

EXPERIMENT STATION
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ANIMAL-HUSBANDRY DEPARTMENT.

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*EXPERIMENTS IN FEEDING STEERS AND IN BREEDING AND
FEEDING PIGS.*

*Feeding Ensilage, Alfalfa Hay and Kafir-corn to Steers of
Different Ages.**

THE 1st of November, 1902, the Kansas Experiment Station purchased eighty head of dehorned steers, of which twenty were classed as three-year-olds, forty as two-year-olds, and twenty as yearlings. Besides these, the Station owned nineteen head of calves (six males and thirteen females), which had been fed experimentally on skim-milk and averaged about six months of age. These steers and calves were secured near Manhattan and represented average quality, the idea being to show what could be done, not with the highest grade of cattle, but with those that are ordinarily handled by the average feeder. The steers were taken directly from pasture and the calves from skim-milk. The two-year-olds were divided as nearly equal as possible as to weight and quality into one lot of twenty and two lots of ten each. The three-year-olds, twenty head of the two-year-olds, the yearlings and the calves were placed in the feed-lots and given the same feed which consisted of chopped alfalfa for roughness and a grain

*Mr. Geo. C. Wheeler, acting assistant, Mr. A. L. Cottrell and Mr. L. S. Edwards, senior students, deserve credit for special pains taken in attending to the details of feeding.

mixture of equal parts of ground corn and ground Kafir-corn. Near the close of the feeding period cottonseed-meal was gradually added to the grain ration of all the lots. One of the lots of ten two-year-old steers was given the feed as above with the addition of corn ensilage; the other lot of two-year-olds, the same grain ration, with chopped Kafir-corn stover for roughness. The feeding was done at 7 A. M. and at 4:30 P. M.

The arrangement of lots, their feeds and their weights at the beginning of the experiment were as follows (see plates 1, 3, 5, and 9):

TABLE I.—Arrangement of lots, feeds, and weights.

Lot.	Age.	Number in lot.	Feed.	Weight of steers at beginning of experiment.	
				Lot.	Per head.
I	Two years.....	10	Ensilage, alfalfa, corn, and Kafir-corn	lbs. 8,079	lbs. 807.9
II	Calves (6 mo.)..	19	Alfalfa, corn, and Kafir-corn	6,708	353.0
III	Yearlings	20	Alfalfa, corn, and Kafir-corn	11,398	569.9
IV	Two years.....	20	Alfalfa, corn, and Kafir-corn	16,166	808.3
V	Three years	20	Alfalfa, corn, and Kafir-corn	20,069	1,003.4
VI	Two years.....	10	Kafir-corn stover, corn, and Kafir-corn	8,081	808.1

The steers were delivered to the Station feed-lots November 1, and were fed alike until the experiment began, November 10. Each lot was given all the roughness the cattle would eat up clean without scouring. It was found that with alfalfa it was possible for the steers to eat too much hay and become loose. The grain ration was begun with four pounds per 1000 pounds live weight. The grain was increased very gradually, the steers getting on full feed about five weeks after the experiment started. There seemed to be no difference in the various lots as to the time required to get on full feed. Salt was kept before the steers at all times. Water was secured from the city hydrant, and by the means of a float the water-tanks were kept full at all times. In cold weather tank-heaters kept the water from freezing.

The feed-lots had a southwestern slope. All the cattle had access to a shed open to the south. Scratching-poles were provided for each lot.

The results obtained in feeding these cattle are given in table II, which is figured for three periods of seventy days each, with a summary for the entire experiment.

TABLE II.—Comparison of steers, in periods.

	No. of lot.	Gain of lot.	Feed consumed per 100 lbs. gain.		Cost per 100 lbs gain.
			Roughness.	Grain.	
<i>First period.</i>	I	<i>lbs.</i> 2,032	<i>lbs.</i> *810.9	<i>lbs.</i> 316.9	\$2 74
Nov. 10, 1902,	II	2,104	444.9	442.3	3 61
to	III	3,380	481.8	394.1	3 44
Jan. 19, 1903,	IV	3,508	536.9	445.7	3 88
70 days.	V	3,270	678.1	528.4	4 72
	VI	1,327	978.6	695.9	4 98
<i>Second period.</i>	I	1,419	^b 791.8	783.2	\$5 41
Jan. 19, 1903,	II	2,326	411.0	534.1	4 01
to	III	2,607	435.3	701.9	4 99
March 30, 1903,	IV	2,426	520.4	871.8	6 14
70 days.	V	2,801	512.8	853.8	6 02
	VI	1,142	992.1	1,126.9	7 33
<i>Third period.</i>	I	1,017	^c 745.8	1,227.9	\$8 56
March 30, 1903,	II	2,712	241.8	633.2	4 31
to	III	2,557	288.8	869.1	5 87
June 8, 1903,	IV	2,425	369.4	1,010.9	6 98
70 days.	V	2,533	412.1	1,071.0	7 47
	VI	1,142	479.8	1,243.5	8 01
Totals of first, second and third periods, 210 days.	I	4,468	^d 790.0	672.4	\$4 91
	II	7,142	356.8	544.6	5 31
	III	8,544	409.8	630.2	5 03
	IV	8,359	483.5	733.3	5 44
	V	8,604	546.0	794.1	5 95
	VI	3,611	825.1	1,005.4	6 68

^a Ensilage, 535.9 lbs.; alfalfa, 275 lbs.
^b Ensilage, 444.3 lbs.; alfalfa, 347.5 lbs.
^c Ensilage, 337.2 lbs.; alfalfa, 408.5 lbs.
^d Ensilage, 461.6 lbs.; alfalfa, 323.4 lbs.

In the column headed "Gain of lot," it will be noticed that the gains decrease rapidly as the feeding period advances. Part of the gains in the first period is undoubtedly due to the "fill" that takes place when cattle are first put into the feedlot. The calves had been accustomed to all the hay and grain they would eat and it will be noticed that they did not gain as much from the "fill." They gained more the second period than the first.

The roughness consumed per 100 pounds gain gradually decreases as the feeding period advances. On the other hand, the grain consumed increases. In the grain column, it will be noticed that the ensilage steers (lot I) required a large amount of grain per 100 pounds gain in the third period. This is partly accounted for by the fact that the ensilage gave out during the latter part of the period, when it became necessary to feed dry hay alone, and partly by the fact that the ensilage steers fattened more rapidly and were ready for

the market earlier than the others, and consequently gained less near the close of the experiment.

The cost per 100 pounds of gain increased, with every lot, in each succeeding period. (See plates 2, 4, 6, 7, 8, and 10.)

By May 5 all the suitable Kafir-corn stover for lot VI had been used up and sorghum fodder was substituted in its place. On May 30 the corn ensilage gave out. Just at this time the floods came and cut Manhattan off from railroad connections, the country roads were almost impassable, and as a result the supply of feed was cut short, Kafir-corn and alfalfa hay could not be obtained, and corn could be purchased only at greatly increased prices. Enough feed was on hand to run until June 8, at which time the experiment closed. From this date until the time of shipment the cattle were kept up by feeding millet to piece out the alfalfa and using corn or Kafir-corn more or less interchangeably, as either of these grains could be procured.

The plan was to ship the cattle early in June, but, owing to the washouts on the railroads and the suspension of business at the Kansas City stock-yards, shipment was delayed until the evening of June 21, arriving at Kansas City on the morning of the 22d.

Table III gives the results as to shrinkage in driving from the feed-lots to the railroad station, a distance of two miles, and in shipping from Manhattan to Kansas City, a distance of 118 miles.

TABLE III.—Shrinkage in driving and shipping.

Lot.	Weight at Col- lege	Weight at rail- road station, Manhattan.....	Shrinkage.		Weight at Kan- sas City	Shrinkage.			
						From Col- lege wt....	From rail- road wt....	From Col- lege wt....	From rail- road wt....
I and VI	24,160	23,910	lbs.	1.0 %	23,750	lbs.	lbs.	1.7 %	0.6 %
II	13,790	13,455	335	2.4 %	13,720	70	+265	0.5 %	+1.9 %
III	19,530	19,475	55	0.3 %	19,120	410	355	2.1 %	1.7 %
IV	24,454	24,120	334	1.3 %	23,950	504	170	2.0 %	0.7 %
V	28,220	27,420	800	2.8 %	27,820	460	+400	1.4 %	+1.4 %

Considerable variation exists between the different lots in the per cent. of shrinkage. The calves lost heavily in driving from the feed-lots to the railroad station, but they nearly regained the loss by the time they were weighed in Kansas City. The yearlings shrank the most. All the steers stood the trip well, and there seems to be little difference in shrinkage that can be attributed to either age or feed.

The cattle were consigned to the McIntosh & Peters Commission Company, who extended every courtesy and assistance possible in securing the data desired from an experimental standpoint. The cattle were bought by Armour & Company at the following prices.

TABLE IV.—Selling price of steers.

