, the shed, pen, or building can be rendered entirely safe for the new animals, no matter how susceptible to cholera. Yard fences can be treated in the same way. The ground is not so easily cleansed. It is true that the ground can be treated the same as a floor, but a very large quantity of solution would be required. It would be necessary, in order to be thorough, to saturate the soil probably several inches deep. Partial disinfection of the ground can, of course, be accomplished by wetting the surface. The spreading of lime thickly over the surface accomplishes the same result, and is a good practice, but it cannot be relied upon for complete disinfection. Plowing yards buries much of the infection beneath the surface and thereby lessens the danger, but does not make swine entirely safe until the lapse of considerable time.

"For making the disinfecting solutions referred to, several preparations may be used. Crude carbolic acid, zenoleum, chloro-naphtholeum and chloride of lime, commonly known as bleaching powder, have been much used. Crude carbolic acid is cheap, but has the fault of mixing poorly with water. For cheapness and effectiveness, few preparations surpass or equal chloride of lime. Used in the strength of from five to six ounces to a gallon of water, it has, in the hands of the writer, proven effectual in destroying the most virulent cholera virus.

"Much depends upon the thoroughness of the application. If thorough work be done, buildings and all pens with floors can be safely used at once, but yards, even

when cleaned by the removal of litter, the liming of the most infected parts, and plowing, should stand for some time before being used again for susceptible animals.

"One great advantage possessed by the individual hog house, so much used, is that it can be easily disinfected and removed to new yards in cholera times.

"To the cattle feeder who must restock his infected yards, or suffer the loss of valuable hog feed, the question is a most important one. A thorough disinfection of such premises is impossible, but something can be accomplished by cleaning the sleeping quarters, destroying the old troughs, etc. After putting the yards in as good condition as is possible under the circumstances, and waiting a short time, the owner can restock with danger of but little loss, providing large animals are bought. Larger hogs have more immunity and in case the disease again appears, they can be shipped to market on the first indication of trouble. On the other hand, small shotes are very susceptible to cholera, and being too small for slaughter, are a total loss."

CHAPTER XX.

# Castration

The necessity of castrating the boar pigs for pork-making purposes is generally admitted, but the importance of spaying such sows as are not designed for breeders has never been appreciated as it should, or as it is likely to be when the rearing of swine is conducted on such business principles as its importance demands. Open sows, running with other stock hogs, are a source of great annoyance, and where more than two or three are kept, there is scarcely a time when some of their number are not in heat, and continually chasing the others, thus keeping them in a worried, fevered condition, extremely prejudicial to growth or fattening. If all are properly sprayed, this is avoided, the hogs are quiet and restful, and much time, annoyance and feed are saved.

All feeders agree that no animals in the swine herd feed more kindly and profitably than spayed sows, and there are no buyers who would not as soon, or sooner, have them than barrows, when they would not buy a lot of open sows at any price. An open sow, when fat, of the same dimensions externally as a spayed sow or a barrow, generally weighs from ten to 20 pounds less.

To the feeder, the buyer, or the butcher, unspayed sows are usually, in one way or another, a cheat, as they may weigh more than they are worth from having a

litter of pigs in them, or may be utterly destitute of inside fat, from having recently suckled pigs; in either case they are of less value than their appearance would indicate. Spayed sows are not troublesome to their mates, are as good as they look for feeding or marketing, and command in all markets such prices as are paid for none but first-class stock.

### TO CASTRATE A BOAR

An expert says: "As to the time for castrating boars, do it whenever most convenient, and the best way is the way understood by every old farmer, unless the hog is ruptured, in which case the striffen around the seed (called the scrotal sack) should be taken out with the seed, and the seed string tied within the neck of the scrotal sack with a small twine. When this is done, cut off the seed sack, and all behind the tie, and let the hog go. I do not like sewing up, as large tumors sometimes result from so doing. Should maggots develop in the gash where a hog has been cut, apply either turpentine, kerosene or buttermilk."

### TO CASTRATE A RIDGLING

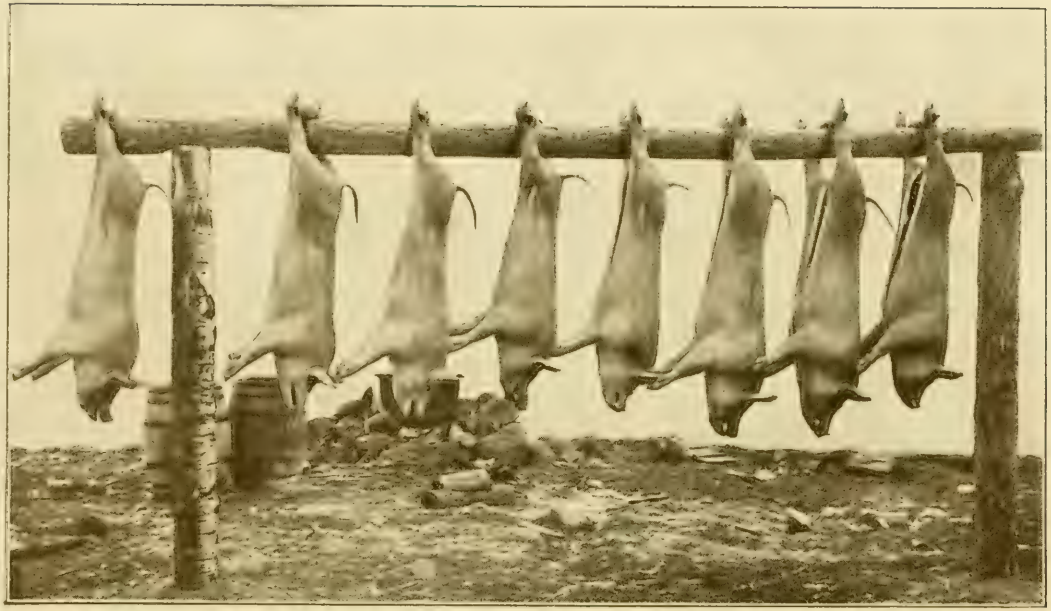
"In a ridgling hog the seeds are not in a scrotal sack or in their proper place, but in the body of the animal, immediately behind the kidneys. He should be cut in the side, the same as in spaying a sow, but the incision should be made of sufficient size to admit the whole hand, when the seeds can be found and easily withdrawn.

If a boar is properly castrated five months before slaughtering there should be no disagreeable flavor or odor to his flesh. In case of incomplete castration, or where enough of a gland was left to keep up sexual excitement, the meat might still be affected. When the animal is alive there is no way to determine positively whether or not its flesh is free from offensive taint. Usually if the wound caused by castration has healed, and the activity and instincts peculiar to a boar have disappeared, and he has become fat, the meat will be edible. The meat of boars five or six months old can usually be eaten six weeks after castration. The flavor usually begins to disappear as soon as sexual activity ceases, and the animal begins to fatten; and it should be entirely gone by the time the average fleshed boar is well fitted for market.

### TO SPAY SOWS

"One man should be in the pen to catch, and two to hold the sow, by the feet alone, flat on the ground on her right side, and stretched out tightly. The spayer, kneeling at the sow's back, will cut the hair off of the place where the incision is to be made (a little back of the last rib, and about midway up and down); then cut a gash—if on a hundred-pound shote, about one-half inch deep and 3 inches long, up and down; slip the flesh back each way, about an inch, making a round gash or wide incision; then turn the knife, and stick the blade straight in, gently, deep enough to go through the peritoneal lining, or inside striffen, at the upper corner of the incision. Then put the left forefinger in, and with it and

At Hog-Killin' Time on the Farm



**CARCASSES OF EIGHT-MONTHS-OLD YORKSHIRES**
At the Northeast Minnesota experiment station

the right forefinger tear the hole large enough to allow working room for the fingers; feel inside near the back, with the first two fingers of the left hand, for the "pride," a little knotty lump, which cannot be mistaken, for there are no others like it within reach, but if it is not found, as is sometimes the case, then feel for small guts, called the "pig-bag," and take them out the best you can, until the first "pride" is reached; take this off; follow back down the pig-bag to a fork where two guts coming together form a larger one, as two branches running together form a creek; here take up the other branch until the lower "pride" is reached; take it off, put the pig-bag back in good order, and see that it is all in the belly proper, and not left at the gash.

"Slack up the upper hind leg, so as to close the gash, and sew up with two stitches, taking good hold, but going only skin deep; one stitch near the middle of the gash, the other above it; draw the edges together, so as to touch from the middle of the gash upward. Both stitches may be taken before tying either, and then tie the threads or twine, crossing each other, in the form of a letter X, and when the sow is let go press the hand over the gash as she starts off. The thread or twine used should not be too harsh or too tightly twisted."

CHAPTER XXI.

# Slaughtering and Curing

Of course the most favorable season, generally, for slaughtering and safely caring for his pork by the farmer, is, all things considered, the early weeks of winter. If the hogs have been fattened in the months of most suitable weather, that is, in autumn, when it could be done most economically, they are ready, and the temperature of winter in most latitudes is such that there is almost no danger of the meat's souring or spoiling before the process of curing is gotten well under way. Besides, there is an absence of flies in the cold weather. The great packing institutions, with their facilities for cooling and refrigerating, can carry on their slaughtering operations throughout the entire year; in fact, instead of as formerly, they now kill more hogs in the warm months than in winter, but this would be entirely impracticable for the ordinary farmer.

On the farms little progress has been made in slaughtering and curing beyond the primitive methods in use a century ago, notwithstanding that in city packing establishments such methods have been, in many respects, completely revolutionized or abandoned. The old way of stunning the hog by knocking on or shooting in the head, freeing of blood by cutting into the neck to sever the jugular vein, scalding in a barrel partly filled with water not quite boiling, into which a quart of wood

ashes has been thrown "to make the hair slip," scraping with knives and hoes, and then lifting by main strength the naked, slippery hog to a pole or some appliance temporarily provided, from which he can be suspended for gutting, washing and cooling is still followed on a large majority of farms.

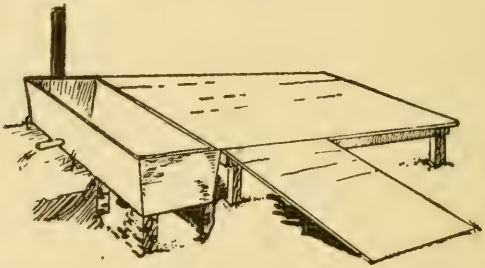
A barrel or cask is not the most convenient vessel in which to scald a hog, and any farmer who each year butchers a half-dozen or more good-sized porkers should provide himself with something different, and in which it is possible to maintain the water at a suitable temperature. As to what this temperature should be and the proper length of time the hog should be immersed few farmers apparently have definite ideas, and to ascertain what those who slaughter in a wholesale way have found to be the right degree of heat the author has made inquiry of some of the leading packers. Among the replies Armour & Company of Chicago write: "For light hogs the temperature range should be 140 to 145 degrees F., and the time of scalding from a minute to a minute and 15 seconds. For heavy hogs the temperature should be 150 degrees and the time from a minute to a minute and a half."

Morris & Company of Chicago say: "The temperature we use for scalding is about 145 to 147 degrees. We allow the hogs to remain in the water from 1½ to two minutes."

Swift & Company, Chicago, write: "Ordinarily a temperature of 145 degrees F. is the most suitable for scalding hogs, and three minutes the time they should remain in the water. However, both the temperature and time

vary somewhat with the different seasons of the year; for instance, it takes a little longer to loosen the hair in the fall than it does in the spring."

Kingan & Company of Indianapolis reply: "Killing hogs at the rate of 400 per hour, scalding tub temperature should be about 148 to 150 degrees F., and the hog should be in the water about 1½ minutes. Killing at a more rapid rate the temperature should be a little higher, and at a slower speed, slightly lower."



A HEATING AND SCALDING VAT WITH SCRAPING PLATFORM

A very convenient and inexpensive farm arrangement for heating water and scalding hogs is a plank tub or vat about 7 feet in length, 2½ feet wide at the bottom, 2 feet deep, with the sides somewhat flaring, and a galvanized iron bottom, well supported from below, set over a brick or stone foundation in which there is a suitable chamber for a fire to heat and keep heated the water for scalding. At its rear end should be a chimney for the smoke, and the sides of the vat may be banked up with earth. The top of the vat should be about 2½ feet above the level of the ground. On a level with the top, on one

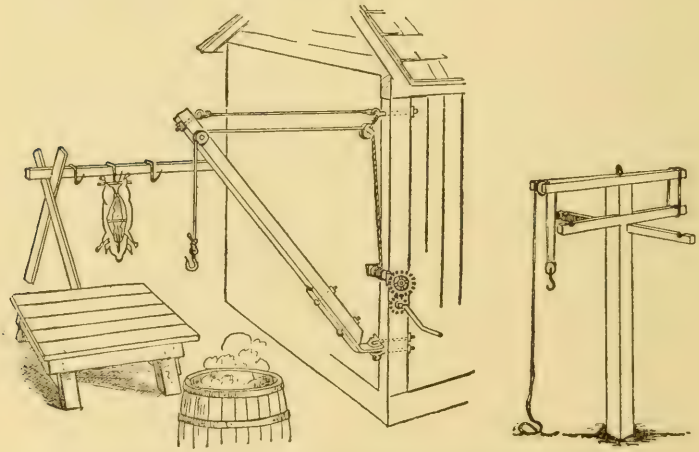
side, there should be a strong platform, about 6 feet wide and 8 feet long, from which to scald the hogs, and upon which they are to be scraped after scalding. At one end of this, the ground should be graded up even with the platform, or a sloping approach built, to facilitate getting the hogs onto the main platform after they have been killed. For convenience in lowering the hogs into and lifting them out of the water, two or more ropes, 8 or 10 feet long, should be secured to the side of the platform next the water, and resting on these, the carcass can be lowered or raised with comparative ease by two or three men. On the bottom of the vat there should be some wooden strips or a slatted frame to prevent the hog from lying directly on the bottom, as with much fire below, the skin would soon cook or scorch.

The animal is immersed for a few seconds, and then, by means of the ropes, raised out of the water, to allow the air to strike its body, and then immersed again. When the hair readily leaves the skin, especially on the head, legs and feet, the hog should be removed from the water as soon as possible, and speedily stripped of every hair. When this is done the hind legs should be freely cut into below the gambrel joint, to reach both main cords under which the end of the gambrel should be inserted. The gambrel should be of strong wood—hickory or oak is best—and from 24 to 30 inches in length, according to the size of the hogs, and be slightly notched on the upper side of each end to prevent the legs from slipping off.