Lot.	Age.	Selling price.
I	Two years (ensilage lot).....	\$4 95 per cwt.
II	Calves.....	4 25 "
III	Yearlings.....	4 55 "
IV	Two years.....	4 70 "
V	Three years.....	4 95 "
VI	Two years (Kafir-corn-stover lot).....	4 50 "

It will be noticed that the ensilage lot sold for the same price as the three-year-olds, which is twenty-five cents per hundredweight higher than the twenty two-year-olds fed without ensilage, but which were of the same class and quality when placed in the feed-lots, and forty-five cents per hundredweight higher than the lot receiving Kafir-corn stover. The ensilage lot was pronounced excellent—fat enough for the ordinary trade.

Through the courtesy of Armour & Company, arrangements were made for data on the slaughter tests of all these lots and of several individuals. Information was also secured on the quality of the carcasses as they hung in the coolers.

Data on the hides and dressed weights are as follows:

TABLE V.—Data on hides and dressed weights.

Lot.	Age.	Weight of hides.		Shrink- age.	Dressed weight.	Tallow.
		Green.	Shrunk.			
		lbs.	lbs.			
I	Two years (ensilage),.....	800	640	20%	60.5%	7.3%
II	Calves.....	1,065	841	21%	56.1%	6.6%
III	Yearlings.....	1,380	1,099	20%	59.6%	5.3%
IV	Two years.....	1,540	1,230	20%	59.3%	6.9%
V	Three years.....	1,640	1,245	24%	60.7%	6.8%
VI	Two years(Kafir-corn stover)	750	598	20%	58.5%	5.5%

The three-year-olds had the greatest shrink in hides, and the calves next. The shrinkage of hides in the other four lots is exactly the same.

It is interesting to note how closely the dressed weights coincide with the prices paid for them on the hoof.

This ensilage lot contained the largest per cent. of fat. Armour & Company said that this lot possessed the per cent. of fat desired by the packers.

NOTES FROM THE COOLERS.

The carcasses of the ensilage lot showed good quality; they were covered with the right amount of fat; the loins and mops were excellent; the carcasses showed very little waste, and were salable in any market. In the dressed-beef trade the most calls are for this size and finish of cattle.

The carcasses of the Kafir-corn lot (lot VI) looked like grass cattle; they were fairly well fleshed, but not well covered with fat. They were considered only an ordinary bunch of cattle.

Considering the amount of money put into them, the calves were considered more desirable than the yearlings; neither lot was fat enough.

The two-year-olds (lot IV) were considered a very fair assortment of cattle.

INDIVIDUAL TESTS.

Before the steers were shipped, three animals in each of the lots II, III and V were selected for individual study and comparison. The selection consisted of the best-formed and best-ripened steer (choice), the best gainer, and the poorest gainer. In one instance the choice steer as to quality gained less than the poorest gainer among the remainder of the lot. The table on next page shows the results.

TABLE VI.—Comparison of individuals.

Lot.	Average selling price of lot.....	No. of animals.....	Kind.....	Weight at beginning of exp.....	Weight at end of exp..	Total gain.....	Average daily gain.....	Weight at Kansas City	Shrinkage in shipment.....	Valued by Armour & Co.		Dressed.....	Cost, Nov. 10, at \$1.20 per cwt.....	Increase in value.....
										Per cwt.	Total.			
II. Calves.	\$4.25 per cwt.	274 258 250	Choice.....	409	785	376	1.79	780	5	\$4.75	\$37.05	59.5 %	\$17.18	\$19.87
			Best gainer	440	840	400	1.90	820	20	4.25	34.85	58.8 %	18.48	16.37
			Poorest gainer,	285	615	330	1.57	600	15	3.65	21.90	53.8 %	11.97	9.93
III. Yearlings.	\$4.55 per cwt.	62 67 79	Choice.....	610	945	335	1.59	940	5	\$4.70	\$14.18	58.1 %	\$25.62	\$18.56
			Best gainer	608	1,173	565	2.69	1,160	13	4.85	56.26	61.6 %	25.54	30.72
			Poorest gainer,	490	830	340	1.62	780	50	4.25	33.15	59.5 %	20.58	12.57
V. Three-year olds.	\$4.95 per cwt.	11 16 6	Choice.....	1,041	1,438	397	1.89	1,390	48	\$5.15	\$71.50	63.1 %	\$43.72	\$27.86
			Best gainer	1,098	1,660	562	2.67	1,600	60	5.05	80.80	68.8 %	46.12	34.68
			Poorest gainer,	929	1,275	346	1.65	1,190	85	4.65	55.33	61.5 %	39.02	16.31

The selection as to quality was made by representatives of the Experiment Station, with valuable assistance given by Mr. John Gosling, of Kansas City.

The best animal as to quality is not always the best gainer, as indicated in the table. With one exception, the highest market price was placed by Armour & Company on the choice animals. In this test the profit for the feeder is, with one exception, considerably more for the best gainer than for the choice animal. It should be noted, however, that the best gainers were also of excellent quality and stood close to the choice animals in respect to merit. Comparing the choice animals and best gainers, it will be seen there is considerable difference in the gains. In the calf lot the choice animal gave the largest per cent. of dressed weight, and in the yearling and three-year-old lots the best gainers were the best dressers.

NOTES ON INDIVIDUALS.

CALF, No. 274. A fine roan heifer, blocky, long, deep, excellent head, good shoulder vein, and splendid back; superior handling qualities, as noted by the buyer valuing her at fifty cents more per hundred than the medium steer, which was the best gainer in the lot, and \$1.10 more per hundred than the poor calf. The dressed carcass showed an excellent covering of firm fat very evenly distributed. Loin and rib cuts were especially well developed. (See plate 11.)

CALF, No. 258, Black heifer; best gainer among the calves; on foot the neck appeared a little long; she was high in the hind quarters but dropped in the crops; a little light in the rump; deficient in heart girth; fair paunch; well fattened in the udder; bone a little coarse; a rather lengthy calf. Her dressed carcass showed lack of even covering, especially in the region of the round and the hips; was considered a grade lower than the choice heifer, No. 274. (See plate 12.)

CALF, No. 250. Heifer; poor feeder; poor conformation; deficient in fat covering. The dressed carcass showed poor development of loin and rib as well as round, plate, and chuck. (See plate 13.)

YEARLING STEER, No. 62. A grade Hereford; raised on skim-milk; remarkably well developed in the valuable cuts; good head and back; good handling qualities; slightly deficient in twist. Although a good feeder and possessing an apparently good constitution, he did not gain very well. In the cooler this steer showed good loin and rib, but hardly enough covering of fat. (See plate 14.)

YEARLING STEER, No. 67. A grade Short-horn; blocky, deep, broad, and full; a splendid head and good heart girth; extraordinarily good

crops; good twist and thighs; hind quarters high, which gives him the appearance of sagging in the back and also caused a lack of fullness in the loin. Carcass covered with an excellent firm coating of fat. Armour & Company pronounced him a splendid beef; he was the best gainer in the lot (two and three-fourths pounds per day). (See plate 15.)

YEARLING STEER, No. 79. Dairy form; very narrow; long head and neck; rather sharp withers; poor quality; sags in the back; poor thighs and twist. A poor feeder. Armour & Company pronounced him a poor killer. Not well covered with fat; especially lacking in covering of round; shallow spine fat. He represents a very unprofitable steer. (See plate 16.)

THREE-YEAR-OLD STEER, No. 11. Grade Hereford; symmetrical, broad, and deep; quarters well covered; comes well down in twist; large heart girth; full chest; rump wide and well fleshed out; excellent quality, as is shown by the price of \$5.15 per hundredweight being placed upon him. Has a good head; large nostrils; splendid neck vein; slightly deficient in crops. His carcass showed an excellent loin and rib, indicated by the well-sprung rib. He was nicely covered with fat. (See plate 17.)

THREE-YEAR-OLD STEER, No. 16. Grade Short-horn; large and long in body; rather high on legs; crops shallow, not well sprung; good hind quarters; twist full; cod full; hips patchy. The carcass of the steer was somewhat of a surprise. Armour & Company pronounced him the best-dressed bullock in the lot; splendid covering of flesh and fat; excellent covering of loin rib and round, with small plates in comparison to his size. This animal was not only the best gainer, but dressed the highest per cent. although, from the buyers' standpoint, he did not bring as high a price as steer No. 11, (See plate 18.)

THREE-YEAR-OLD STEER, No. 6. Possessed a little Hereford blood; dairy type; poor feeder; long head and nose; nostrils contracted; long neck; light in both quarters; poor in heart girth; back narrow; ribs not sprung, wide apart, but well covered; sickle hock; hair coarse. On the block this steer was poor in the loin and rib cuts; round lacking in fulness; a large per cent. of plates; not well covered with fat, although possessing plenty of fat in the regions of the kidneys, rump, and cod. Armour & Company considered him a very undesirable type. (See plate 19.)

FINANCIAL STATEMENT.

The feed consumed by the different lots was charged at the following prices per hundredweight: Corn chop, 58 cents; Kafir-corn chop, 50 cents; cottonseed-meal, \$1.25; alfalfa hay, 27½ cents; corn ensilage, 5 cents; and Kafir-corn fodder, 12½ cents.

The financial outcome of the different lots is as follows:

Lot I. *Dr.*

To ten steers, weight 8079 pounds, at \$4.20 per cwt.....	\$339 32	
To feed: 20,625 pounds ensilage, at 5 cents per cwt.....	\$10 31	
14,675 pounds alfalfa hay, at 27½ cents per cwt.....	40 36	
15,970 pounds corn chop, at 58 cents per cwt.....	92 63	
15,146 pounds Kafir-corn chop, at 50 cents per cwt....	75 73	
867 pounds cottonseed-meal, at \$1.25 per cwt.....	10 84	
		<u>229 87</u>
To expense of sale, as follows:		
Freight.....	\$14 30	
Commission.....	5 60	
Yardage.....	2 50	
Hay.....	40	
		<u>22 20</u>
Total Dr.....		\$591 39

Cr.

By ten steers, weight 12,360 pounds, at \$4.95 per cwt.....	\$611 82	
By 358 pounds of pork, at \$6.50 per cwt.....	\$23 27	
Less 389 pounds of grain fed extra.....	2 69	
		<u>20 58</u>
Total Cr.....		632 40
Balance profit.....		\$41 01

Lot II. *Dr.*

To nineteen calves, weight 6708 pounds, at \$4.20 per cwt.....	\$281 74	
To feed: 25,484 pounds cut alfalfa, at 27½ cents per cwt.....	\$70 08	
19,530.1 pounds corn chop, at 58 cents per cwt.....	113 27	
18,546.8 pounds Kafir-corn chop, at 50 cents per cwt..	92 73	
823.6 pounds cottonseed-meal, at \$1.25 per cwt.....	10 30	
		<u>286 38</u>
To expense of sale, as follows:		
Freight.....	\$27 17	
Commission.....	9 50	
Yardage.....	4 75	
Hay.....	80	
		<u>42 22</u>
Total Dr.....		\$610 34

Cr.

By nineteen calves, weight 13,720 pounds, at \$4.25 per cwt.....	\$583 10	
By 623 pounds of pork, at \$6.50 per cwt.....	\$40 49	
Less 778 pounds grain fed extra.....	5 37	
		<u>35 12</u>
Total Cr.....		618 22
Balance profit.....		\$7 88

Lot III. *Dr.*

To twenty yearling steers, weight 11,398 pounds, at \$4.20 per cwt.....	\$478 72
To feed: 35,020 pounds of cut alfalfa, at 27½ cents per cwt.....	\$96 30
26,962 pounds of corn chop, at 58 cents per cwt.....	156 38
25,574 pounds of Kafir-corn chop, at 50 cents per cwt.	127 87
1,311 pounds of cottonseed-meal, at \$1.25 per cwt....	16 39
	<u>396 94</u>
To expense of sale, as follows:	
Freight.....	\$28 60
Commission.....	10 00
Yardage.....	5 00
Hay.....	80
	<u>44 40</u>
Total Dr.....	\$920 06

Cr.

By twenty steers, weight 19,120 pounds, at \$4.55 per cwt.....	\$869 96
By 568 pounds of pork, at \$6.50 per cwt.....	\$36 92
Less cost of grain fed extra.....	5 37
	<u>31 55</u>
Total Cr.....	\$901 51
Balance loss.....	\$18 55

Lot IV. *Dr.*

To twenty two-year-old steers, weight 16,166 pounds, at \$4.20 per cwt...	\$678 97
To feed: 40,420 pounds cut alfalfa, at 27½ cents per cwt.....	\$111 15
30,610 pounds corn chop, at 58 cents per cwt.....	177 54
29,041 pounds Kafir-corn chop, at 50 cents per cwt....	145 20
1,646 pounds cottonseed-meal, at \$1.25 per cwt.....	20 57
	<u>454 46</u>
To expense of sale, as follows:	
Freight.....	\$28 60
Commission.....	10 00
Yardage.....	5 00
Hay.....	80
	<u>44 40</u>
Total Dr.....	\$1,177 83

Cr.

By twenty steers, weight 23,950 pounds, at \$4.70 per cwt.....	\$1,125 65
By 434 pounds of pork, at \$6.50 per cwt.....	\$28 21
Less cost of grain fed extra.....	5 37
	<u>22 84</u>
Total Cr.....	1,148 49
Balance loss.....	\$29 34

Lot V. *Dr.*

To twenty head of steers, weight 20,069 lbs., at \$4.20 per cwt.....	\$842 90	
To feed: 46,980 pounds cut alfalfa, at 27½ cents per cwt.....	\$129 19	
34,102 pounds corn chop, at 58 cents per cwt.....	197 79	
32,351 pounds Kafir-corn chop, at 50 cents per cwt....	161 75	
1,866 pounds cottonseed-meal, at \$1.25 per cwt.....	23 32	
		512 05
To expense of sale, as follows:		
Freight.....	\$28 00	
Commission.....	10 00	
Yardage.....	5 00	
Hay.....	80	
		44 40
Total Dr.....		\$1,399 35

Cr.

By twenty head steers, weight 27,820 pounds, at \$4.95 per cwt...	\$1,377 09	
By 453 pounds pork, at \$6.50 per cwt.....	\$29 44	
Less cost of extra grain fed.....	5 37	
		24 07
Total Cr.....		1,401 16
Balance profit.....		\$1 81

Lot VI. *Dr.*

To ten steers, weight 8081 pounds, at \$4 20 per cwt.....	\$339 40	
To feed: 29,097 pounds Kafir fodder, at 12½ cents per cwt.....	\$36 37	
700 pounds alfalfa hay, at 27½ cents per cwt.....	1 92	
18,104 pounds corn chop, at 58 cents per cwt.....	105 00	
17,281 pounds Kafir-corn chop, at 50 cents per cwt....	86 40	
924 pounds cottonseed-meal, at \$1.25 per cwt.....	11 55	
		241 24
To expense of sale, as follows:		
Freight.....	\$14 30	
Commission.....	5 00	
Yardage.....	2 50	
Hay.....	40	
		22 20
Total Dr.....		\$602 84

Cr.

By ten steers, weight 11,390 pounds, at \$4.50 per cwt.....	\$512 55	
By 290 pounds pork, at \$6.50 per cwt.....	\$18 85	
Less cost of grain fed extra.....	2 69	
		16 16
Total Cr.....		528 71
Balance loss.....		\$74 13

The steers fed ensilage in addition to alfalfa hay for roughness were of the same class of steers, as to weight and quality, as the two-year-olds in lot IV, and, with the exception of ensilage, were fed on the same feed. The results are shown in table at top of next page.

Lot.	Gain per head.	Feed consumed per 100 lbs. gain.		
		Grain.	Ensilage.	Alfalfa.
I, with ensilage. . . .	446.8 lbs.	715 lbs.	471 lbs.	329 lbs.
IV, without ensilage,	447.9 "	733 "	.....	485 "

It will be noticed that for every 100 pounds of gain the 471 pounds of ensilage saved 18 pounds of grain and 156 pounds of alfalfa. At 54 cents per cwt. for grain (average of corn and Kafir-corn) and 27½ cents per cwt. for alfalfa, this 471 pounds of ensilage made a saving of 52.62 cents; but this is not all. The ensilage steers sold at \$4.95 per cwt. while the others brought only \$4.70 per cwt., a difference of 25 cents, to be added to the credit of ensilage. This makes the 471 pounds of ensilage worth 77.62 cents, or at the rate of \$3.29 per ton. Average farm land, with an average season, will produce from twelve to fifteen tons of green corn per acre. Rich bottom land, under favorable conditions, will produce from twenty to twenty-five tons per acre. With the modest yield of ten tons per acre, there is an income, according to the above experiment, of \$32.90 per acre.

Making the comparison on the basis of roughness alone, the 471 pounds of ensilage plus 329 pounds of alfalfa, in lot I, equals the 485 pounds of alfalfa in lot IV; in other words, the 471 pounds of ensilage takes the place of 156 pounds of alfalfa, or 3.02 tons of corn ensilage equals one ton of alfalfa hay.

The financial statement shows that the ensilage steers made a profit for feed consumed of \$4.10 per head, while the same grade of steers on the same feed except ensilage lost \$1.47 per head.

The ensilage acted as a regulator of the bowels; it was also an appetizer; and for these reasons the steers fed ensilage could be forced more than the others. The best gains from the ensilage occurred in the fore part of the feeding period.

The heaviest loss, \$7.41 per head, was with the two-year-olds fed Kafir-corn stover for roughness.

The experiments detailed above show that the amount of both grain and roughness consumed per 100 pounds of gain increases with the age of the animal. This does not necessarily indicate that the youngest animal is the most profitable feeder, as the demands of the market may be such that the best gainers for feed consumed (usually spoken of as baby beef) may not command the highest prices. The calves in this experiment brought \$4.25 per cwt., while the three-year-olds brought \$4.95 per cwt.

The results show that, by feeding plenty of nitrogenous roughness (like alfalfa) and plenty of succulence (most cheaply obtained in

corn ensilage), it is possible to make rapid gains and at the same time put the steers in prime condition for market.

The results further emphasize the superior and economic value of alfalfa hay. Corn or Kafir-corn stover does not contain the nutrients required by the steer in securing best results unless the grain ration is supplemented with nitrogenous concentrates like oil-meal or cottonseed-meal, which is usually costly.