Posts or forks should be so set that a strong pole resting on them will be in part over the platform, about

6 feet from the ground, and on this the hogs can be hung, and slipped along toward either end, out of the way, after they have been thoroughly scraped and rinsed down.

The butchering convenience shown on the left of the illustration herewith, was described to the *Ohio Farmer* by one of that journal's correspondents, who says: "Its main feature is the swinging derrick, such as is used by

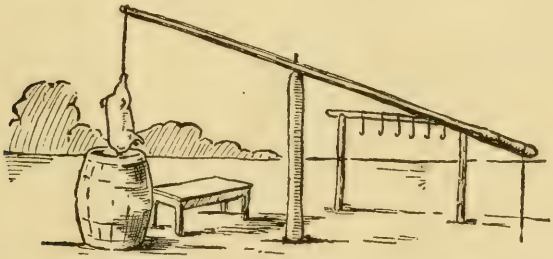


A NUMBER OF BUTCHERING CONVENIENCES

stone quarries, bridge companies, etc., for hoisting heavy loads. We have the hog pen on one side; swing the derrick around to that side, after killing; hoist the hog up, swing him around to the scalding barrel; after scalding, swing to scraping table; after scraping, swing him on around to the hanging pole. We have the pen, barrel, table and hanging pole on a half circle, so the derrick will swing around just right for each of them. The

scalding barrel is set upright. The outfit need not cost much. Ours is made with a pole cut from the woods, old hay-fork pulleys and cog-wheels from an old binder. A self-locking block, such as is advertised, would be just the thing instead of the cog gearing for the hoists. The swing principle is what makes it so handy. The illustration on the right shows a simple device for lifting, and hanging a carcass at any desired height.

The contrivance shown here is a good one for use in scalding and hanging a hog without any hard lifting.

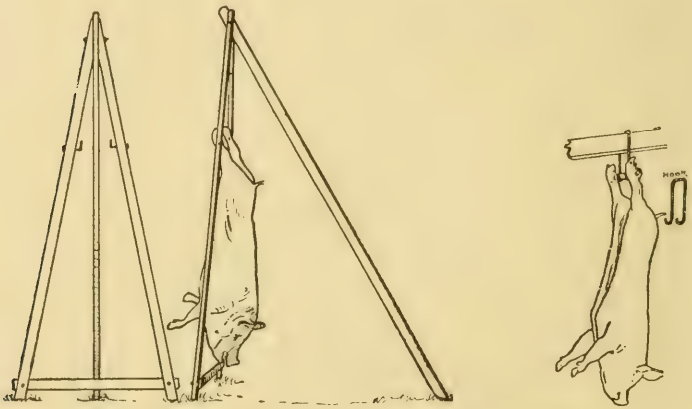


DEVICE FOR EASY SCALDING AND HANGING

The upright is a strong post 7 or 8 feet high above the ground, and the sweep or arm is 16 feet long. On the short end should be a short chain, and attached to the other end is a rope for pulling down on the sweep or for tying to a post for holding the hog suspended at any desired height. With the scalding barrel, scraping platform and cooling rack in their proper places the hog in dressing is easily handled from start to finish

A Kansas man's device for hanging a slaughtered hog after its hair is removed will be readily understood

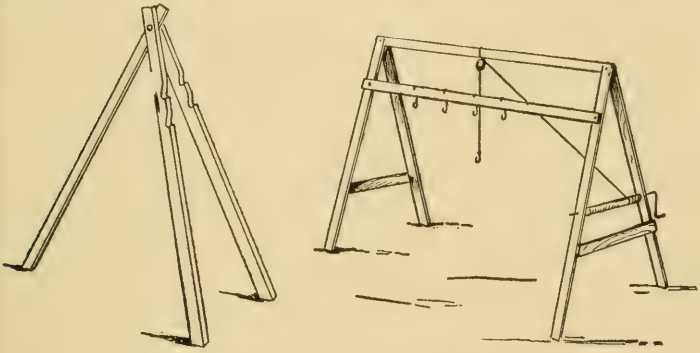
from the illustration. It is made of two pieces of two-by-fours, each 10 feet long, and one piece 12 feet long, for a brace to hold the frame upright. This brace is made longer than the legs, to reach back out of the way. There is a crosspiece to hold the bottom of the legs 4 feet apart. There are two hooks 3½ feet from the top




ARRANGEMENTS FOR HANGING HOGS

to hold the hog, without a gambrel. If gambrels are used the frame will hold two hogs if they are not too heavy. To use the frame lay it across the scraping table with the brace outstretched. Hook the hog fast and raise by moving the brace forward. It raises easily because the table holds the weight of the head and shoulders until the frame is partly up. The frame may be easily moved back from the table by lifting a leg at a time. With this frame one man can hang a hog weighing 400 or 500 pounds.

Opening the hogs should be done by some one familiar with such work, and no directions here would be of practical value. After removing the intestines, the mouth should be propped open with something, and all blood carefully rinsed out of the lower part of the body and neck. The next point, and a most important one, is to let the carcass, well spread on the gambrel, hang until thoroughly cooled in all its parts; unless this is observed, the pork cannot be cured or preserved in good condition, however much pains may be taken with it.



SIMPLE DEVICES FOR HANGING HOGS

### CURING AND PRESERVING

For the most perfect curing of meat of any kind it is desirable to have it from animals that before slaughter were in a considerable degree matured, or had attained their natural growth. After dressing the first requisite is to thoroughly cool the carcass, and for this it should hang in a low temperature, for 36 or more hours, but on no account should it freeze; freezing the outer surface surrounds the interior of the flesh with a wall,

through which the animal heat still remaining in and around the bones cannot escape, and the result will be souring and speedy decay at the center of hams, shoulders, etc., that outwardly appear in good condition.

Meat, and particularly pork, that has been frozen and afterward thawed does not keep as well as that which has been simply chilled. Pork intended for curing should never be frozen. It is stated by the authorities that frozen meat will spoil in sixteen hours if subjected to a temperature of 75 degrees. Meat hung up in an ordinary air temperature until the animal heat has passed off keeps better than that rapidly chilled immediately after dressing.

In the case of pork intended for curing, it is found that a temperature which will reduce the carcass within a period of 48 hours to from 36 to 39 degrees at its thickest and most vulnerable portion, viz., the center of the ham and shoulder, is the most desirable. At a temperature of 40 degrees a percentage of taint is liable to develop, and at any point above that temperature, tainted meat develops rapidly.

Packers say that hogs will show a temperature of 106 degrees F. on the killing rail—that is, the hams and shoulders—and will cut nicely at 37 degrees F. "Joint meats are all the better for being chilled down to just above freezing before curing."

Having so large a per cent of fat, side pork does not readily become over-salt and there is really no danger of injury to any but the leaner portions of the carcass by too much salt; yet where salt is dear, economy would dictate that only so much be used as is actually necessary

as a preservative. Salting with and without brine are both popular and both are satisfactory. If brine or "pickle" is used, no danger is to be apprehended from insects during the pickling process; the brine extracts the blood and other juices from the meat, which rise to the surface (more rapidly in warm weather), and there decomposing, are likely to contaminate the entire contents of the cask, unless given occasional attention. The preventive of trouble in this direction is to occasionally subject the brine to boiling; the impurities will rise to the top, and are to be skimmed off; in this way the brine may be kept pure, and its strength undiminished, for any desired length of time.

In "dry salting," or salting in barrels, boxes or piles without the addition of water to form a brine, it is of the utmost importance that no chance be afforded for flies to deposit eggs, or even to come in contact with the meat. If flies have had access to the pork it cannot then be saved, unless at once put into brine, or kept in a temperature so low the eggs cannot hatch, the latter being not often practicable.

Pork is cut to suit different demands and the various uses for which it is intended, but the aim should be, in all cases, to have it in such form as to pack snugly, and never to pack it until thoroughly cooled throughout.

### CURING HAMS AND SHOULDERS

Fulton, in his "Home Pork-Making,"* gives the following directions for the treatment of hams and shoul-

*Home Pork-Making, by A. W. Fulton, Orange Judd Company, New York. 124 pp.

ders prior to smoking: "To each 100 pounds of meat use 7½ pounds of fine salt, 1½ pounds granulated sugar and four ounces saltpeter. Weigh the meat and the ingredients in the above proportions, rub the meat thoroughly with this mixture and pack closely in a tierce. Fill the tierce with water and roll every seven days until cured, which, in a temperature of 40 to 50 degrees, would require about 50 days for a medium ham. Large hams take about 10 days more for curing. When wanted for smoking, wash the hams in water or soak for 12 hours. Hang in the smokehouse and smoke slowly 48 hours and you will have a very good ham. While this is not the exact formula followed in big packing houses, it is a general ham cure that will make a first-class ham in every respect if proper attention is given it.

"Another method of pickling preparatory to smoking includes the use of molasses. Though somewhat different from the above formula, the careful following of directions cannot fail to succeed admirably. To four quarts of fine salt and two ounces of pulverized saltpeter, add sufficient molasses to make a pasty mixture. Two pounds of brown sugar will do as well as the molasses. The hams having hung in a dry, cool place for three or four days after cutting up, are to be covered all over with the mixture, more thickly on the flesh side, and laid skin side down for three or four days. In the meantime, make a pickle of the following proportions, the quantities here named being for one hundred pounds. Coarse salt, seven pounds; brown sugar, five pounds; saltpeter, two ounces; pearlash or potash, one-half ounce; soft water, four gallons. Heat gradually and as the

skim rises remove it. Continue to do this as long as any skim rises, and when it ceases, allow the pickle to cool. When the hams have remained the proper time immersed in the mixture, cover the bottom of a clean, sweet barrel with salt about half an inch deep. Pack in the hams as closely as possible, cover them with the pickle, and place over them a follower with weights to keep them down. Small hams of 15 pounds and less, also shoulders, should remain in the pickle for five weeks; larger ones will require six to eight weeks, according to size. Let them dry well before smoking." In winter curing boiling the brine is not so essential.

### DRY SALTING BACON AND SIDES

"For hogs weighing not over 125 or 130 pounds each, intended for dry curing, one bushel fine salt, two pounds brown sugar and one pound saltpeter will suffice for each 800 pounds of pork; but if the meat is large and thick, or weighs from 150 to 200 pounds per carcass, from a gallon to a peck more of salt and a little more of both the other articles should be taken. Neither the sugar nor the saltpeter is absolutely necessary for the preservation of the meat, and they are often omitted. But both are preservatives; the sugar improves the flavor of the bacon, and the saltpeter gives it greater firmness and a finer color, if used sparingly. Bacon should not be so sweet as to suggest the 'sugar cure;' and saltpeter, used too freely, hardens the tissues of the meat and renders it less palatable. The quantity of salt mentioned is enough for the first salting. A little more new salt is added at

the second salting and used together with the old salt that has not been absorbed. If sugar and saltpeter are used, first apply about a teaspoonful of pulverized saltpeter on the flesh side of the hams and shoulders, and then, taking a little sugar in the hand, apply it lightly to the flesh surface of all the pieces. A tablespoonful is enough for any one piece.

"If the meat at the time of salting is moist and yielding to the touch, rubbing the skin side with the gloved hand, or the 'sow's ear,' as is sometimes insisted on, is unnecessary; the meat will take salt readily enough without this extra labor. But if the meat is rigid, and the weather very cold, or if the pieces are large and thick, rubbing the skin side to make it yielding and moist causes the salt to penetrate to the center of the meat and bone. On the flesh side it is only necessary to sprinkle the salt over all the surface. Care must be taken to get some salt into every depression and into the hock end of all joints. An experienced meat salter goes over the pieces with great expedition. Taking a handful of the salt, he applies it dexterously by a gliding motion of the hand to all the surface, and does not forget the hock end of the bones where the feet have been cut off. Only dry salt is used in this method of curing. The meat is never put into brine or 'pickle,' nor is any water added to the salt to render it more moist.

### FOR BEST DISTRIBUTION OF THE SALT

"A platform or bench of planks is laid down, on which the meat is packed as it is salted. The packer lays down first a course of middlings and then sprinkles a little

Texas Razor-Back Boar

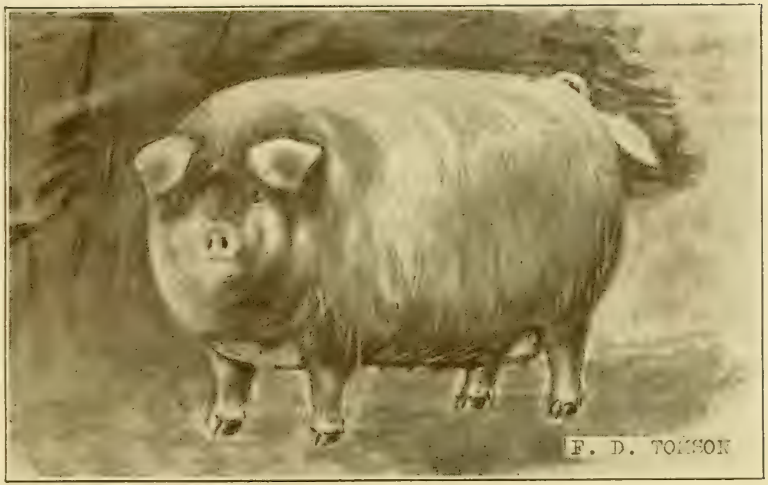
Crossbred Razor-Back-Berkshire Pig

Texas Razor-Back Sow

Crossbred Razor-Back-Poland-China Pig

First Generation of Razor-Back Pigs Under Improved Conditions

RAZOR-BACKS USED IN CROSSBREEDING EXPERIMENTS AT THE WISCONSIN EXPERIMENT STATION




A GREAT CHESTER WHITE SOW

more salt on all the places that do not appear to have quite enough. Next comes a layer of shoulders and then another layer of middlings, until all these pieces have been laid. From time to time a little more salt is added, as appears to be necessary. The hams are reserved for the top layer, the object being to prevent them from becoming too salt. In a large bulk of meat the brine, as it settles down, lodges upon the lower pieces, and some of them get rather more than their quota of salt. Too much saltiness spoils the hams. In fact, it spoils any meat to have it too salt, but it requires less to spoil the hams, because, as a rule, they are mostly lean meat. The jowls, heads and livers, on account of the quantity of blood about them, are put in a separate pile, after being salted. The chines and spareribs are but slightly salted and laid on top of the bulk of neat meat. Close-fitting boxes, which some use to keep the rats from meat, are not the best; the meat needs air.