Since alfalfa is such a splendid feed, is a heavy yielder and a good drought-resister, its growth cannot be urged too strongly as an economical producer of beef, as well as other classes of stock which relish and thrive upon it. Alfalfa and ensilage combined furnishes a feed that can almost invariably be depended upon, no matter what the season is, and when grain fails will keep stock in good condition; and when grain is available will enable the feeder to put on gains rapidly with a comparatively small allowance of grain.



Plate 1. Calves in lot II when placed in the feed-lots.



Plate 2. Calves in lot II at close of experiment. Grain consumed per 100 pounds of gain, 544 pounds.
Sold at \$4.25 per cwt.



Plate 3. Yearlings in lot III when placed in feed-lots.



Plate 4. Yearlings in lot III at close of experiment. Grain consumed per 100 pounds gain, 630 pounds.
Sold at \$4.55 per cwt.



Plate 5. Representatives of two-year-olds in lots I, IV and VI when placed in the feed-lots.



Plate 6. Two-year-olds in lot IV at close of experiment. Grain consumed per 100 pounds of gain, 733 pounds. Sold at \$4.70 per cwt.



Plate 7. Two-year-olds in lot I (fed corn ensilage) at close of experiment. Grain consumed per 100 pounds gain, 672 pounds. Sold at \$4.95 per cwt.

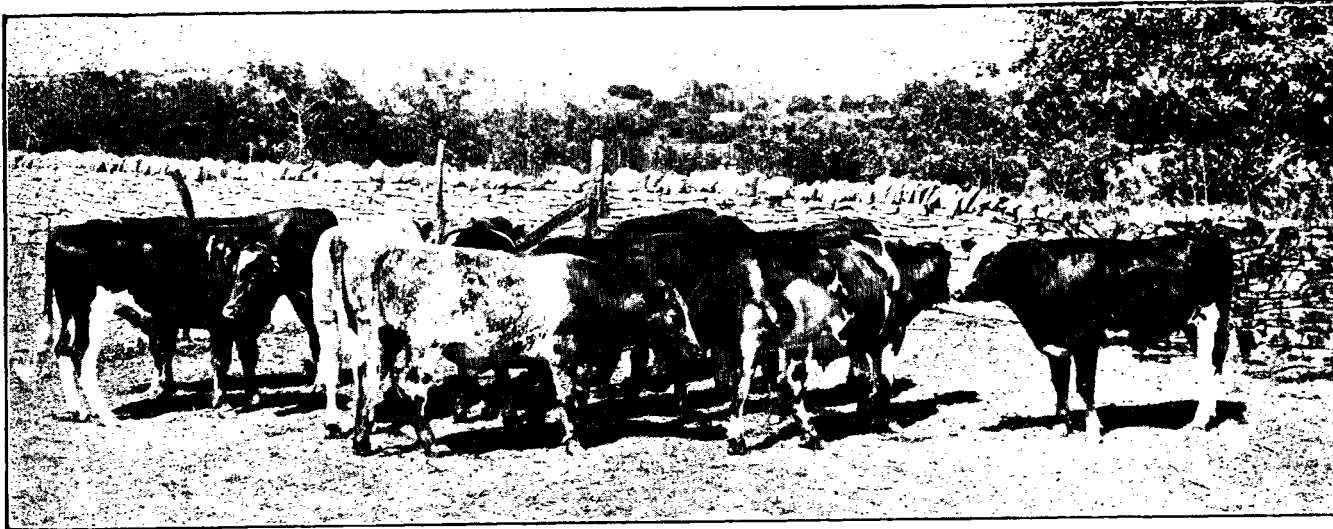


Plate 8. Two-year-olds in lot VI (fed Kafir-corn stover) at close of experiment. Grain consumed per 100 pounds of gain, 1005 pounds. Sold at \$4.50 per cwt.

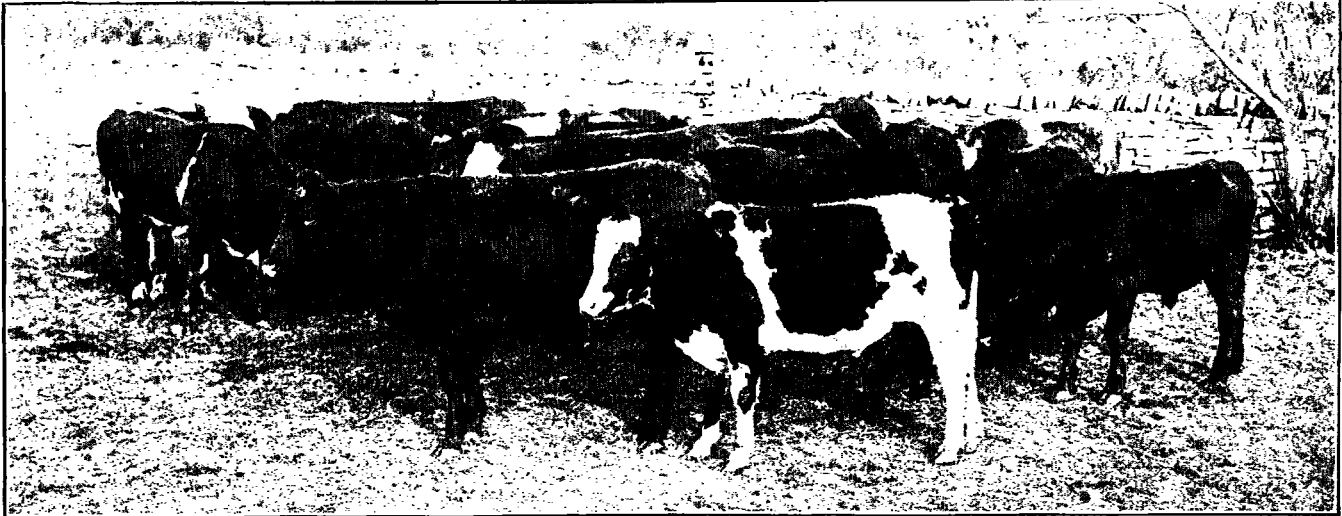


Plate 9. Three-year-olds in lot V when placed in feed-lots.



Plate 10. Three-year-olds in lot V at close of experiment. Grain consumed per 100 pounds gain, 794 pounds.
Sold at \$4.95 per cwt. _____

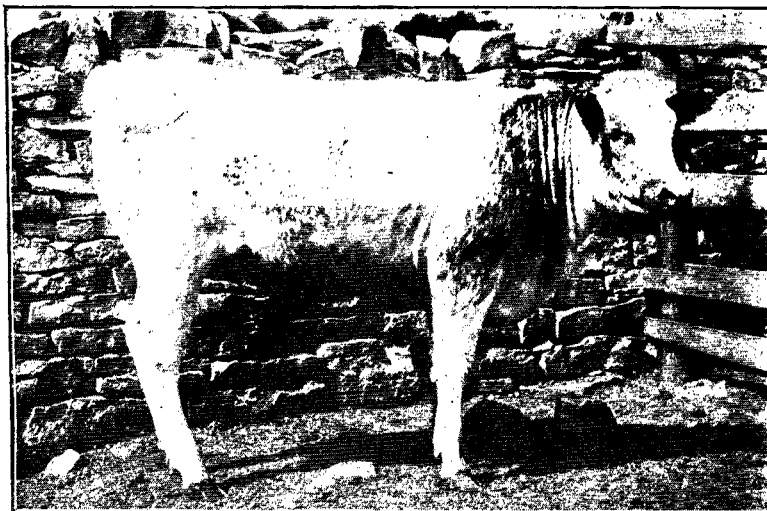


Plate 11. Calf No. 274 (in lot II). Choice, as to quality. Total gain, 376 pounds. Selling price, \$4.75 per cwt.



Plate 12. Calf No. 258 (in lot II). Best gainer. Total gain, 400 pounds. Selling price, \$4.25 per cwt.

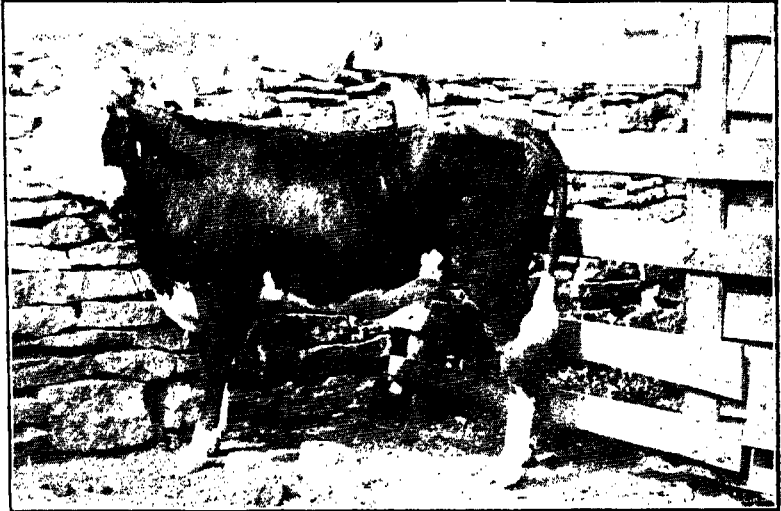


Plate 13. Calf No. 250 (in lot II). Poorest gainer. Total gain, 330 pounds. Selling price, \$3.65 per cwt.

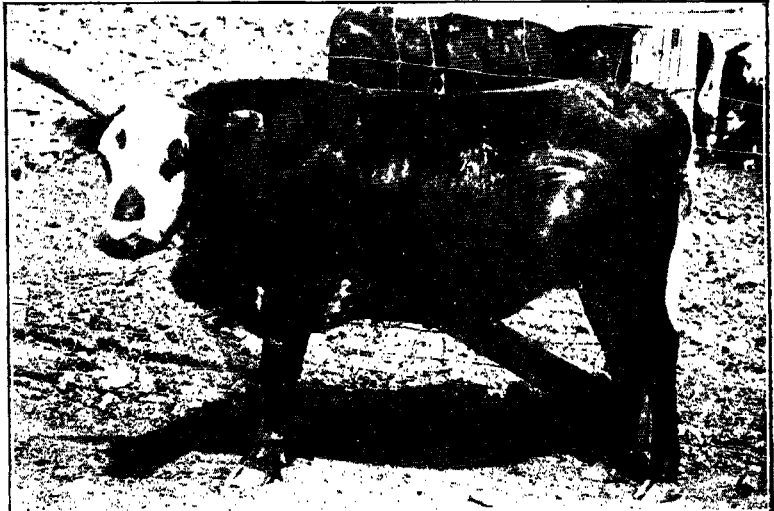


Plate 14. Yearling No. 62 (in lot III). Choice, as to quality. Total gain, 335 pounds. Selling price, \$4.70 per cwt.



Plate 15. Yearling No. 67 (in lot III). Best gainer. Total gain, 565 pounds.
Selling price, \$4.85 per cwt.

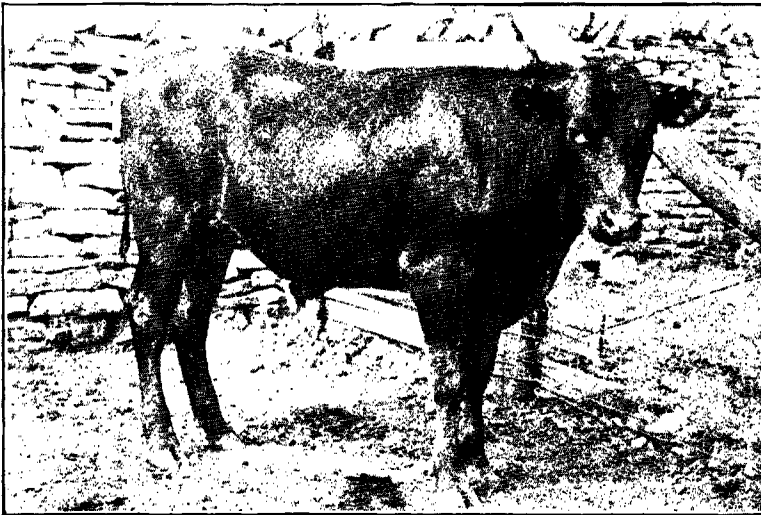


Plate 16. Yearling No. 79 (in lot III). Poorest gainer. Total gain,
340 pounds. Selling price, \$4.25 per cwt.



Plate 17. Three-year-old steer No. 11 (in lot V). Choice, as to quality. Total gain, 397 pounds. Selling price, \$5.15 per cwt.

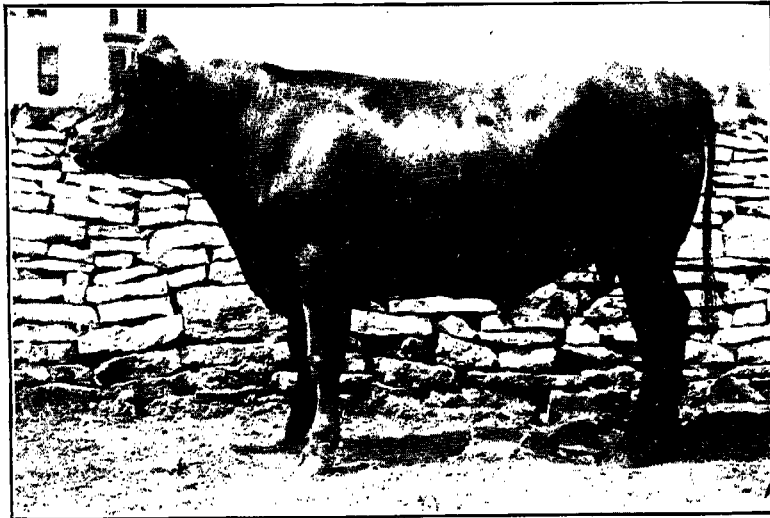


Plate 18. Three-year-old steer No. 16 (in lot V). Best gainer. Total gain, 562 pounds. Selling price, \$5.05 per cwt.

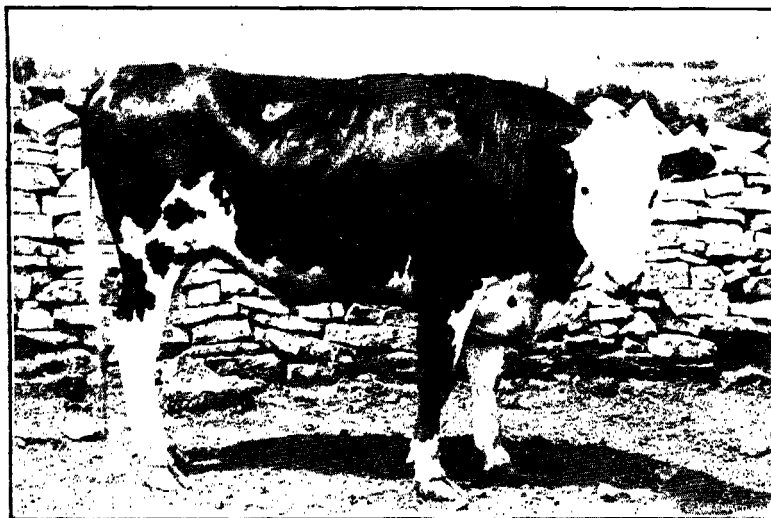


Plate 19. Three-year-old steer No. 6 (in lot V). **¶** Poorest gainer.
Total gain, 346 pounds. Selling price, \$4.65 per cwt.

*Breeding and Feeding Pigs.**

Two years ago last June the Kansas State Agricultural College and Experiment Station did not possess a single hog specimen of any kind, and was without funds with which to buy. The hog breeders over the state took such interest in the College that they determined to see it well represented with pure-bred swine. Accordingly a large number of breeders each donated one hog to the institution which represented what he considered a typical hog from his herd. These hogs were used for judging and breeding purposes, and the offspring have been used in conducting experiments. As it was not considered advisable for the College to enter as a competitor with those who had donated hogs, no breeding stock was sold.

The following swine breeders are placed upon our

ROLL OF HONOR.

BREEDS.	Sex.	Breeder.	Post-office.	County,
Poland-China...	Sow	J. D. Marshall.....	Walton.....	Harvey.
" " ...	Sow	C. H. Barth.....	Iola.....	Allen.
" " ...	Sow	Chas. Morrison.....	Phillipsburg..	Phillips.
" " ...	Sow	Herman Arndt.....	Templin.....	Wabaunsee.
" " ...	Sow	W. E. Hunter.....	Mitchell.....	Rice.
" " ...	Sow	T. J. Lawhead.....	La Cygne.....	Linn.
" " ...	Sow	G. W. Kelly.....	Abilene.....	Dickinson.
" " ...	Sow	J. W. Vining.		
" " ...	Sow	John Bollin.....	Leavenworth..	Leavenworth.
" " ...	Sow	O. E. Morse.....	Mound City..	Linn.
" " ...	Sow	A. O. Northrup.		
" " ...	Boar	A. M. Jordan.....	Alma.....	Wabaunsee.
" " ...	Boar	C. S. Kelly.....	Paxico.....	Wabaunsee.
" " ...	Boar	Deitrich & Spaulding..	Richmond....	Franklin.
Duroc-Jersey...	Sow	A. D. & H. L. Perrin...	Prescott.....	Linn.
" " ...	Sow	J. B. Davis.....	Fairview.....	Brown.
" " ...	Sow	Peter Blochier.....	Richland.....	Shawnee.
" " ...	Sow	W. E. Mason.....	Haddam.....	Washington.
" " ...	Sow	J. T. Tredway.....	La Harpe....	Allen.
" " ...	Boar	J. M. Williams.....	Frankfort....	Marshall.
" " ...	Boar	J. U. Howe.....	Wichita.....	Sedgwick.
" " ...	Boar	G. G. Burton.....	Topeka.....	Shawnee.
" " ...	Boar	H. W. Steinmeyer.....	Volland.....	Wabaunsee.
Berkshire.....	Boar	W. B. Sutton & Sons...	Russell.....	Russell.
" " ...	Sow	C. A. Stannard.....	Emporia.....	Lyon.
Cross-bred.....	Sow	R. A. Willis.		

The offspring from these donated hogs has furnished some excellent material with which to carry on experiments.

* Credit is due Geo. C. Wheeler, who has been acting assistant, and R. N. Dorman, senior student, who have very materially assisted in carrying out the details of these experiments.