"In ten days to three weeks, according to weather and size of the meat, break bulk and resalt, using the old salt again, with just a little new salt added. In four to six days more, or sooner, if need be, break up and wash the meat nicely, preparatory to smoking it. Some farmers do not wash the salt off, but the meat takes smoke better and looks nicer if washed."

Another method having the highest recommendations is to leave the meat in a cool, dry place for at least 36 hours after being cut up in order that the animal heat may escape. It should not be permitted to freeze under any circumstances. The recipe for curing material for each 100 pounds of meat is to mix together thoroughly

1½ pounds white granulated sugar, 1½ ounces finely ground black pepper, one-half ounce of finely pulverized saltpeter and 12 pounds of the best salt. Rub each piece of meat thoroughly with the mixture in the bare hand, afterward laying meat side down. The skin side of the meat will need only the one (first) treatment. The meat should be examined about once a week for four or five weeks to see that any that has absorbed the mixture is given a further thorough rubbing with it, taking pains to see that the parts around the bone are thoroughly treated. After about five weeks the meat can be smoked, hickory wood or corncobs being excellent for this purpose. From eight to ten days of smoking is sufficient, but some authorities claim that smoking for two days and then discontinuing the smoke for two or three days is better than continuous smoking. When properly smoked the meat will have a dark or tobacco brown color. After the smoking is completed the meat can be wrapped in paper and stored in a cool, dry place away from flies. The more thoroughly it is wrapped the more secure it is likely to be against the attacks of insects.

The preservative principle of smoke is known as creosote. If the smoking process is too much hurried, the creosote will not have time to penetrate the entire substance of the meat, but ten days' steady smoking is, in all cases, sufficient, unless the pieces are unusually large and very thick. Smoked meats may be left in the smokehouse for some time during moderate weather. The house should be kept perfectly dark and well enough ventilated to prevent dampness. 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 but a short time, hams and bacon will need only to be hung separately without covering. For longer keeping, it will be necessary to wrap them first in paper, and then in burlap, canvas, or muslin, when they may be buried in grain, bran or ashes, or in some other suitable way kept at a uniform temperature and protected from insects. Ground pepper rubbed into each piece before wrapping will be distasteful to the insects. For absolute safe-keeping for an indefinite period of time it is essential that the meat be thoroughly cured.

### PORK FOR THE SOUTH

"This requires a little different treatment," says Fulton's "Home Pork-Making." "It is dry-salted and smoked. The sides, hams and shoulders are laid on a table and rubbed thoroughly with salt and saltpeter (one ounce to five pounds of salt), clear saltpeter being rubbed in around the ends of the bones. The pieces are laid up, with salt between, and allowed to lie. The rubbing is repeated at intervals of a week until the meat is thoroughly salted through, and it is then smoked. It must afterward be left in the smokehouse, canvased or buried in a box of ashes, to protect it from the flies."

Dry salt pork for southern use in winter needs to be cured in salt for 30 days, but for summer use it should have from 50 to 60 days' curing.

## NET PERCENTAGE THAT HOGS WILL DRESS

A question that frequently confronts farmers is that of dressing the hogs at home and selling the carcasses, or selling alive. Some townspeople are glad to buy dressed hogs for private use and will pay a good price for a carcass that has been nicely dressed. Whether it will pay to dress and sell thus or sell to the stock buyer is a question.

Where one has but a few hogs it is often very profitable to dispose of them dressed. One should, of course, allow for labor required in slaughtering, fuel used in heating water, and other miscellaneous expenses. Then by knowing how many pounds of pork every 100 pounds of live hog will make, the price that he must have for the carcass to get the same as for the live animal can be determined.

Several factors influence the yield by a hog. Conformation, waste, degrees of fatness and development—all play important parts. Thick, deep-bodied hogs are always better dressers than those that are narrow and shallow. By adding length of body something is also added to the yield. Animals that are big bellied are always objectionable, because not only is the offal or waste great, but the side is unshapely. The paunch alone sometimes makes a difference of one or more per cent in the dressing, and, with contents included, this difference sometimes becomes as great as five per cent.

An intelligent writer says: "Degree of fatness and development probably influence the yield more than any other factors. Because of this, hogs that are well de-

veloped in all parts and of good size, in addition to being extremely fat, are always the best dressers. The development of muscle means enlargement of the cells that make it, and fattening means the depositing of fat about muscle fibers and around the muscles of the body. The extreme development of muscle and fat then must give the extreme weight that can be secured from the carcass.

"The viscera does not increase in weight proportionately as the development takes place, therefore there is a greater yield of edible meat. Taking ordinary hogs as they run as regards fatness and development after being off feed for only 12 hours, the writer has found that the yields are about as follows for various weights:

| | Pounds | Per Cent Dressed |
|---|---|---|
| Weight of hog | 100 | 72 |
| " " " | 150 | 73 |
| " " " | 200 | 75 |
| " " " | 250 | 77 |
| " " " | 300 | 79 |
| " " " | 350-500 | 80-87 |

"It will be noticed that the small, immature, unfinished hog dresses the least, and the large, mature and finished hog dresses out the most weight of carcass. For every 100 pounds additional to live weight the hog increases in yield approximately four per cent."

CHAPTER XXII

# Razor-Backs Not "Cholera-Proof" or Profitable

There is a belief, perhaps justifiable, held by numerous breeders that many of the more highly bred swine are over-refined, and that the system of mating and rearing by which they were produced has made them delicate, and more susceptible to disease, while lessening their feeding qualities and growthiness. Those who have had this belief have in many instances further believed that the best available corrective of the defect and a restorer of the desired robust hardiness would be an infusion of blood from the supposedly hardier and more vigorous wild or half-wild hogs quite common in some parts of the South and Southwest, and known as Razor-Backs, which unfounded tradition says are "cholera-proof."

The Wisconsin experiment station made an attempt to discover whether there were good grounds for the belief in the extra hardiness or feeding qualities of the wild hogs, and secured a stock of them from Texas, which were used especially in crossing with improved breeds, the story of which is told in Annual Reports 19 and 20 of the Wisconsin station.

A striking incident of the experiments, not contemplated in the beginning, was that from an attack of "cholera" the Razor-Back pigs were the first to die, thus

forcibly suggesting that the alleged hardiness of the wild hog, so often claimed as disease-proof, exists mainly in the imagination. Referring to this Prof. W. L. Carlyle, who had the experiments in charge, says: "The epidemic took about 50 per cent of our pure-bred hogs and about 92 per cent of the cross-bred Razor-Backs. Why the fatality was greater with the cross-bred animals than with the others I do not know, unless it was that their ancestors had never been afflicted to any extent with this disease, and they were, therefore, more susceptible to its inroads." The experiments at the Wisconsin station were undertaken, at least in part, to determine primarily whether pure Razor-Back hogs would consume as much food of a similar kind and make from it as great a live weight gain as pigs of crossed Razor-Back or improved breeding, thus determining the truth as to the impression among some stockmen that scrub stock will make as good gains in feeding as animals better bred. Twelve shotes were selected; six were Razor-Backs, and the other six were the get of a Razor-Back boar out of Berkshire and Poland-China sows. Both lots were fed twice daily all they would eat of a mixture in equal parts of ground corn, ground rye and shorts, for four weeks, and at the end of that time the feed was continued seven weeks longer, but with the addition of 1.4 parts of milk to one part of grain. The table on the next page shows the initial weights, feeding, and weekly gains of the animals.

It was found that the cross-bred pigs ate considerably greater quantities of grain than the Razor-Backs, and made greater gains in proportion to the feed consumed.

| | 1st generation. | | | Total gain and weight. | 2d generation. | | | Total gain and weight. | Total gain and weight of both generations. | Total feed of both generations. | Skim milk. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of pigs. | 71 | 72 | 74 | | 61 | 62 | 64 | | | | |
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| Initial weights.. | 99 | 118 | 141 | 358 | 149 | 175 | 162 | 486 | 844 | ..... | ..... |
| Gain, 1st week. | 4 | −3 | −4 | −3 | 3 | 3 | 5 | 11 | 8 | 140.1 | .... |
| " 2d " . | 4 | 3 | −1 | 6 | 8 | 7 | 7 | 22 | 28 | 133.1 | .... |
| " 3d " . | 3 | 4 | 2 | 9 | 4 | −1 | 3 | 6 | 15 | 126 | .... |
| " 4th " . | 7 | 4 | 8 | 19 | 5 | .. | 3 | 8 | 27 | 138 | .... |
| " 5th " . | 11 | 13 | 8 | 32 | 28 | 22 | 8 | 58 | 90 | 163 | 240 |
| " 6th " . | 7 | 5 | 6 | 18 | 3 | 9 | 12 | 24 | 42 | 177 | 352 |
| " 7th " . | 10 | 10 | 16 | 36 | .. | −3 | 20 | 17 | 53 | 210 | 395 |
| " 8th " . | 8 | 10 | 2 | 20 | 18 | 29 | 1 | 48 | 68 | 210 | 420 |
| " 9th " . | 1 | 1 | 6 | 8 | 2 | 4 | 13 | 19 | 27 | 210 | 420 |
| " 10th " . | 11 | 11 | 16 | 38 | 9 | 5 | 14 | 28 | 66 | 217.5 | 440 |
| " 11th " . | 8 | 5 | .... | 13 | 12 | 12 | 1 | 25 | 38 | 210 | 390 |
| Total gain... | 74 | 63 | 59 | 196 | 92 | 87 | 87 | 266 | 462 | 1934.5 | 2657 |
| Final weight | 173 | 181 | 200 | 554 | 241 | 262 | 249 | 752 | 1306 | ..... | ..... |

The gains made by the Razor-Backs were extremely variable, and a satisfactory gain by an individual in one week would be offset by no gain in the preceding and succeeding weeks. This was probably due to the intermittent opportunities offered to the hogs in the wild state for obtaining their food, as the Razor-Backs would gorge themselves and then eat sparingly for some time, when they would again devour all they could contain. The experiment showed that it cost one-half cent per pound more to produce gain with Razor-Backs than with cross-breds. The Razor-Backs were not able to thrive on corn or other concentrated rations and required considerably more bulky food and pasturage.

In another experiment an interesting comparison was made between Razor-Backs and Razor-Back-cross-breds

with pure-breds. The Razor-Backs ate a smaller amount of feed than any other type, and made the smallest gain. The table below shows initial weights, weekly gain and feed, with total weights, gain and feed eaten by the cross-bred Razor-Back-Poland-China and Razor-Back-Berkshire pigs:

| | Razor-back Poland-Chinas | | | Total gain and weight. | Razor-back Berkshires. | | | Total gain and weight. | Total weight and gain of both crosses. | Total feed of both crosses. | Skim milk. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of pigs.. | 83 | 85 | 89 | | 97 | 101 | 112 | | | | |
| Initial weights.. | Lbs. 156 | Lbs. 156 | Lbs. 162 | Lbs. 474 | Lbs. 153 | Lbs. 151 | Lbs. 135 | Lbs. 439 | Lbs. 913 | Lbs. ..... | Lbs. ..... |
| Gain, 1st week. | 4 | 3 | 7 | 14 | 1 | 0 | 3 | 4 | 18 | 140 | ..... |
| " 2d " . | 5 | 5 | 6 | 16 | 10 | 4 | 8 | 22 | 38 | 154 | ..... |
| " 3d " . | 13 | 5 | 10 | 28 | 7 | 10 | 7 | 24 | 52 | 193.5 | ..... |
| " 4th " . | 7 | 13 | 8 | 28 | 13 | 7 | 11 | 31 | 59 | 213 | ..... |
| " 5th " . | 15 | 16 | 17 | 48 | 14 | 20 | 15 | 49 | 97 | 247.5 | 348 |
| " 6th " . | 11 | 22 | 14 | 47 | 21 | 14 | 16 | 51 | 98 | 259.5 | 524 |
| " 7th " . | 10 | 12 | 9 | 31 | 15 | 3 | 9 | 27 | 58 | 273 | 560 |
| " 8th " . | 2 | 17 | 13 | 32 | 11 | 19 | 13 | 43 | 75 | 273 | 560 |
| " 9th " . | 10 | −2 | 11 | 19 | 8 | 3 | 11 | 22 | 41 | 273 | 560 |
| " 10th " . | 15 | 25 | 13 | 53 | 19 | 11 | 12 | 42 | 95 | 292.5 | 612 |
| " 11th " . | 4 | 12 | 14 | 30 | 12 | 16 | 15 | 43 | 73 | 269 | 572 |
| Total gain... | 96 | 128 | 122 | 346 | 131 | 107 | 120 | 358 | 704 | 2588.0 | 3736 |
| Final weight | 252 | 284 | 284 | 820 | 284 | 258 | 255 | 797 | 1617 | ..... | ..... |

Set forth in another way, some of the results of these experiments are shown thus:

| | Cross-bred. | Razor-back. |
|---|---|---|
| | Pounds | Pounds |
| Average amount of grain feed eaten daily | 5.56 | 4.18 |
| Average amount of milk eaten daily | 12.7 | 9.0 |
| Average amount of grain for 100 pounds of gain | 366.0 | 420.0 |
| Average amount of milk for 100 pounds of gain | 530.0 | 565.0 |
| Average daily gain of each pig | 1.52 | 1.02 |
| Average amount of grain for 100 pounds gain the first 4 weeks | 566.0 | 624.0 |
| Average amount of grain for 100 pounds gain the last 7 weeks | 331.0 | 364.0 |
| Amount of grain saved by each 100 pounds milk fed | 6.26 | 9.78 |

The experiments were interrupted by an outbreak of "cholera," or the investigations would have been much further extended. The report, in commenting upon results arrived at, says: "The experiment resulted in showing that the cross-bred pigs made greater gains and consumed more feed, but required less grain per 100 pounds gain. The cross-breds made a total gain of 704 pounds and the Razor-Backs a gain of 462 pounds, and a daily gain of 1.52 pounds and 1.02 pounds respectively. The second generation of Razor-Backs made a total gain of 70 pounds over the representatives of the first generation. This shows very clearly what the change of environment did for the second generation; their appearance also indicated that they were capable of consuming more food and putting on greater gains than the first generation. The Razor-Backs made very irregular gains, increasing considerably in one week and not any the next. This was due to the fact that their appetites were variable and they would overeat occasionally. This may be attributed to inherited peculiarity, due to the irregular food supply of their ancestors. Incidentally, the value of skimmed milk when fed with a ration, such as was given to these pigs, was worked out. It was found that 100 pounds was worth the equivalent of 6.26 pounds of grain in the case of the cross-bred pigs, and 9.78 pounds of grain for the Razor-Backs. The reason for this great difference in the value of skimmed milk for these two lots was thought to be due to the fact that the Razor-Backs have not been found to thrive best on a heavy grain ration. It may be that the pigs of the first generation made as good gains for the food con-

sumed as those of the second generation, yet the data presented clearly brings out the fact that they fell far behind in rate of gain, and we may safely assume from their appearances that they were not nearly equal to the pigs of the second generation, in ability either to consume large quantities of food or to assimilate and store the food nutriments in their body tissues."

There should be no hesitation about recognizing the qualities obtained through selection and breeding. Injudicious work in this regard may, however, develop bad traits as well as good ones, but the good breeder will take care to eliminate these. More is to be lost than gained by introducing strains of wild or Razor-Back blood. The Razor-Back is at variance with any desirable uniformity, and this applies to both fattening qualities and form. In any case, where an attempt has been made to introduce crosses of Razor-Back or any other miscellaneous kind of swine, the results have been in the end unsatisfactory.

CHAPTER XXIII.

# The Most Common Diseases of Swine

### THIS NOT A VETERINARY WORK

This book is not that of a veterinary surgeon, and no one lacking the training of a veterinarian, or its equivalent in practical experience, should presume to lay down the law of diseases which afflict swine. There are times, however, when ready reference to the most generally approved remedies or treatments becomes essential to the swine husbandman, and to meet such situations this chapter has been prepared, by assembling here the advice and suggestions as to prevention and treatment of the more common ailments of swine by men esteemed highly competent to deal with the respective subjects.

The best and surest "cure" for any disease is undoubtedly prevention, but as any breeder is aware, there are frequently occasions when such a suggestion is little more than an aggravation. When disease attacks his herd the owner desires information which points to the best possible immediate relief, and the problem then confronting him is not one of prevention. Nevertheless, as one of the men quoted in this chapter aptly suggests, the time to look out for a disease is six months or a year before it is expected. It should not require special medical training or technical knowledge on the breeder's part to realize that clean, dry quarters, a supply of wholesome water and a reasonable use of disinfectants will go

far toward keeping away diseases which would thrive where filth, foul water and lack of care were present.

The greatest annoyance and losses by disease with which the hog raiser contends comes from so-called "cholera," swine plague, and from tuberculosis. Dr. J. R. Mohler of the United States Department of Agriculture has made the statement that the loss from tuberculosis is greater than from any other disease, and this condition has come about in comparatively recent years. The last word is far from being said regarding what should or may be done to stamp out these diseases, and the best that can be recorded now is that the government authorities, as well as other experimentalists in this country and abroad, are believed to be making progress toward a definite procedure in the work of eradicating the scourges so much to be dreaded. In fact, authorities are confident that prevention of cholera by vaccination, properly done by an expert, is unquestionably practicable.

In summing up the tremendous losses by diseases, Dr. D. E. Salmon, Chief of the Bureau of Animal Industry, once said: "When the investigations of swine diseases were commenced by the government in 1878, the annual losses were estimated at from $20,000,000 to $30,000,000. They have gone on increasing with the growth of the swine industry, until it appears from statistics (in 1898) that have been gathered in some states, they sometimes reach $60,000,000 or $70,000,000 a year—possibly more if the ravages in the sections heard from are equaled in all of the hog-raising states.

"These losses and their effects upon the country are not appreciated fully by many of the people, and it is

common to hear the remark, even among farmers, that were it not for cholera hogs would be so numerous and so cheap that they would be worth nothing. This is a superficial and incorrect opinion. If there were no cholera hogs could be produced cheaper than at present, and the number marketed would be increased until the price was forced down to the limit of profitable production. But on the other hand, when the limit of profit was reached, the number grown would be reduced, just as happens at present, and the average returns from the grain fed would not vary greatly from what are now received.

"With no contagious diseases, however, the hog raiser would be doing a much safer business than at present; he would not be subject to such disastrous periodical losses, and he could consequently sell his animals lower and still make more money than at present. Lowering the price of pork would be a great boon to thousands of consumers and would greatly stimulate our export trade. Above all, perhaps, would be the saving and adding to the wealth of the country of the fifty, sixty or seventy millions of dollars' worth of property now annihilated every year.

"The hog disease question is, therefore, one worthy of the most careful and persistent study, and while primarily an agricultural problem, in its broader sense it is one which affects many industries and even has a material effect upon the nation."

### IMPORTANCE OF PREVENTION

Dr. A. S. Alexander says: "There are several feasible plans of fighting disease among hogs, and these

should be followed wherever swine are kept. In the first place, every precaution should be taken to raise hogs of strong vitality, and this is to be accomplished by using robust breeding stock, not too closely related, but changed often enough to prevent the weaknesses sure to result from consanguineous breeding. Next, the hogs at all stages of life should be fed in such a way as to induce full exercise of the excretory organs, and incidentally or primarily of the respiratory organs, that the blood circulation may be active and the blood pure. The surroundings of hogs are to be kept as clean and free from germs as possible; the food and drinking water must be protected against germ contamination; worms are to be prevented or destroyed; indigestion is to be avoided so far as possible, and all known sources of the specific germs of cholera, swine plague, etc., are to be excluded from the premises.

"Medicine is an afterthought and used mostly when trouble has been observed. It seldom is effective where actual disease is absent, and if used strongly as a preventive, is apt to cause conditions conducive to disease. For these reasons, the less medicine hogs are required to take, the better will it be for them, provided they are properly fed and cared for, disinfectants and whitewash frequently and freely used about the pens, the drinking water is pure, the food suitable, well-balanced and free from germ contamination or conditions likely to cause derangement of the digestive organs. It is right and beneficial, however, to mix a disinfectant in the slop now and then as a preventive, and hogs have been found to take readily to slop impregnated with coal tar

disinfectant at the rate of from a pint to a quart per barrel. There can be no question that such a use of disinfectant is useful in preventing or destroying worms and germs in the intestinal tract, and so warding off cholera and other enteric diseases. It also is legitimate to use other simple correctives with the hope of preventing indigestion, and these may include salt, charcoal, wood ashes, stone coal, epsom salts, glauber salts and lime water. Strong irritating medicines should be avoided and no medicine the exact composition of which is unknown should be used. One cannot afford to trust to the other fellow's intelligence or integrity when it comes to treating hogs for disease or attempting to prevent its ravages. For the latter reason, and the fear of contamination, it is a wise policy to keep the hog-cholera-patent-dope peddler off the place by any means necessary."

### HOG CHOLERA AND SWINE PLAGUE

The latest and perhaps the most informing presentation of the subject of hog cholera, and incidentally swine plague, is that by Dr. M. Dorset, of the Bureau of Animal Industry, United States Department of Agriculture, in Farmers' Bulletin No. 379, issued November 27, 1909, from which the following is condensed. This bulletin "was prepared especially for the use of the practical farmer in order that he may be enabled to recognize the disease and to deal with it effectively":

"Hog cholera is an acute febrile disease which, so far as is known, affects only hogs, and which is characterized by extreme contagiousness and a very high death rate. It is usual to speak of two forms of this disease.

One is called the acute and the other the chronic form. This is because of the fact that in some cases the disease is sudden in its onset and rapid in its course, whereas in others, the affected hogs linger for weeks or months before death or recovery. Notwithstanding the dissimilarity in the symptoms and lesions observed in these two types, the causative agent is the same in both, the difference in the manifestations of the disease being no doubt due to a variation in the virulence of the germs which cause the disease, and possibly to some extent also to a variation in the resisting power of hogs. While outbreaks may occur at all seasons of the year, the great majority take place during the late summer and fall. The mortality is as high as 100 per cent in some herds, while the average is probably from 70 to 80 per cent, and many of the hogs which survive are comparatively worthless, owing to their being weakened and stunted in growth.

### THE GERM WHICH CAUSES CHOLERA

"The germ or microbe which causes cholera is present in the blood of sick hogs, and also in the excretions from such hogs, particularly in the urine. It has been shown that the disease can be produced almost without fail by inoculating well hogs with the blood or urine from sick hogs. The germ which is in this blood and urine is so small, or else of such structure, that it can not be seen with the strongest microscopes.

"While the specific cause of cholera is the minute micro-organism or germ just referred to, there are many factors which may render a herd more susceptible to

the disease. Anything which tends to lower the health of the animals may be regarded as a predisposing cause. Among such predisposing factors are improper feeding, an insanitary condition of the hog lots, damp or cold sleeping places, and dirty drinking and feeding troughs. Insanitary surroundings and poor feed can not in themselves produce cholera, but they lower the vitality of hogs to such an extent that they become comparatively easy victims of any disease-producing germs to which they are exposed.

### WAYS IN WHICH THE CHOLERA GERMS REACH A HERD

"Although the conditions just mentioned undoubtedly exert considerable influence upon the relative resisting powers of hogs to cholera, the disease can be started in a herd only by introducing the germ which causes it. This germ is always present in the bodies of sick hogs, and is thrown off from them in large numbers in the feces and urine, thus contaminating the yards or pens in which sick hogs are kept. The most dangerous factor in spreading cholera is, therefore, the sick hog; but any agency which might serve to carry a particle of dirt from infected yards may be the means of starting an outbreak.

"Sick hogs may get onto a farm (1) by escaping from a neighboring herd, (2) by the purchase of new stock which may show no symptoms of sickness until some days after purchase, (3) by returning show hogs to the herd after visits to fairs or stock shows, (4) by purchase of hogs which have apparently recovered from cholera. The risk incurred by purchase of new hogs or

the return of hogs which have been shown at fairs is chiefly due to the fact that such hogs are generally transported by rail, unloaded in public stock yards, or driven along public roads. It is well known that sick hogs are frequently shipped by rail, and the roads over which they are driven, the stock yards, and the railroad cars thus become contaminated with the germs. The only safe plan is to place new arrivals in lots entirely separated from those occupied by the main herd, and to keep them isolated until all danger of their developing hog cholera has passed.

"Aside from the danger of introducing infection through the hogs themselves, the germ may be transported in a minute particle of dirt on the feet of attendants or neighbors who have previously visited farms where cholera exists. It may also be carried in this way by dogs, and by crows and other birds. It has been claimed that the disease may be carried downstream from herds which are affected above. It is therefore well to avoid placing hogs so that they will have access to streams which pass through other farms.

"After cholera has visited a farm, the lots, houses, feeding troughs, and implements used for cleaning have naturally become contaminated with the germs, and if new stock is placed in such yards soon after these were occupied by sick hogs, the new hogs are very likely to contract the disease, but if such yards are left unoccupied the germs will die out after a while. It is not possible to tell just how long a time is required for these germs to die out. It is safest to wait as long as possible before placing new hogs in lots that have been

infected—not sooner than three months after the last hog has been removed. Before restocking, the premises should be cleaned and thoroughly disinfected.

### SYMPTOMS OF CHOLERA

"The beginning of cholera in a herd is marked by the sickness of one or two hogs, and the disease may not be suspected until a week or two later, when other hogs are attacked. As the number of sick hogs increases the opportunities for the well animals to contract the disease are multiplied, and in a comparatively short time all hogs exposed will be attacked.

"The symptoms observed in particular cases will be influenced by the virulence of the germ responsible for the attack, and also by the resisting power of the hogs. If this resisting power is low, or if the germ is of high virulence, we may have a typical manifestation of the acute type of cholera. In this the chief symptoms are sluggishness, disinclination to move, weakness, loss of appetite, a high fever, inflammation of the eyes with gumming of the lids, and maybe diarrhea. If the animals are examined carefully, red or purplish blotches may be seen on the skin, especially over the surface of the abdomen, on the inside of the legs, and around the ears and neck. As a rule the progress of the infection is so rapid that the hog is not greatly emaciated before death; it is, in fact, usual in acute outbreaks for hogs to die after being sick only a few days.

"In the chronic type of the disease the symptoms are quite similar to those seen in acute cases. The sick

hogs are sluggish and disinclined to move when disturbed, and coughing is frequently heard when they are suddenly roused. They may eat very little and usually lose flesh rapidly, finally becoming so emaciated and weak that they stagger or walk with an uncertain gait, the hind-legs particularly appearing to be very weak. The eyes become inflamed and the lids may be gummed together. After the first few days of illness there is apt to be a profuse diarrhea, and in these chronic cases the hog usually lingers for several weeks, sometimes months, before it finally dies. It is extremely rare for such an animal to recover sufficiently to be of value.

"At the beginning of an outbreak in a herd it is a difficult matter to be sure that hog cholera is actually present, for the outward symptoms are not characteristic, but only such as might be expected in any acute disease. The same may be said of some of the changes which take place in the internal organs. It is therefore necessary to consider all of the features of the disease before making a positive decision concerning the presence or absence of hog cholera in a herd.

"The important features of hog cholera are:

"1. Contagiousness.

"2. Symptoms of severe illness, such as fever, weakness, loss of appetite, and diarrhea.

"3. Hemorrhagic spots in the internal organs or button-like ulcers in the intestines.

"If these characteristics are found in a disease of hogs in this country, we may be reasonably certain of the presence of cholera.

"Among the few diseases which may lead to uncer-

tainty are digestive troubles (due to improper feeding), swine plague, tuberculosis, anthrax, and inflammation of the lungs caused by worms.