GAINS OF SHOATS ON ALFALFA OR RAPE PASTURE, AS COMPARED WITH DRY FEEDING.

When the pigs were large enough to wean we put them into experimental feed-lots, and comparisons were made between the different pastures and dairy by-products. Comparative tests have also been made between pigs of the different breeds and crosses under like conditions.

In the summer of 1902 thirty shoats, averaging fifty-two pounds in weight, were divided into three as nearly equal lots as possible. One lot was placed on alfalfa pasture, one on rape pasture, and one in a dry lot. All were fed the same kind of grain and all had access to water.

The results obtained in this experiment are shown in the following table:

TABLE I.—Results in pasturing rape and alfalfa.

Lot.	Number of hogs.	Days fed.	Grain consumed.	Gain.		Grain consumed per 100 lbs. gain.
				Total.	Daily per head.	
I, no pasture.....	10	98	3,801 lbs.	1,023 lbs.	1.04 lbs.	371 lbs.
II, rape pasture.....	10	98	3,244 "	1,076 "	1.09 "	301 "
III, alfalfa pasture...	10	98	3,244 "	1,078 "	1.10 "	300 "

It will be noticed that the three lots are very nearly equal in the gains made. The no-pasture lot consumed 557 pounds (or 70 pounds for every 100 pounds of gain) more grain than the pasture lots. The lot receiving rape pasture required an area of one acre ; those on alfalfa pasture, one-half an acre. The lot without pasture required 371 pounds of grain to produce 100 pounds of gain. Assigning the same value to the grain fed the hogs on rape pasture gives 874 pounds of pork credited to the grain, and 202 pounds credited to the rape. At six cents per pound, the price at which hogs were selling at the close of the experiment, this would bring us an income of \$12.12 per acre for rape. In like manner, the alfalfa is credited with 204 pounds of pork, equal to \$12.24, and, as there was only one-half an acre of alfalfa, this makes a rate of \$24.48 per acre. This experiment emphasizes the superior value of alfalfa, and likewise emphasizes the value of Dwarf Essex rape, which can be seeded in the feed-lots that would otherwise go to waste or grow up to weeds, and be made to pay a handsome profit on the investment.

The pasture is not only economical from the standpoint of gains, but it furnishes succulence and variety and keeps the hogs in a healthier condition.

GAINS VS. SIZE OF LITTER.

Observations have been made and data gathered on the gains of small and large litters, Some swine breeders claim that it is not advisable for sows to farrow more than six or seven pigs, and some prefer only five or six pigs per litter.

The results of different-sized litters are given in table II.

TABLE II.—Gains of young pigs in different-sized litters.

NUMBER OF SOW.	Number of days under experiment.	Size of litter.		Av. daily gain, in lbs. per head.	
		1902.	1903.	1902.	1903.
1. Poland-china.....	56	5	6	0.33	0.38
2. Poland-china.....	56	4	8	0.47	0.57
3. Poland-china.....	56	6	6	0.34	0.46
4. Poland-china.....	56	2	6	0.23	0.52

No extra-large litters are reported in table II. It will be noticed that with the same sow the larger litters have made the best gains. This may be due in part to the age of the sows, as the record for 1902 is for their first litters. It will also be noticed that in the same year the larger litters may make the best gains.

EFFECT OF SIZE OF LITTER UPON AMOUNT OF FEED CONSUMED BY THE DAM.

The observations shown under this heading are in table II. It was impossible, with the funds at our command, to keep an individual record of the feed consumed by each sow and litter. The sows with small litters were fed five pounds of grain daily per head, while the sows with large litters were fed from eight to ten pounds per day per head, depending upon the size of the sow and the use she made of the feed. We find that some sows are poor milkers, no matter what the quantity and the quality of their feed.

EFFECT OF AGE OF DAM UPON THE SIZE OF THE LITTERS.

Nearly all of the sows at the College were gilts at the time they were donated, in 1901. For this reason we do not have records from very aged dams, but we do have records for the past two years, and these are shown in table III.

TABLE III.—Effect of age on size of litter.

Mature sows.				Young sows.			
Breed.	No. of sows	Age.	Size of litter	Breed.	No. of sows	Age.	Size of litter
Poland-China,	1	3 yrs.	5	Poland-China,	1	1 yr. 3 mos..	8
"	2	1 yr. 11 mos.,	4	"	2	1 yr. 1 mo...	4
"	3	1 yr. 11 mos.,	7	"	3	1 yr. 1 mo...	3
"	4	2 yrs.	5				
"	5	1 yr. 11 mos.,	6	Duroc-Jersey,	4	1 yr. 1 mo...	5
"	6	2 yrs.	7	"	5	1 yr. 1 mo...	5
"	7	2 yrs. 1 mo..	9	"	6	1 yr.	10
"	8	2 yrs.	9	"	7	1 yr.	10
"	9	2 yrs.	11	"	8	1 yr.	14
"	10	2 yrs. 1 mo..	6				
Duroc-Jersey,	11	2 yrs.	12				
"	12	2 yrs.	10				
"	13	2 yrs.	9				
"	14	2 yrs.	11				
Totals.....	14	.....	111	.....	8	.....	59
Average pigs per sow			7.9	.....			7.4

The records collected in table III show practically no difference in the size of litters that can justly be attributed to age.

SOWS BEHIND STEERS COMPARED WITH OTHERS IN THE SIZE OF LITTERS FARROWED.

During the fall of 1902 the Kansas Experiment Station fed 100 head of steers and calves. In order to get enough hogs to put behind these steers it was necessary to use some of the brood-sows. These hogs got very little feed outside of what they received from running behind the steers, and as the grain ration fed the steers increased they got no feed outside of the feed-lots.

Sows of the same age and breeding were kept and fed what we considered a good ration for a brood-sow. This ration consisted of one-third shorts, one-third corn, and one-third bran, all the sows being provided with ashes. The results show that the number of pigs in a litter from sows running behind the steers varied from three to fourteen, the average being seven. The average number of pigs per litter from sows not running behind the steers was 7.6.

FEEDING ALFALFA HAY TO SHOATS.

During the fall of 1902 the shoats that had been in the pasture experiments were placed in the feed-lots and fed the same grain ration, one lot receiving alfalfa hay in addition to grain. Results of feeding alfalfa hay to fattening hogs are detailed in table IV.

TABLE IV.—Test of alfalfa hay.

Lots.	Number of hogs.....	Days fed.....	Grain consumed.....	Gains.		Amt. grain per 100 lbs.....	Amt. roughness per 100 lbs. gain.....
				Total.	Daily, per head.		
With alfalfa.	12	56	3,780	812	1.20	465	102
Without.....	12	56	4,227	799	1.18	529	.....

By comparing the two lots in columns 7 and 8, we find that 102 pounds of alfalfa hay takes the place of 64 pounds of grain. Assuming that it requires 529 pounds of grain to produce 100 pounds of gain, as indicated in the lot without alfalfa, 714.5 pounds of the 3780 pounds gain in the lot with alfalfa is to be credited to the grain and the remaining 97.5 pounds to the alfalfa fed. At this rate, the alfalfa hay would produce 235 pounds of pork per ton. While this record falls far short of the results obtained in a previous experiment, where alfalfa produced pork at the rate of 868 pounds per ton, it is nevertheless a good record and emphasizes the superior value of alfalfa hay as a hog feed.

COMPARATIVE TEST OF PURE-BRED AND CROSS-BRED PIGS.

In the spring of 1903 we had a herd of about thirty sows, composing representatives of the Berkshire, Duroc-Jersey, Poland-China and Tamworth breeds; the latter breed having only three representatives. As it was not the aim of the Station to raise pigs for breeding purposes, it was thought advisable to make a test and see the effect of cross-breeding. Poland-China sows were crossed with Berkshire, Duroc-Jersey and Tamworth boars. We did not have enough Berkshire sows to use in cross-breeding, so these were bred pure. The Duroc-Jersey sows were also cross-bred with Berkshire, Poland-China and Tamworth boars. The Tamworth sows were bred pure. When the pigs were weaned, we had three lots of pure-breds and four lots of cross-breds. These were all placed on alfalfa pasture and given a grain ration of one-half shorts, one-fourth corn, and one-fourth Kafir-corn. The different breeds and crosses used, together with the data obtained from the experiments, are given in table V.

TABLE V.—Results in feeding pure-bred and cross-bred pigs.

BREEDS AND CROSS-BREEDS.	Number of pigs in lot.	Average weight at beginning of experiment.	Days fed.	Grain consumed.	Gains.		Grain consumed per 100 lbs. gain.	
					Total.	Daily, per head.		
Pure-bred. {	Poland-China.....	10	71.0 lbs.	63	2,312 lbs.	575	0.91	402.0
	Duroc-Jersey.....	10	65.0 "	63	2,108 "	687	1.09	306.8
	Berkshire.....	10	43.3 "	63	2,108 "	459	0.72	459.2
Poland-China and Duroc-Jersey cross.....	10	76.1 "	63	2,312 "	735	1.16	314.5	
Poland-China and Berkshire cross.....	9	47.0 "	63	1,897 "	549	0.96	345.5	
Duroc-Jersey and Tamworth cross.....	10	76.1 "	63	2,335 "	708	1.12	329.8	
Duroc-Jersey and Berkshire cross.....	10	62.6 "	63	2,312 "	616	0.97	375.3	

In the above experiment it was impossible to get the pigs of the same weight, and this point should be borne in mind in making comparisons. It will be noticed that the cross-breds made the best gains and at less cost for feed consumed.