### SWINE PLAGUE

"It is not practicable for a farmer to attempt to distinguish between hog cholera and swine plague, for, while swine plague is generally regarded as a lung affection, and cholera as a disease of the intestines, the fact is that practically all of the lesions which are found in cases of cholera have also been reported as being present in outbreaks of swine plague. There is at present a tendency on the part of those who have investigated these diseases to regard both cholera and swine plague as caused by the same invisible germ, the predominance of lung lesions in one case and intestinal inflammation in the other being caused by the action of different germs which attack the hog after it has been made sick by the invisible germ which is looked upon as the prime cause of the disease in both cases. However this may be, it is quite safe to say that the great losses which occur among hogs in this country are brought about by cholera, and that, for the present at least, we may ignore the existence of swine plague as a separate disease, especially as the general measures for controlling it are the same as those required in cases of cholera.

### HOW CHOLERA DIFFERS FROM TUBERCULOSIS

"The distinguishing features between hog cholera and tuberculosis are that in tuberculosis the onset is slow

rather than sudden, as is the case in cholera; likewise the progress is very slow, and the symptoms are those of general unthriftiness rather than of acute illness. Tuberculosis does not show a tendency to spread rapidly, as is the case in cholera, and the deaths, if any occur, will in the vast majority of cases follow a prolonged illness.

### ANTHRAX

"Hogs are rarely affected by anthrax, but when this does occur it might be readily mistaken for acute cholera. The distinguishing features of anthrax are marked swelling of the throat and tongue, with frequently a bloody froth in the mouth, and further by the fact that anthrax in hogs usually follows disease in other animals on the farm, horses, cattle, and sheep being more susceptible to anthrax than hogs.

### LUNG WORMS

"Young, growing pigs are at times attacked by lung worms, which bring about an inflammation of the air passages. The most important symptoms are general unthriftiness, and a hard cough. Old hogs are rarely attacked and the younger hogs usually recover. The worms are very small (one-half to one inch in length), and examination of the frothy expectoration of sick hogs or of the lungs after death is usually required to make a positive diagnosis. In this disease there is an entire absence of symptoms of acute illness such as usually accompany an attack of cholera.

### GENERAL PREVENTIVE MEASURES

"All that is necessary to prevent hog cholera is to keep the germ of the disease away from the herd. In the vast majority of cases this germ is transported mechanically, in the bodies of sick hogs and on the feet of men or animals, including birds. It thus follows that the chances of an outbreak of hog cholera will be greatly lessened, if not completely avoided, if a herd is protected from these carriers of the infection. The enforcement of a complete quarantine is not practicable, and the best that can be hoped for is the lessening of the opportunity for infection by placing the herd on a part of the farm that will be the least accessible to men or animals from other farms. Hog lots should never be located near public roads. All newly purchased stock should be kept separate from the main herd for at least thirty days.

"In addition to protecting by methods of quarantine, careful attention should be given to the general health. The hogs should be provided with clean, dry sleeping places, and the lots and feeding troughs be kept clean. It is well occasionally to scatter slaked lime about the lots and to wash and disinfect the troughs. Probably the best disinfectant for this purpose is the compound solution of cresol (U. S. P.), which can be prepared at any drug store. One part of this should be mixed with 30 parts of water and the troughs scrubbed with it. The disinfectant is then washed out of the troughs with water.

"After an outbreak of cholera the yards and pens should be thoroughly cleaned, all dead hogs should be burned or buried deep with quicklime, the litter should

be collected and burned, and lime scattered freely over the ground. The sheds and hog houses should be washed thoroughly with the solution of cresol as described before new stock is brought on the place. Feeding troughs used by sick pigs should be burned if made of wood, but if this is not practicable they should be scrubbed clean and thoroughly soaked with the cresol solution, the latter being washed out before the troughs are used again.

"It is possible to start an outbreak of hog cholera by bringing hogs on the farm that have had the disease and have apparently recovered. For safety's sake two or three months should elapse after complete recovery before placing such an animal with susceptible pigs, and then only after washing or dipping in a disinfectant solution (compound solution of cresol, 1 to 100)."

"In Farmers' Bulletin 24, Dr. D. E. Salmon gave the following formula for a medicine which was used many years ago as a preventive and cure for hog cholera:

| | Pounds |
|---|---|
| Wood charcoal | 1 |
| Sulphur | 1 |
| Sodium chlorid | 2 |
| Sodium bicarbonate | 2 |
| Sodium hyposulphite | 2 |
| Sodium sulphate | 1 |
| Antimony sulphid (black antimony) | 1 |

"Experience has shown that this is not to be regarded as a cure or preventive in the true sense, but is nevertheless a very good condition powder. This is mixed with the feed in the proportion of a large tablespoonful

to each 200 pounds' weight of hogs to be treated, and given once a day.

### PREVENTION BY INOCULATION

"The Bureau of Animal Industry has endeavored for a number of years to find a medicine or serum which could be used for preventing hog cholera or for curing hogs sick of that disease. It is a well-known fact that hogs which have recovered from hog cholera are thereafter immune against that disease. The experiments of the Bureau resulted in the discovery that it is entirely possible to protect hogs if they are treated with serum from a properly treated immune hog.

"The method of producing the serum is briefly as follows:

"A vigorous immune hog—that is, one which has recovered from an attack of hog cholera or one which has been exposed to the disease without contracting it—is treated with a large quantity of blood from a hog sick of hog cholera. After a week or two blood is drawn from the immune by cutting off the end of the tail. After standing, the blood clot is removed and the serum or fluid portion of the blood is mixed with a weak solution of carbolic acid and filled into sterilized bottles. We have in this fluid portion of the immune's blood the serum which will protect hogs from cholera. This serum is used in either one of two ways, namely, (1) the serum inoculation, and (2) the simultaneous inoculation. These two methods of treatment are carried out as follows:

"*Serum inoculation.*—The hogs which are to be pro-

tected are injected on the inside of the hind-leg with a suitable dose of the serum alone. This injection will serve to protect hogs from hog cholera for several weeks and, in some cases, for a longer time. But if the hog is not exposed to hog cholera within a few weeks after this treatment, the immunity which is conferred by the serum will gradually lessen in degree and the hog may again become susceptible. If, however, the hog is exposed to cholera within a short time after the injection of the serum, the immunity becomes, so far as experiments have shown, of permanent and life-long duration.

"The injection of the serum alone is especially to be recommended in cases where there is immediate danger of exposure, especially when valuable hogs are carried to fairs, and in herds where the disease has already broken out but has not progressed very far. In herbs of this character all of the well animals may be treated, and even in the case of slightly sick animals much good may be accomplished by the serum injection.

"*Simultaneous inoculation.*—In this form of vaccination the same serum is used as is employed when the serum alone is used, but in addition to the serum there is injected on the opposite side of the body, in the same manner as the serum, a very small amount of blood taken from a hog sick of cholera. This simultaneous injection of serum and virulent blood confers upon the injected pig a permanent and lasting immunity, and is therefore to be recommended in cases of well herds which may not be exposed for some months after the treatment.

"*Safety of the methods.*—Properly prepared serum used alone, without the employment of blood from a sick hog, is harmless and incapable of giving rise to an attack of cholera. Nor does this injection interfere in any way with the growth of the treated hogs.

"The simultaneous inoculation, involving as it does the use of a disease-producing virus, requires much more care when employed than does the serum-alone inoculation, for, if from any cause the serum should be weaker than required, injury to the vaccinated hog might result. This danger is extremely slight when carefully tested serum is used.

"In deciding which method to use one must be governed largely by the length of immunity which is required. If this is needed for only a few weeks, or if the treatment can be repeated at short intervals, as in the case of exceptionally valuable pure-bred hogs, where the increased cost would not be objected to, the serum alone may be used. In other cases the simultaneous method is recommended. In either process of vaccination it is considered highly desirable for the treatment to be applied by competent veterinarians who have had special training in this class of work, and only such skilled men should employ the simultaneous process. After treatment by the simultaneous method the herd should be kept under observation for ten days or two weeks, and if any of the inoculated hogs show serious symptoms of disease the herd should be immediately re-treated with the serum alone. When properly performed, the simultaneous inoculation does not seem to injure the hog or interfere with its growth in any way,

and if the precautions indicated are taken it is safe enough for practical use.

"While in practice the serum may not always give as good results as have generally been obtained, there can be no doubt that if used properly and in the early period of an outbreak of cholera it will effect a very large saving.

"The Department of Agriculture has brought this method of preventing hog cholera to the attention of the various state experiment stations and live stock sanitary boards throughout the country, and has proposed to them that they prepare a serum for the benefit of hog raisers, as the preparation of serum by the Federal Government on a large enough scale to supply the needs of the entire country seemed to be impracticable. As a result of this, a number of the states have taken up the work, and in practically all cases where a thorough test has been made they have confirmed the results obtained by the department with this method. We therefore feel safe in saying that this process will prevent cholera, provided due care is given to the preparation of the serum and to its application.

"The serum preparation is of such a nature that it should not be undertaken by farmers themselves, but should be under the control of trained men who have had experience in bacteriology and who are also thoroughly familiar with the diseases which affect hogs.

"It should be remembered that this serum is to be used especially as a preventive, and that little success can be expected in herds which are badly affected with cholera. An early application is essential, and in the

states which have taken up this work the farmers should notify the proper authorities immediately upon their hogs becoming ill, so that they may be treated at once.

"Inasmuch as the serum described is a comparatively new substance, it is not to be expected that success will always follow its use, but as it has been already definitely proved that hog cholera may be prevented with this serum, the failures, if they occur, will be caused by local conditions or variations in the details of serum production, which can be corrected.

"The United States Department of Agriculture does not prepare anti-hog cholera serum for distribution. Those who wish to obtain it should apply to their respective state veterinarians or agricultural colleges."

### BURNING CHOLERA CARCASSES

Burning is the preferable method of disposing of infected carcasses. The wood should not be piled over the carcass, as this impedes circulation of the air. Start a good fire and place on it one carcass at a time until all have been destroyed.

### TUBERCULOSIS

Because of its insidious nature, tuberculosis is more to be dreaded than cholera. The rapid manner in which a hog will lay on fat seems to enable him successfully to resist the destructive nature of the disease until he can be sent to the packer. At times, however, the symptoms of tuberculosis may be observed through a noticeable enlargement of parts of the body, particularly the glands of the neck, accompanied with diarrhea

and swelling of the joints. An affected animal will sometimes show loss of flesh, and in this case the disease has usually reached the stage which means the death of the hog in a comparatively short time, usually in a few weeks.

The United States Bureau of Animal Industry estimated in 1906 (Bulletin No. 38) that the approximate number of carcasses of hogs condemned annually by Federal meat inspectors because of tuberculosis totals 65,000, valued at $780,000, and in addition to these there were, in 1905, 142,105 parts of hog carcasses condemned for the same cause. This total of $780,000 is nearly double the amount representing the value of beef carcasses annually condemned because of tuberculosis, and the value is steadily on the increase.

The main source of contagion is from the skimmed milk and droppings of dairy cows, and tuberculosis in swine is most prevalent in the dairy sections. Scientists generally agree that the tuberculosis of hogs and other mammals may be communicated to human beings, and that tuberculosis of human beings is communicable to swine, dogs and cats, although not generally communicable to cattle.

Tuberculosis is due to a microbe which multiplies only inside the animal body and produces tuberculosis among all domestic animals and a great many wild animals. A full description of the manner of infection through the tubercular bacillus is given in "Tuberculosis of the Food Producing Animals," prepared by Salmon as Bulletin No. 38 of the Bureau of Animal Industry, United States Department of Agriculture.

Up to within a recent time, knowledge of tuberculosis as affecting swine has been quite limited, as most observations of the disease in animals had been in connection with cattle. Its spread among hogs, has, however, been so rapid that increased attention has of late been given to its dangerous character and to measures of prevention. In states, as in Wisconsin, where the pasteurization of skimmed milk used for feeding is required, a very extensive source of contagion is thereby removed. Packers have in some instances been compelled to protect themselves by refusing to purchase hogs from a notoriously infected district. In many cases, however, this method is regarded as drastic, and, as Doctor Salmon has said, "There are probably but a small proportion of the shippers of tubercular hogs who know that they have this disease in their herds, and the evidence of the fact which is discovered in the abbattoirs is never brought to their attention."

It seems probable that the combined efforts of federal and state authorities, the packers and the hog raisers, are essential to the control of this disease in swine, and that its eradication must be conducted co-ordinately with a similar movement for eradicating it from cattle. A first essential to this is a realization by the owners of hogs or cattle of the great danger attending the disease. Assuredly, no one who stops to consider that he may be planting the seeds of consumption in members of his own family would hesitate to assist in taking decisive measures! When this possibility is realized generally, and is brought home, the solution of the problem will be much nearer at hand. Even if looked at from a purely

monetary point of view the eradication of the disease would, in itself, within a very few years, make good the expense incurred, through the saving of animals that would otherwise be condemned.

The number of herds in which tuberculosis exists is small as compared with the number of animals affected. This fact in one way makes the eradication problem easier; but in another it is thereby the more difficult, since farmers generally do not realize that the dangers from tuberculosis are much greater than those from cholera, which leaves ravages so boldly apparent to the eye and the pocketbook. Dr. Burton Rogers of the Kansas experiment station is satisfied, as a result of investigations made at different times, that less than six per cent of the hog raisers of the country send to market animals affected with tuberculosis. He found, in tagging 3,430 hogs, brought to market in 626 different wagons, that only 39 farmers had brought in hogs that were affected. This was in a district where tuberculosis was supposed to be especially prevalent. Dr. Rogers believes that the only solution of the animal tuberculosis problem is for the 94 per cent of the farmers who do not have tuberculosis in their herds to insist upon the stamping out of the disease by the six per cent who own affected herds.

The Bureau of Animal Industry (Bulletin No. 88) says: "The feces of cattle that swallow tubercle bacilli are highly infectious for hogs that are exposed to them. The feces of tuberculous cattle very probably contain numerous tubercle bacilli that reach the intestines through swallowing or otherwise. . . . We judge from experiments made in which hogs were fed large quantities

of such milk that of the two methods—the exposure of hogs to the feces or to the milk of tuberculous cattle—the former has by far the greater damage, entirely apart from the fact that exposure to the feces in the manner in which it occurs is never a simple exposure to one thing, but a general exposure to all the infectious material that may pass from cattle, irrespective of whether they are milk-producing animals or not. . . . It is a question whether the tuberculosis that occurs among hogs associated with dairy establishments is not more directly traceable to the feces of tuberculous cows than to skim milk. . . .