VALUE OF THE BY-PRODUCTS OF THE DAIRY FOR HOGS IN DRY LOTS AND ON PASTURE.

Thirty-six shoats were divided as equally as possible into six different lots of six hogs each. One lot was fed without pasture and was given skim-milk in connection with the grain (shorts, one-half; corn, one-fourth; and Kafir-corn, one-fourth). Another drylot was fed the same ration, except that buttermilk was substituted for the skim-milk. Two lots on alfalfa were fed the same ration, one getting buttermilk and the other skim-milk. In the same manner the remaining two lots were fed on rape pasture, one getting buttermilk and the other skim-milk. The results of this experiment are detailed in table VI.

TABLE VI.—Value of by-products of the dairy in feeding pigs.

	Number of pigs in lot.	Days fed.	Grain consumed.	Milk consumed.	Gains.		Amount grain per 100 lbs. gain.	
					Total.	Daily per head.		
Skim-milk. {	No pasture.....	6	77	1,793	2,195	537	1.16	333
	Alfalfa pasture.....	6	77	1,538	2,001	517	1.11	297
	Rape pasture.....	6	77	1,538	2,001	506	1.09	304
	Averages.....	6	77	1,623	2,065½	520	1.12	311½
Butter-milk. {	No pasture.....	6	77	1,793	2,195	472	1.02	379
	Alfalfa pasture.....	6	77	1,538	2,001	491	1.06	313
	Rape pasture.....	6	77	1,538	2,001	511	1.10	301
	Averages.....	6	77	1,623	2,065½	491½	1.06	331

Very little difference is noted between skim-milk and buttermilk. The gains of the hogs in the different lots are nearly equal, but the amount of grain consumed per 100 pounds of gain is considerably less with the hogs on pasture. The gains and grain consumed per 100 pounds of gain are practically the same for alfalfa and rape pasture. The area required for the hogs on rape was twice that required for those on alfalfa.

EXPERIENCE WITH RUNT PIGS.

After the shoats suitable for experimenting were placed in the feed-lots in the summer of 1902, there remained behind a few runts that were rather sorry-looking specimens, as will be seen from plate 46. We made a combination of the best feeds we had and undertook to see what we could do in bringing out these runts. They were placed on rape pasture and given a grain mixture of one-third corn, one-third Kafir-corn, and one-third shorts. For every 150 pounds of this mixture there was added twenty pounds of dried blood and thirty pounds of soy-beans. This feed, together with good care, produced some excellent results, as shown in table VII.

TABLE VII.—Results in feeding runt pigs.

Number of pigs.	Number of days fed.	Gains.		Grain consumed per 100 pounds gain.
		Total.	Daily per head.	
4	278	1,052 lbs.	0.94 lbs.	330 lbs.

In addition to the grain ration, the hogs in the above experiment picked up a little feed by running after steers, of which it was impossible to take any account in the above table. For grain fed the cost was \$2.64 per 100 pounds of gain. The pigs sold for \$6.25 per cwt., leaving \$3.61 per 100 pounds of gain to pay for labor and what little pasture and steer droppings were consumed.

ARRANGEMENTS FOR DIPPING HOGS.

In order to keep hogs free from lice and to disinfect them as far as possible from germ diseases, it is necessary to have arrangements for dipping them. Several makes of dipping-tanks are offered on the market, any one of which will give satisfactory results. Any of these tanks will require some kind of a chute leading to them, through which the hogs can be kept moving steadily without injury. The chute in use at this Station is shown in plate 51. The lumber required is as follows :

- 9 pieces 1" x 10" x 16', for sides.
- 3 pieces 2" x 8" x 16', for sills.
- 3 pieces 2" x 8" x 16', for floor.
- 1 piece 2" x 8" x 8', for floor.
- 4 pieces 4" x 4" x 10', } for the legs.
- 2 pieces 4" x 4" x 16', }

For panels leading up to chute :

- 6 pieces 1" x 10" x 16', for panels.
- 2 pieces 2" x 4" x 12', for cross-pieces on panels.

While this chute has worked very satisfactorily, it could be improved by reducing the height at the highest point of the floor to two and one-half feet. A gunny-sack should be hung across the lower end of the short part of the chute, so that the hogs cannot see the tank.

FARROWING-HOUSES.

At farrowing time the sow needs to have a warm, comfortable and well-lighted house by herself. This house needs to have a railing on the inside about nine inches from the floor and extending out from the sides about twelve inches, for the protection of the young pigs. This railing is best made of two 2x4's with two-inch space between them, and also the wall. It is desirable to have small yards connected with the houses, to give the sows before farrowing, and the sow and pigs after farrowing, moderate exercise. The houses used at the Kansas Experiment Station are 6x8 feet—6 feet high in front and 4 feet in the rear. They are enclosed with drop-siding and covered with grooved roof boards and ogee battens. The floor is made of two-inch planks. These houses are placed on runners, and are illustrated in plates 49 and 50. In plate 50 the houses are located in an alfalfa pasture, and are raised sufficiently to allow the hogs to run under them for shade. In this case the houses proper are used for the storage of feed. Being on runners they are easily handled by a team, and can be placed on any part of the farm. When desired they make excellent chicken-houses. In cold weather they can be placed under an open shed or in a protected place and be very warm. The lumber required in the construction of these houses is as follows :

- 48 ft. 2 inch plank, for floor.
- 72 ft. grooved roof boards (16 ft. stuff).
- 140 ft. drop-siding (either 14 ft., or half and half 12 and 16 ft. stuff).
- 64 ft. ogee battens (16 ft. stuff).
- 3 pieces 2" x 4" x 14', for studs and plates.
- 1 piece 2" x 4" x 16', for front and back plates.
- 2 pieces 2" x 6" x 8', for runners (preferably oak).
- 3 pieces 2" x 4" x 10', for guard-rails inside of house.
- 1 pair strap hinges, for door.
- 1 pair butts, for window.
- 1 window, 52 x 20.
- 1 door hasp.

The yards are best made in movable sections. The lumber required is : Nine pieces 1" x 4" x 12'. (See plate 49.)

These houses have proven their merit at the Agricultural College, especially for early spring and late fall pigs. They soon pay for themselves by the increased number of pigs saved through their use.

SLAUGHTER TESTS.

During the second week in March, the Kansas State Agricultural College conducted a judging school for swine. Mr. G. W. Berry, of the Sunny Slope farm, Emporia, Kan., acted as expert judge. For this week a slaughter test was provided by the Animal-husbandry Department, for the purpose of comparing the quality of the various breeds of swine owned by the College. The breeds were Berkshire, Duroc-Jersey, Poland-China, and cross Tamworth-Poland-China. Another test was made by slaughtering a fat hog, a medium hog, and a poor hog (all Poland-Chinas), to show the difference in the character of the carcasses of pigs slaughtered at these different stages. These hogs were submitted to a local buyer before being slaughtered, and he valued them on foot. Their live weight, value, dressed weight, weight of leaf-lard, etc., are recorded in table VIII.

TABLE VIII.—Results from the slaughter tests.

BREED.	Live weight.	Value per cwt. on foot.	Dressed weight.	Weight of the leaf-lard.	Per cent. dressed weight.	
Berkshire	345 lbs.	\$6.75	286 lbs.	16 $\frac{3}{4}$ lbs.	82.9	
Duroc-Jersey.....	large.....	351 "	6.65	288 "	21 "	82.0
	small.....	140 "	6.40	114 "	2 $\frac{1}{2}$ "	81.4
Poland-China.....	large.....	340 "	6.75	285 "	13 $\frac{1}{2}$ "	83.8
	small.....	170 "	6.65	142 "	2 "	83.5
Grade Tamworth,	large.....	286 "	6.50	232 "	14 "	81.1
	small.....	172 "	6.60	138 "	2 $\frac{1}{2}$ "	80.2
Poland China.....	fat.....	339 "	6.75	283 "	7 $\frac{3}{4}$ "	83.4
	medium..	221 "	6.60	176 "	4 "	79.6
	lean.....	222 "	6.00	182 "	1 "	81.9

During the test, weights were taken of the shoulders, sides, and hams, and these were compared with each other. The results obtained are recorded in table IX.

TABLE IX.—Comparison of shoulders, sides, and hams.

BREEDS.	Shoulders.	Sides.	Hams.	
Berkshires	21 $\frac{1}{2}$ lbs.	17 lbs.	23 $\frac{1}{2}$ lbs.	
Duroc-Jersey {	large.....	19 $\frac{1}{2}$ "	15 "	24 $\frac{1}{2}$ "
	small.....	8 $\frac{3}{4}$ "	5 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "
Poland-China {	large.....	19 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "
	small.....	9 $\frac{3}{4}$ "	9 $\frac{1}{4}$ "	16 $\frac{1}{2}$ "
Grade Tamworth {	large.....	16 "	18 "	21 "
	small.....	8 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	14 "
Poland-China {	fat.....	32 "	27 "	34 $\frac{1}{2}$ "
	medium.....	20 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "
	lean.....	27 "	10 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "

The local butchers from Manhattan attended this slaughter test. They seemed to think that the Duroc-Jersey had the most fat on his back, the Poland-China next, then the Berkshire, and the Tamworth last. Not very much difference was noted between the Tamworth-

Poland-China cross and the Berkshire, except that the latter had a little more fat and was thicker than the Tamworth-Poland-China cross.