"No farmer and no dairyman who is acquainted with the value of the undigested grain or other nutriment in cattle feces as a food for hogs, fails to feed as much of it as he possibly can. . . . The system in practice in many portions of the country of turning a herd of hogs behind a herd of cattle that are being fattened for market may be accountable for tuberculosis among hogs if the disease exists among the cattle. Hogs associated in this way with cattle may be protected effectually from tuberculosis by applying the tuberculin test to the cattle and removing every animal from the herd that shows a reaction indicative of the presence of tuberculosis. And it is strongly recommended that in regions where tuberculosis among hogs has been discovered, the cattle with which they are associated be first of all tested, and reacting animals segregated or disposed of in a way that will insure against further harm from them. . . .

"The feces of tuberculous cattle are a menace to hogs even when not deliberately fed to them. Very few es-

tablishments that keep both hogs and cattle make provisions effectually to prevent the access of the former to the manure heap on which the droppings of the latter are thrown. No farmer or stockman intentionally practices a system of feeding that is lacking in economy, and to know the benefits that are derived by hogs from the manure heap of stables containing heavily grain-fed dairy or beef cattle immediately causes its location in the hog yard. This practice is not harmful when the cattle are healthy, but when they are affected with tuberculosis, it means, in the light of the evidence we now have, an almost certain transference of the disease to the hogs."

The tuberculin test used upon cattle is practicable for hogs, and its results fully as reliable, if the hogs are kept quiet throughout the test and for some time before. This was demonstrated by the Bureau of Animal Industry (Bulletin No. 88). As keeping hogs quiet is ordinarily quite difficult, and yet essential, the application of the test to swine is a more uncertain undertaking than it is with cattle.

### SOME INTESTINAL AND OTHER WORMS

The hog is host for a variety of intestinal worms. It is doubtful if more than a small percentage of swine growers realize the extent to which hogs are, ordinarily, infested with worms, or the menace these parasites are to the health, thrift and lives of their animals. One intelligent observer ventures to express the belief that half the ills or diseases which afflict swine are traceable, directly or indirectly, to worms. A hog afflicted with

worms cannot grow or thrive to best advantage, because of being in an abnormal condition, and in such a condition must, further, be more susceptible to attacks of disease. Among the worms more common to the hog are the Pin worm, Long Thread worm, Round worm (most common), Thorn-headed worm, and the Kidney worm; also one called *Strongylus dentatus*, which lives in the intestines, and *Strongylus elongatus*, which lives in the lungs and air passages, and others of less importance. Dr. D. McIntosh, of the University of Illinois, in his work entitled "Diseases of Swine" treats of these worms comprehensively thus:

### PIN WORMS

"The seat of these worms is the rectum, but they are sometimes found in the colon, and have been seen in the stomach; on this account they have been called the maw-worm. They are usually about ½ inch long and white in color; they multiply very rapidly; their eggs are very small, and are often deposited on the grass, and may be washed into the streams or ponds of water and in this way enter the stomach and bowels. They are found in all the higher animals. They usually cause itching at the root of the tail, or by reflex action cause derangement of other parts of the body. Though productive of great annoyance and even suffering, they do not usually injure the health of the animal.

"Clean out the rectum by injections of warm water. Infuse two ounces of quassia chips in one pint of boiling water, and when cool, inject it into the rectum; re-

peat in a week if necessary. A brisk purge will often wash out a number of them.

### LONG THREAD WORM

"This is found most frequently in some part of the colon and cecum, but sometimes in the small intestines, either loose or with its anterior capillary portion inserted into the mucous membrane. It is often observed in great numbers in animals that have died from some acute disease. I have found numbers of these worms partially buried in the mucous membrane, but they did not seem to have caused much disturbance. They are about ½ inch to 1½ inches long, about as thick as a common thread, and are very active in their motion. From experiments that have been made, it appears that the ova are never developed in the animal body, but being discharged with the feces, retain their vitality for a long time, and if placed in water, become at the end of about eight and a half months developed into embryos, about 1-300 of an inch in length. It is probable that these are carried by the rain and other means into streams, wells, etc., whence the drinking water is derived, and thus they become fully developed. There are no particular symptoms by which we can detect this worm from others during the life of the animal, and the treatment would be the same as for the Thorn-headed worm. Very often when worm medicine is given, a variety of worms will be discharged at the same time.

### ROUND WORM

"A round, smooth worm of considerable size; the male usually reaches, when fully developed, six inches,

and the female may be twice that length. This worm usually does no harm when there are only a few present. The animal will likely keep in good health, but when they are numerous, they will disturb digestion and cause colicky pains, loss of flesh, dry hair, morbid appetite, restlessness and nervous twitching, and in some cases, fits. Cases are recorded in which they worked through the walls of the intestines and, reaching some of the other organs of the body, caused death This worm generally inhabits the small intestine, but not infrequently finds its way forward to the stomach, or backwards to the rectum, and sometimes escapes from the intestine through the anus. This worm has also been found in the biliary duct, gall bladder, and the substance of the liver. There have been a number of experiments made to find the origin of this worm, and it is found that its eggs are passed from the bowel. They retain their vitality for a long time; they appear never to be developed in the bowels, but when discharged and kept in water they begin to show signs of life, and in about seven months contain embryo worms 1-120 of an inch in length. These have not been seen to break shell, but the ova, carried into streams, ponds, and wells, sometimes probably find an entrance into the stomach with the drinking water, when the embryo escapes from its shell and completes its growth in the intestine.

"The best remedy for this worm is the fluid extract of spigelia and senna, given in ½-ounce doses every four hours until it causes purging. Wormseed oil (chenopodium), in doses of from five to ten drops, given in a tablespoonful of castor oil, is also good. Turpentine

in doses of from 15 to 20 drops, three times a day, followed by castor oil or epsom salts, is useful. The cedar apple, an excrescence found on the red cedar, has been used with good results, in doses of from 20 to 25 grains of the powder, repeated three times a day, followed by a physic.

THE ROUND WORM

**THORN-HEADED WORM**

"This is quite frequently found in the intestines of pigs; it is easily known by the peculiar proboscis, which bears several circles of small but sharp hooks. They locate usually in the small intestines of the pig, where they fasten themselves by means of the spiny proboscis mentioned above, this being pushed into the lining membrane of the intestine. In some cases they bore through this and migrate to other parts of the body, where their presence causes great disturbance. The eggs of this worm pass from the hog and are eaten by the grubs of certain large beetles; in the stomach of these grubs the eggs develop into embryos, or, rather the embryos already developed are set free and bore through the intestine and locate themselves in the body of the grub. Here they become encysted and remain dormant until the grub is eaten by the pig, and then once in the stomach or intestine of this animal it develops into a worm at once. The color of this worm is white or bluish white, the female being from 5 to 20 inches in length, while the male is from 3 to 5 inches long. The female is very

prolific, producing immense numbers of eggs, which are of a somewhat oblong-oval shape.

"Pigs may have a number of these worms without their causing any noticeable derangement; on the other hand, they often derange the digestion and assimilation, causing loss of flesh and a general unhealthy appearance. The animal is usually hungry and may eat large quantities of food and yet remain thin. When a pig has such symptoms, with the absence of any other ailment, we may suspect that worms are the cause. In very bad cases the pig becomes weak in the loins and the membrane in the corners of the eyes swollen, red and watery; the animal suffers pain, which is indicated by it continually grunting or squealing; such hogs are usually bad tempered and will bite and snarl at the other pigs. In some cases the weakness increases and the animal is unable to stand, and soon dies.

"This worm is easily removed by medicine. Give one-half ounce of the fluid extract of spigelia and senna at a dose every four hours until purging takes place, or 30 grains of koosin as a pill; one dose of this is usually sufficient. Another good remedy is to beat up two ounces of pumpkin seeds into a pulp with sugar and give at one dose; this should be followed in four hours with a brisk physic—castor oil or epsom salts. Santonine is also useful in from three to five-grain doses made into a pill. *Chenopodic oleum* (wormseed oil), in from 20 to 30 drops may be given in a little syrup, followed in two hours by a purge. These medicines should be given on an empty stomach. If the animal has become very weak the strength should be kept up by stimulants, such

as small doses of whisky and cod-liver oil, or whisky and eggs; and if there is fever, two to four grains of quinine should be given at a dose three times a day.

### KIDNEY WORM

"This is found in the kidneys of all the domestic animals and in man, although it is rare. It is a large worm, and it is said that sometimes the female becomes 3 feet long and ½ inch in diameter, although usually much

THE KIDNEY WORM

less. The male becomes 10 to 12 inches long. They are usually only a few inches long. The body is smooth, round and tapering somewhat to each end, and of a deep red color. When such worms are present in the kidneys they gradually, but completely, destroy the substance of the kidney, which becomes filled with purulent matter, upon which the worm feeds, while the walls often become hardened with calcareous deposits. The effects and symptoms are the same as in other acute diseases or abscesses in one of the kidneys. The only positive proof of the presence of the worms would be the discovery of the eggs in the urine. It is probable that no remedy can be applied when the parasite is once lodged in the kidney. The history of this worm is not fully known. (Verill.)

"I have found live worms in the kidneys of both the pig and dog, and the kidneys were perfectly healthy, and neither animal seemed to be in any way affected by them. The loss of power of the hind parts of pigs, which has been attributed to kidney worms, is not due to a parasite, but to paralysis of the muscles of the hind parts. I have made careful investigations of such cases, but failed to find any worms or any disease of the kidneys. Paralysis of the hind parts would not be the symptom of kidney disease.

THE STRONGYLUS DENTATUS

**STRONGYLUS DENTATUS**

"This worm is found in the intestines of swine. It is a slender, filiform worm about ½ inch long; the head is obtuse and surrounded by six acute papillæ; the esophagus is short, thick and muscular; in the male the tail is truncated and provided with an oblique bursa; in the female it is elongated and slender, ending in a fine point; the genital opening is near the posterior end. The history of this worm is not known. It does not seem to do much harm. The usual treatment for worms is nearly always effectual in bringing them away. I have seen quite a number of them mixed with other worms in the feces of a hog that had been treated for worms.

### STRONGYLUS ELONGATUS

"This species lives in the lungs and air passages. It is about 1 to 1½ inches long. They often occur singly or several together. When they are numerous they set up great disturbance, often resulting in the death of the host. The first symptom of the disease is a cough, usually slight at first, but soon becoming very distressing, and the pig shows signs of suffocation, which sometimes takes place, or inflammation may set in and carry the animal off. This disease is often taken for catarrh or some other respiratory trouble, and it is very difficult to diagnose unless a worm which has been coughed up may be seen protruding from the nose.

"Treatment is not easy. Small quantities of turpentine injected into the nostrils may reach the worms. Turpentine given in teaspoonful doses three times daily will sometimes be of use, as the turpentine is partly eliminated by the lungs. Inhaling the fumes of carbolic acid is also useful.

### SPIROPTERA STRONGYLINE

"There are a number of small, whitish or reddish round worms which taper somewhat toward the anterior end, or toward both ends. The head is small, with small papillæ or naked; the male grows to about ½ inch long or more; the female 1-3 inch or more; it lives in the stomach of the pig, but generally does not produce any serious disease. The fluid extract of spigelia and senna in ½ ounce doses, given every four hours until purging ensues, usually dislodges them.

### SCLEROSTOTUM DENTATUM

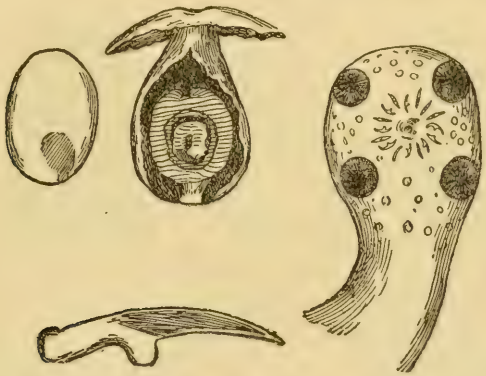
"This is a small worm living in the intestines of swine. The male is about 1-3 inch long; the female ½ inch long; the body is of a dark color and the surface is finely marked with transverse striæ. It is quite slender and tapering at each end, but the male has near the tail a three-lobed expansion. The eggs are laid in the intestine, from which they pass out into the open air and are soon hatched. The mouth of this worm is circular and armed with six teeth, by means of which it attaches itself to the intestine and pierces the tissue, feeding upon the blood. If there are many of them they create such a drain on the system of their host as to weaken and possibly destroy it. It may also by its irritation of the bowels cause serious trouble and disease. An active purge is the best remedy for the removal of this worm."

### MEASLES AND TRICHINA

*By Dr. C. J. Sihler, formerly of the United States Bureau of Animal Industry.*—The illustrations give some idea of the appearance of two muscle parasites which are easily communicated to man by the consumption of the uncooked flesh of infested animals. They are the muscle or cysticercus and the *Trichina spiralis*. Measles in the pig is the cystic form of tapeworm (*Taenia solium*) in man. From the earliest ages its existence in the pig was known; but only after years of experiment, and not until about the year 1845, was the true nature of this parasite, and its identity with the tapeworm in man, established. There are,

however, three distinct species of tapeworm which infest man, derived from the pig, ox and fish, but the measle in the pig is the most common. Measles in swine have no resemblance nor any relation to the disease by that name which afflicts the human.

Infection from this source is much more rare than formerly, since we have become better acquainted with



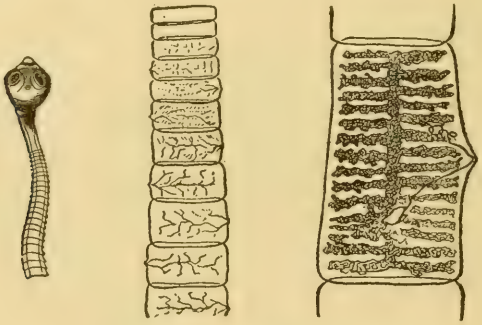
MEASLES OR TAPEWORM IN SWINE

the nature of the parasite, and the inspection of meat and the improved methods of raising pigs have lessened the liability.

The above figure shows the cyst as it appears when taken from the muscular tissue; also the head of the parasite and one of the hooks, the last two being highly magnified.

At the left is the cyst or sack containing the parasite and is filled with a clear fluid. In size it varies from a very small to a large pea, and is found in greater or less numbers in the muscles. In the center is the cyst with

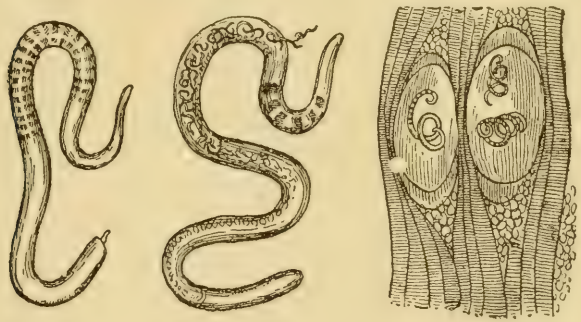
walls removed, and showing the embryo and manner in which it is deported. At the right is the head of the parasite, showing the rostellum or hooks with which it attaches itself to the inner coat of the intestine; also, the four sucker discs which serve the same purpose. And below is shown one of the hooks very highly magnified.



ADULT OF THE SWINE TAPEWORM

Herewith are shown parts of the adult worm. The left sketch shows head and neck of the worm as it develops after finding a lodging place in the intestine; the center shows segments still more developed but not yet mature; while at the right we observe a fully developed section. Let it be clearly understood that the tapeworm, no matter what its species, does not live and grow by sustenance obtained through the head, but by absorption through its body walls. Each of the segments as shown in the figure is complete in itself, containing male and female sexual organs, and is capable of producing from 3000 to 6000 eggs. In the single mature section shown, the genital pore is easily observed. This parasite can

be easily detected in the flesh of an infested hog by an observing person. The red meat is much paler and softer than that of healthy meat. When cut it presents a watery appearance, caused by the knife dividing the numerous cysts containing the fluid heretofore spoken of. This much as to how the human family becomes infested with this parasite. As to how to get rid of it, I will refer you to my eminent brothers of the medical profession, who can give you much information on this subject which does not properly belong to a paper of this nature.



THE TRICHINA WORM

In the figure above is shown the trichina, an entirely different parasite, which humanity derives almost solely from the pig. This parasite is one with which the public is but little acquainted, but is the one which caused several of the European countries to place an embargo on the import of the products of the American hog. To overcome this embargo, only meat which has been microscopically examined is sent to the objecting countries. In this figure is seen the mature worm and also those in

a larval state. At the left the mature male worm is shown, and in the center the female. The male is the smaller of the two, and is easily distinguished from the female. They reproduce themselves within a few days after lodgment in the intestines and in great numbers, one female yielding from 5,000 to 15,000 living young. The young, which can be seen in the figure in the act of emission, begin their migration soon after birth and reach the voluntary muscles in a manner yet somewhat in doubt, after which they become encysted, as shown at the right. They remain in this state until they are again taken into the stomach, where they are liberated by the gastric juice and again reproduce themselves. These parasites are only visible under the microscope, and for this reason their presence in the system may escape the notice of the ordinary practitioner.

### QUESTIONS AND ANSWERS

If the embryo tapeworm is taken into the human stomach, does it remain there in a different state, or does it pass into a different part? *Answer.* When the measle in its cystic form is taken into the stomach, the gastric juice dissolves the cyst, liberating the embryo. It then passes into the intestines, where it affixes itself and develops into a mature worm.

How does the pig get the measles? *Answer.* By eating the mature segments or eggs which are discharged with the excrement by persons having *Tænia solium,* the ordinary tapeworm.

Is this disease called measles frequently found in the hog? *Answer.* Only occasionally in this country, but it is quite common in some of the European countries.

Is the full-grown worm found in the intestines of the pig? *Answer.* Only the cystic form is found in the pig. The adult is only found in man.

Do pigs have any species of the adult tapeworm? *Answer.* No, but they harbor a great many other intestinal parasites.

How can one who is not an expert detect the presence of trichina in the flesh of the pig? *Answer.* Without the aid of a microscope it is impossible.

Does ordinary cooking destroy the liability to become infested with trichina? *Answer.* Yes. The danger lies in eating imperfectly cooked meat. In some of the European countries the flesh of the pig is eaten raw, or nearly so, which accounts for the greater prevalence of the disease there than in this country.

How long after eating the infested meat before trichinosis develops in man? *Answer.* From eight to 12 days.

Do not smoking and salting destroy the worms? *Answer.* They may have some influence on those on the surface of ordinarily cured meat, but the worms in the middle are found to be alive and active.

### MANGE

Mange is a parasitic disease, but not difficult to cure, and seldom causes death. It is caused by a parasite which burrows under the scarf skin, producing considerable irritation, destroying it so that scabs form, and on

account of the great itchiness on the part the animal rubs it, causing the part to become a rough sore. It is contagious from one pig to another; it generally appears first on the thin parts of the skin under the arm, behind the ear, inside of the thighs and upon the back. In the early stage it resembles eczema, but if the eyesight is good and assisted by the bright sunlight, the parasites may be seen as a moving white speck; they can be readily seen by using a small magnifying glass.

Doctor McIntosh says: "This disease is transmitted by contagion; that is, the parasites themselves or their eggs must get on the skin in order to produce the disease. All unaffected pigs should be removed from the premises where the diseased ones are or have been, and the woodwork of the sties washed with a strong solution of carbolic acid. Wash the pigs all over with soft soap and water, then rub in well dry sulphur. When the sulphur comes in contact with secretions from the sores, it forms a compound poisonous to the parasites. In a day or two give the animal another washing, and rub on some more sulphur. A very sure remedy is to boil for one hour two ounces of stavesacre seeds in 1½ quarts of water, and keep it nearly boiling for an hour longer; make up the water to the quantity originally used. Such a solution, rubbed into the skin, not only kills the parasite, but its eggs also. Repeat in a week if necessary. Another is to steep one part of tobacco in 20 parts of boiling water for a few hours, and, after washing the pig, apply a little of this to the affected parts with a sponge. If the surface to be covered is large, only apply it to one part today and to the other tomorrow. For instance,

if the neck and the legs are affected, apply to the neck first, then to the other parts the day following, and there will be no bad results from the use of the tobacco, and it is an excellent remedy when carefully used."

Some very excellent advice along this line, the outgrowth of practical experience, is written out by James Atkinson, thus: "Mange, or scurviness (the latter being simply the resulting product of the mange organism) is an enemy of thrift and growth, and one of the best and most up-to-date ways that we know to waste feed is to shovel it into a bunch of mangy or scurvy hogs. As a rule, they spend half their time scratching and the rest of the time thinking about it.

"It is one ailment, however, for which there is an absolute specific, and that is a good coal tar dip. If we had a bunch of mangy hogs on hand and did not have access to a dipping tank we would order a spray pump—one that could be used for spraying the orchards afterward, if necessary. Round the pigs into a shed, mix up the dip according to directions and turn the pump loose. This will literally saturate the hogs as well as their bedding. If it is at all cold keep them in the shed for a few hours after they are sprayed. The idea is simply to keep the hogs out of a draft for fear they will catch cold. If they are kept together they will soon warm up after the application of the cold dip, and when they are dry they can be turned out without risk. Of course, if enough dip is used to thoroughly saturate their bedding the shed should afterward be cleaned and fresh bedding put in.

"It may require the second application of dip to absolutely free them of scurf, though one good one with a dip used a little strong will generally do the work. Some of the dip companies sell at a reasonable price a small compressed air pump, which is exceedingly handy, and one should be found on every farm. A man can throw one of these over his shoulder and pass through a bunch of hogs or into the hog or poultry quarters and disinfect every crevice. On a big bunch of hogs it would not be a difficult matter to save the price of a good spraying outfit and a five-gallon can of dip in the value of the feed in a single week. A good dip comes nearer performing miracles on the skin of an unhealthy hog than anything else that we are familiar with. Five or ten dollars' worth of good dip is the best investment that the average swine breeder can make, because these dips have powerful disinfecting qualities without being skin irritants."

### SCOURS

Various homely farm remedies are utilized for scours in pigs, among them being black walnut bark soaked in the swill barrel ten or 15 hours, or tea from white oak bark, made strong and given to the sows (a pint of it, more or less) once or twice a day in their slop. Sulphur mixed in the slop is often recommended, in doses of a tablespoonful each day for three or four days to each sow. It may be necessary to repeat this treatment after three or four days. The sows should be kept in dry quarters.

L. N. Bonham says: "We look upon scours as evidence of indigestion or cold. Whenever we find any derangement of this kind we at once try to find the cause. It may be that the sow has been overfed or her slop has been changed, or she has found some impure or unwholesome feed the effect of which is seen in the pigs. We have known litters to be put out of fix by giving a sow a feed of very sour buttermilk or stale milk. We know a case where the pigs were made sick from the sow getting out of a clean pen and grass lot into a filthy barnyard and coming back to her pigs covered with the filth of a wallow. We have known the disorder to follow a change of pen, causing the pigs to take cold. A wet bed or pen is a most prolific source of scours. Pigs that have dry, clean beds and pens may be put out of condition by one run in wet grass or clover, or going with the sow into wet places where they are chilled, or where the sow gets rank roots or coarse growth that she is not accustomed to. Sudden changes of weather, or from sound to unsound feed, sweet to sour feed, or even a single overfeed, are common causes of the disorder.

"After the pigs are four to five weeks old and have learned to eat with the sow, they are not so quickly influenced by the condition of the sow. If one can feed a sow so regularly as to secure her against the accidents of weather and neglect of attendants he can hope to avoid disorders of bowels in the young pigs. If derangement arises from improper feeding it must be cured by correcting the condition of the sow by change of feed. Usually the condition of the sow will come right by care to have her food sound and given regularly in moderate

quantity. Parched corn and scalded milk for one or two feeds will usually correct the trouble arising from indigestion or wrong feed. If the trouble comes from damp beds the cause must be removed. The antidote is dry quarters. Keep them clean and dry. Let in the sunshine. Cover the droppings with fresh earth or dry soil, and clean the pens often.

"Cleanliness, sunshine and sound, wholesome feed given judiciously will usually correct such bowel derangements better than drugs. Charcoal is a corrective. Too many go to the opposite extreme and change looseness to constipation, which is only a change from one bad condition to another. The trouble is hard to manage in cloudy, rainy weather, especially where the shelter is poor and the lots are muddy and uncomfortable."

One good authority says: "To each pig two or three weeks old give a teaspoonful each of castor oil and glycerin at a dose. After the physic operates, if the scours still continue, give five drops each of tincture of opium and spirits of camphor in a dessertspoonful of water at a dose every four hours until cured. Be careful about feeding too rich food to the sows, or feeding soured swill or slop. Keep the pens clean and dry, and see that sows and pigs get plenty of fresh air and sunshine, plenty of exercise and plenty of good, fresh water."

A. J. Lovejoy says a never-failing remedy for white scours in young pigs is to reduce the richness of the sow's feed and give her in slop twice a day a tablespoonful of sulphur for two days.

### CONSTIPATION

This occurs most frequently in winter. It may be relieved with salts or bran mashes containing sulphur. Warm soapsuds used as an injection is useful, and soft soap given in the feed will often afford relief. Such foods as pumpkins, apples or roots are very helpful as correctives, and usually will be sufficient to bring about a normal condition.

### DEATHS FROM EATING COCKLEBURS

Every year there are reports of losses of swine "poisoned" by eating cockleburs or cocklebur plants. These reports almost invariably describe the losses as occurring at times when the hogs have access to ground where young cocklebur plants have made a growth of but 2 or 3 inches. The hogs eat these plants and root up and eat some of the burs from which they are growing, with sometimes, but not always, fatal results. It appears that such slight investigations as have been made, so far, have not definitely demonstrated whether the hogs are poisoned by some property in the young plant, or in the meat of the bur, or whether it is taking the bur, or rather its rough and irritating hull, into the stomach, that does the harm. The exact nature of the ailment, or its cure, are not known; hence immunity is only assured by keeping swine off ground infested with cocklebur. In sending up its shoot the hull or outer, rough coating of the bur is carried on top of the young plant, and in grazing on the plants, swine are liable to swallow the coatings, some of which may find lodgment in the throat.

It is said that an investigation made by a veterinarian at the Indiana experiment station convinced him that lodging of the hulls in the throat or stomach, with resultant irritation, choking, ulceration and perhaps blood poisoning is what does the mischief. Pigs fed the plants divested of bur hulls showed no ill effects.

### CANKER SORE MOUTH IN YOUNG PIGS

Large water blisters appear about the mouth and snout, rapidly succeeded by much heat and swelling of the parts, and later thick brown scabs appear which open into deep cracks. These scabs extend over the face, head, and even to the body and limbs, the joints of the latter becoming much swollen and inflamed. Ulcers often form about the snout and jaws, eating the flesh from the bone. There is dullness and a disinclination to move, and often to suck the young pigs. The treatment, which should be prompt and thorough, is a solution of permanganate of potash, using one ounce of the crystals dissolved in a gallon of water in a common pail. In extreme cases, use two ounces to a gallon of water. The young pigs should be dipped head foremost into the solution and kept there for a brief time. Repeat this two or three times, giving the pig time to catch its breath in the intermissions. This treatment continued for three or four days will usually effect a cure, if the disease is not of too long standing. Having successive litters of pigs farrowed in the same pen should be avoided where this disease has been prevalent, until the pen has been thoroughly disinfected.

A correspondent of *Hoard's Dairyman* gives the following experience: "I had 25 good pigs affected with canker sore mouth and nose; one litter had scabs extending over most of the head and some of these had scabs on their ears. I used an ounce of permanganate of potash dissolved in 1½ gallons of water, and I thoroughly dipped the head of each pig about twice, a few seconds each time, just so as to cover the affected portion. I used an ordinary 20-pound lard bucket. Later I put the dipped pigs in a small pen to dry for an hour. I then greased the affected parts with the ordinary veterinary vaseline and carbolic acid made into a salve by melting. Three applications completely cured my pigs without any loss or injury. I consider the malady very easily cured if treated in time. If you are a close observer you will notice that in the beginning the part just back of the nose commences to wrinkle. Then is the time to apply the remedy, and two applications will cure. It is inexpensive and easily applied. The permanganate of potash destroys the parasite, and the vaseline and carbolic acid heal the sores."

### BLACK TEETH

A great deal has been said and written on this subject, but the majority of the veterinary profession now consider black teeth as nothing serious. Doctor McIntosh has studied black teeth, and never been able to connect them with any of the diseases affecting pigs, and in the majority of cases it seems to him they do no harm. "I have no doubt, however, that pigs suffer as well

as other animals from toothache, but I have never seen any cases where I could detect it. I am not able to account for the cause of black teeth unless it be natural for some hogs to have them. If it should be discovered that a hog has a decayed tooth and is apparently suffering from it, by all means have it removed, which can easily be done with a pair of wolf teeth forceps. I can advise swine breeders not to trouble themselves if they should notice some of their pigs having discolored teeth."

### THUMPS

For thumps this has been recommended: "Drive the pigs out of their beds into the sunshine, and see that they take exercise every day. Decrease the sow's milk-producing food till the pigs are older. Be sure they have a clean bed and plenty of exercise and they will not be troubled with thumps or sore tails. Thumps in larger pigs is sometimes caused from an affection of the lungs, but never in a pig three weeks old. Early pigs are more apt to have thumps than later ones, as in cold weather they stay close to the nest." Doctor McIntosh says thumps is palpitation of the heart and its most frequent cause is a morbid condition of the system from feeding too much corn or food deficient in nitrogen.

### QUINSY

This is characterized by sore throat and the appearance of a swelling on the sides of the neck at the angle of the lower jaw and sometimes extending between the wings of the jaw. When the swelling is large it presses

on the upper part of the windpipe, causing difficult breathing, and in some cases suffocation. It is a local disease common to the pig and usually yields to treatment. Give the pig all the cold water it will drink. Put one-half dram of chloride of ammonia in one-half pint of water, and if the animal is thirsty and will drink water, put it in the drinking water; if not, give it from a bottle three times a day. Bathe the neck with hot water and rub on camphorated liniment. If the breathing is difficult give three drops of the fluid extract of belladonna and ten grains of chlorate of potassium three times a day.

### HOGS "BREAKING DOWN"

James Atkinson: "There are a number of ailments that might result in stiffening the hind quarters of hogs. It frequently happens that too heavy feeding of corn causes a weakening of the bones, and the 'animals break down.' This is apt to occur where they are not supplied much pasture, or grains or feeds other than corn. If the ailment is due to corn, use such supplementary feeds as shorts, bran or linseed oil meal. Tankage is also an excellent food in cases of this kind, as it is a most satisfactory flesh and bone builder. Stiffness may be due to rheumatism. This, in our opinion, is the cause of a good deal of trouble among hogs. Sleeping in damp quarters is a cause of this ailment. We have known instances where it resulted when hogs were compelled to sleep on drafty floors. The hog can stand some hardship, but nothing will throw him out of condition quicker than

air drafts that circulate through his sleeping quarters. As the cold nights approach generous bedding will prevent them from piling up and they will consequently do much better than if compelled to sleep on the bare floor or in damp quarters. If the food seems to be responsible for the trouble, it might be necessary to do a little drugging in order to more quickly bring them to their normal condition. We have found that a teaspoonful of sulphur mixed with the food about three times a week will do more for a hog out of condition than anything else. If this is used, however, they must have good, dry quarters, otherwise there is danger of their taking cold, and this may result in lung fever. If charcoal is not available, supplying them with some ordinary coal slack serves a good purpose. It should be given in small quantities at first, because hogs in this condition are usually ravenous for mineral matter, and they may eat too much if they have free access to it."

### GARGET—INFLAMED UDDER

Inflammation of the udder commonly occurs in heavy milkers, and is caused by all of the milk not being removed, says Craig. Frequently it occurs as a result of the milk accumulating in the udder when the sow has lost a part of her litter. Other causes are obstructed teats, injuries to the glandular tissue, and infection from germs. Congestion and inflammation of the udder sometimes follow a difficult birth. Milking the sow two or three times a day will usually relieve its congested condition. 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 an ointment applied daily, made as follows: Extract of belladonna and gum camphor one dram of each, and vaseline three ounces. Hot fomentations may also be used. Sore teats should be bathed daily with one part zinc sulphate, three-fourths part lead acetate, and 30 parts water until healed.

### SUNSTROKE

Fat hogs driven, or even when hauled to market, in hot weather are very susceptible to the heat, and always under such circumstances measures should be taken, as well as in the yards and pastures, to afford protection which will ward off sunstroke. Hogs being shipped to market in hot weather should be frequently wetted with water to keep them cool. A hog suffering from heat or sunstroke should be moved to a shady place and cool water poured on the head and neck, but not on the rest of the body.

Prof. John A. Craig explains why the hog succumbs so unresistingly when overheated. The man or horse when heated soon has the surface of his body covered with perspiration, and the evaporation of this at once begins to reduce his temperature. Nature has made no such provision for the relief of the hog when heated by exposure to the sun or by excessive exercise. This is reason enough why it should have an abundant and convenient water supply, shade, and a convenient bathing or wallowing place, whether on summer pasturage or confined in a lot, and plenty of the green food that is laxative and cooling.

### PIGS LOSING THEIR TAILS

The main cause of pigs' tails becoming sore and falling off is foul nesting and sleeping quarters. The surest protection is cleaning out all bedding within three days after sows farrow, and at least once a week, or oftener, thereafter. If the tail is not too far gone when treated, it can usually be saved by greasing thoroughly with lard containing a little carbolic acid. If nests are kept clean the danger of sore tails will be slight.

### DRENCHING A HOG

Prof. R. A. Craig in his work, "Disease of Swine," gives the following practical suggestions relative to administering medicine as a drench:

"Drenching a hog is not difficult, if the animal is easy to manage and we go about it quietly. The quickest and easiest way to drench a drove of hogs is to drive them into a small pen, where they will have but little room to move about. 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 forefeet off the ground. For this purpose a pulley and rope wire stretcher is recommended. It should be

hung in the most convenient part of the pen, and the animal secured in the usual way by placing a noose around the jaw. The end of the rope is thrown over the hook in the lower pulley and the hog drawn up until it is almost off the floor. 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."

# Appendix

## NUMBERS AND VALUES FOR EACH OF 32 YEARS

| Year. | Number. | Price per head. | Total Farm value. |
|---|---|---|---|
| 1877 | 28,077,100 | $5.66 | $158,873,410 |
| 1878 | 32,262,500 | 4.85 | 156,577,228 |
| 1879 | 34,766,100 | 3.18 | 110,507,788 |
| 1880 | 34,034,100 | 4.28 | 145,781,515 |
| 1881 | 36,247,683 | 4.70 | 170,535,435 |
| 1882 | 44,122,200 | 5.97 | 263,543,195 |
| 1883 | 43,270,086 | 6.75 | 291,951,221 |
| 1884 | 44,200,893 | 5.57 | 246,301,139 |
| 1885 | 45,142,657 | 5.02 | 226,401,683 |
| 1886 | 46,092,043 | 4.26 | 196,569,894 |
| 1887 | 44,612,836 | 4.48 | 200,043,291 |
| 1888 | 44,346,525 | 4.98 | 220,811,082 |
| 1889 | 50,301,592 | 5.79 | 291,307,193 |
| 1890 | 51,602,780 | 4.72 | 243,418,336 |
| 1891 | 50,625,106 | 4.15 | 210,193,923 |
| 1892 | 52,398,019 | 4.60 | 241,031,415 |
| 1893 | 46,094,807 | 6.41 | 295,426,492 |
| 1894 | 45,206,498 | 5.98 | 270,384,626 |
| 1895 | 44,165,716 | 4.97 | 219,501,267 |
| 1896 | 42,842,759 | 4.35 | 186,529,745 |
| 1897 | 40,600,276 | 4.10 | 166,272,770 |
| 1898 | 39,759,993 | 4.39 | 174,351,409 |
| 1899 | 38,651,631 | 4.40 | 170,109,743 |
| 1900 | 37,079,356 | 5.00 | 185,472,321 |
| 1901 | 56,982,142 | 6.20 | 353,012,143 |
| 1902 | 48,698,890 | 7.03 | 342,120,780 |
| 1903 | 46,922,624 | 7.78 | 364,973,688 |
| 1904 | 47,009,367 | 6.15 | 289,224,627 |
| 1905 | 47,320,511 | 5.99 | 283,254,978 |
| 1906 | 52,102,847 | 6.18 | 321,802,571 |
| 1907 | 54,794,439 | 7.62 | 417,791,321 |
| 1908 | 56,084,000 | 6.05 | 339,030,000 |

## LIVE WEIGHTS AND LARD AVERAGES

The average live weight of hogs packed in the West in the winter seasons (ending March 1), and their average yield of lard, in pounds, for each of the 32 years named, as compiled by the *Cincinnati Price Current,* are here shown:

| Year. | Weight. | Lard. | Year. | Weight. | Lard. |
|---|---|---|---|---|---|
| 1879 | 271.42 | 39.40 | 1894 | 248.20 | 36.07 |
| 1880 | 266.17 | 36.32 | 1895 | 232.73 | 33.62 |
| 1881 | 259.63 | 35.65 | 1896 | 240.71 | 35.53 |
| 1882 | 262.70 | 36.44 | 1897 | 244.80 | 36.91 |
| 1883 | 267.02 | 35.43 | 1898 | 235.35 | 34.73 |
| 1884 | 251.44 | 33.25 | 1899 | 232.65 | 35.53 |
| 1885 | 266.51 | 36.02 | 1900 | 235.67 | 35.97 |
| 1886 | 258.98 | 35.22 | 1901 | 230.31 | 34.16 |
| 1887 | 251.31 | 33.54 | 1902 | 206.38 | 31.34 |
| 1888 | 242.30 | 31.06 | 1903 | 224.05 | 31.92 |
| 1889 | 263.46 | 34.76 | 1904 | 223.46 | 32.13 |
| 1890 | 250.92 | 36.37 | 1905 | 221.73 | 31.77 |
| 1891 | 239.75 | 33.45 | 1906 | 222.27 | 32.83 |
| 1892 | 247.64 | 34.69 | 1907 | 222.88 | 32.81 |
| 1893 | 227.73 | 31.66 | 1908 | 221.40 | 31.92 |

The average live weight of hogs and yield of lard from hogs packed in the West in the summer season (ending November 1) for 17 years are given by the same authority as below:

| Year. | Weight. | Lard. | Year. | Weight. | Lard. |
|---|---|---|---|---|---|
| 1891 | 221.76 | 31.39 | 1900 | 228.74 | 34.12 |
| 1892 | 222.42 | 31.23 | 1901 | 219.48 | 31.81 |
| 1893 | 240.41 | 34.04 | 1902 | 223.11 | 31.34 |
| 1894 | 229.98 | 33.05 | 1903 | 231.03 | 32.58 |
| 1895 | 226.52 | 33.10 | 1904 | 222.09 | 32.39 |
| 1896 | 240.76 | 40.61 | 1905 | 221.72 | 33.25 |
| 1897 | 239.12 | 36.41 | 1906 | 223.14 | 32.18 |
| 1898 | 231.36 | 33.24 | 1907 | 230.21 | 32.89 |
| 1899 | 231.46 | 35.66 | | | |

## YEARLY COST OF HOGS

The average cost per hundred pounds of hogs alive, packed in the West in the summer and winter seasons, and the yearly average of cost for each of 24 years are tabulated by the *Price Current* as follows:

| Year. | Sum. | Win. | Year | Year. | Sum. | Win. | Year |
|---|---|---|---|---|---|---|---|
| 1884-85 | $5.35 | $4.29 | $4.70 | 1896-97 | $3.30 | $3.30 | $3.30 |
| 1885-86 | 3.90 | 3.66 | 3.75 | 1897-98 | 3.70 | 3.53 | 3.63 |
| 1886-87 | 4.10 | 4.19 | 4.15 | 1898-99 | 3.85 | 3.52 | 3.71 |
| 1887-88 | 4.75 | 5.04 | 4.90 | 1899-00 | 4.00 | 4.29 | 4.11 |
| 1888-89 | 5.58 | 4.99 | 5.26 | 1900-01 | 5.12 | 5.02 | 5.07 |
| 1889-90 | 4.30 | 3.66 | 3.98 | 1901-02 | 5.92 | 5.97 | 5.94 |
| 1890-91 | 3.91 | 3.54 | 3.74 | 1902-03 | 7.06 | 6.44 | 6.81 |
| 1891-92 | 4.48 | 3.91 | 4.16 | 1903-04 | 6.11 | 4.74 | 5.54 |
| 1892-93 | 5.03 | 6.54 | 5.60 | 1904-05 | 5.16 | 4.67 | 4.93 |
| 1893-94 | 6.33 | 5.26 | 5.87 | 1905-06 | 5.37 | 5.27 | 5.33 |
| 1894-95 | 4.98 | 4.28 | 4.67 | 1906-07 | 6.33 | 6.46 | 6.38 |
| 1895-96 | 4.41 | 3.68 | 4.07 | 1907-08 | 6.20 | 4.47 | 5.52 |

## NUMBERS AND VALUES OF SWINE BY STATES, JANUARY 1, 1908

| State or Territory. | Number. | Average price per head. | Total farm value. | State or Territory | Number. | Average price per head. | Total farm value. |
|---|---|---|---|---|---|---|---|
| Maine | 67,000 | $8.75 | $586,000 | No. Dakota | 233,000 | $7.50 | $1,748,000 |
| New Hampshire | 52,000 | 9.25 | 481,000 | So. Dakota | 903,000 | 7.00 | 6,321,000 |
| Vermont | 99,000 | 8.15 | 807,000 | Nebraska | 4,243,000 | 6.25 | 26,519,000 |
| Massachusetts | 70,000 | 10.25 | 718,000 | Kansas | 2,663,000 | 5.90 | 15,712,000 |
| Rhode Island | 13,000 | 10.00 | 130,000 | Kentucky | 1,274,000 | 4.60 | 5,860,000 |
| Connecticut | 47,000 | 10.50 | 494,000 | Tennessee | 1,502,000 | 4.65 | 6,984,000 |
| New York | 669,000 | 8.90 | 5,954,000 | Alabama | 1,251,000 | 4.60 | 5,755,000 |
| New Jersey | 155,000 | 10.00 | 1,550,000 | Mississippi | 1,316,000 | 4.50 | 5,922,000 |
| Pennsylvania | 990,000 | 7.80 | 7,722,000 | Louisiana | 669,000 | 4.50 | 3,010,000 |
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