The prices prevailing for the cuts of pork at that time were as follows: Loin, 15 cents; front part of back, 12½ cents; shoulders, 12½ cents; the back strip, 12½ cents; the bacon sides, 18 to 20 cents; spareribs, 10 cents.

Comparing the hams, the Berkshire showed more lean and less fat than the Poland-China. The shoulders of the Berkshire also showed more lean meat. The Berkshire had heavy bone.

The Poland-China showed more fat than the Berkshire, but as lean and fat were selling at about the same prices, it made very little difference in the value. The spareribs of the Poland-China appeared light. It had a good loin and shoulder and the sides were about the same as the Duroc-Jersey; in fact, the two compared very closely in all parts.

The Tamworth-Poland-China cross contained more bone, more lean, and the spareribs were very light and very lean.

Comparing the fat, medium and lean hogs, there was found to be a great difference in the leaf-lard. The sides from the lean hog were said by the local butcher to make better bacon than the sides from the fat hog. The fat hog was considered to be more profitable from the butcher's standpoint, likewise from the breeder's standpoint, because they dressed a higher per cent. The medium hog was considered the best for bacon, but not as good as the lean hog for ham. From the butcher's standpoint the lean hog was the most unprofitable. The color of the meat was practically the same in the fat and medium hogs.

The butchers remarked that there would be no difference in the prices of the different cuts of the various breeds, although they said the more lean a hog presented the better the bacon. The Berkshire and Tamworth hogs produced the lean hams, while the others produced what is known as fat hams. The texture of the meat was pronounced by the butchers as being the same in all the hogs, the Tamworth perhaps being a little more firm than the others. The butchers said they would have paid the same prices for any of the hogs except the Tamworth, for which they would not have given as much on account of its not being as fat. The highest percentage of waste was in the Tamworth, and the next highest was in the Duroc-Jersey.

Pictures were taken of the different cuts and are shown in the latter part of this bulletin. There was practically little difference in the quality of the pork of the small and large specimens of the Poland-China, Duroc-Jersey, and Tamworth-Poland-China cross, except that there was not as much fat in the small hogs.

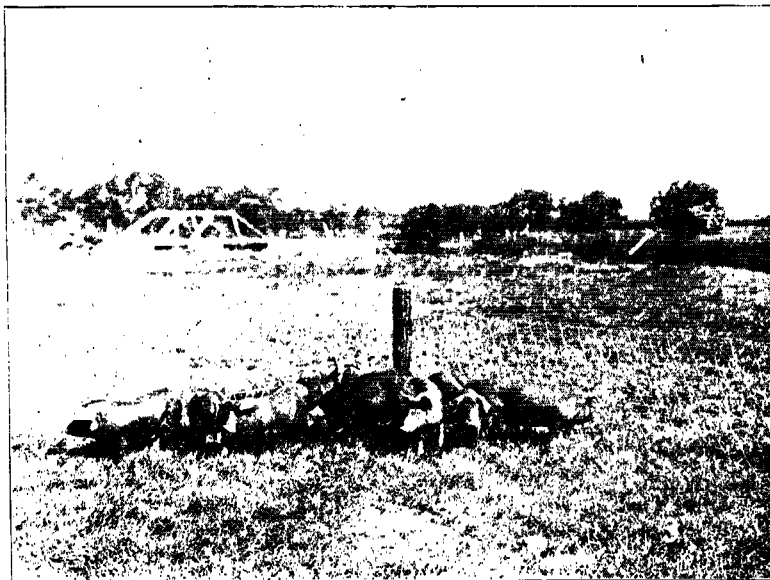


Plate 20. Pigs at beginning of pasture experiment.
Average weight, 52 pounds.

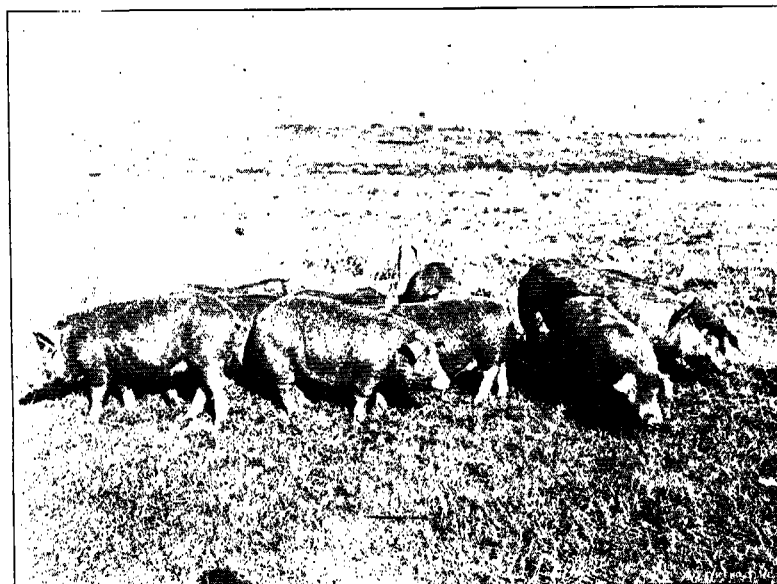


Plate 21. Same pigs (shown in plate 20) at close of experiment. Average daily gain, 1.10 pounds. Grain consumed per 100 pounds gain, 300 pounds.



Plate 22. Berkshire used in slaughter test. Weight, 345 pounds.
Value per cwt., \$6.75.



Plate 23. Duroc-Jersey used in slaughter test. Weight, 351 pounds.
Value per cwt., \$6.65.

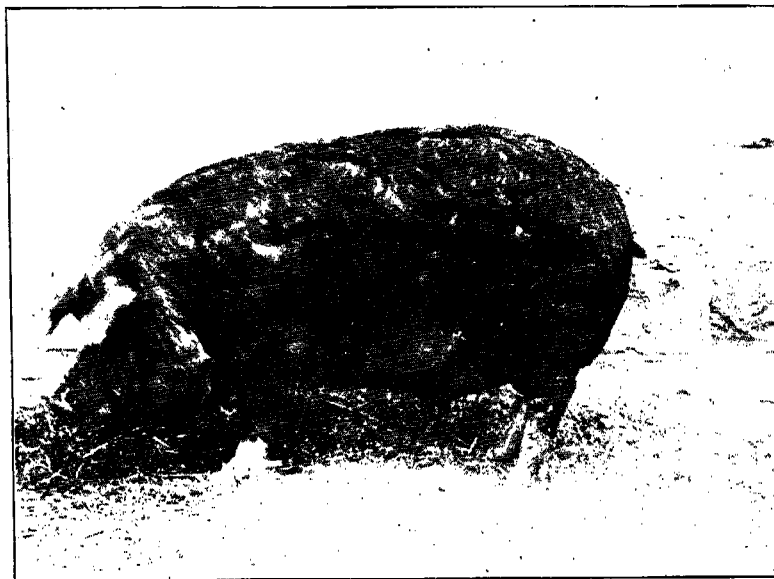


Plate 24. Poland-China used in slaughter test. Weight, 340 pounds.
Value per cwt., \$6.75.

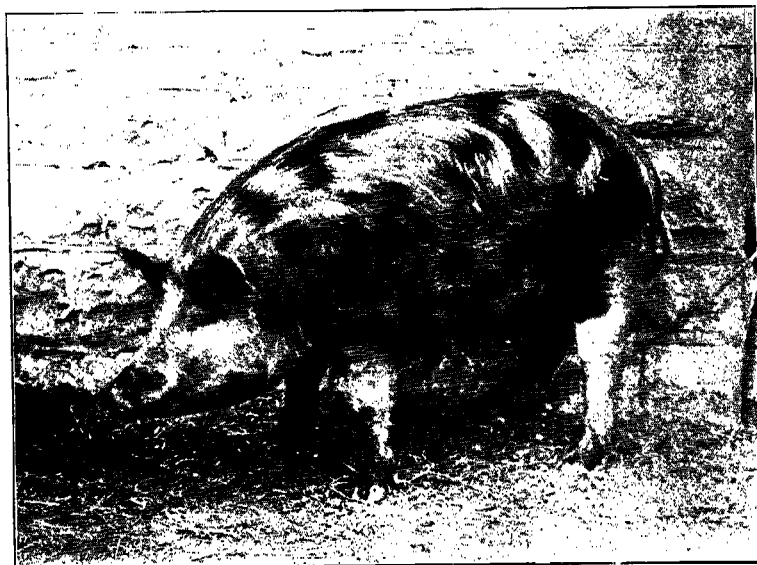


Plate 25. Tamworth-Poland-China cross used in slaughter test.
Weight, 286 pounds. Value per cwt., \$6.50.



Plate 26. Fat hog used in slaughter test. Weight, 339 pounds.
Value per cwt., \$6.75.

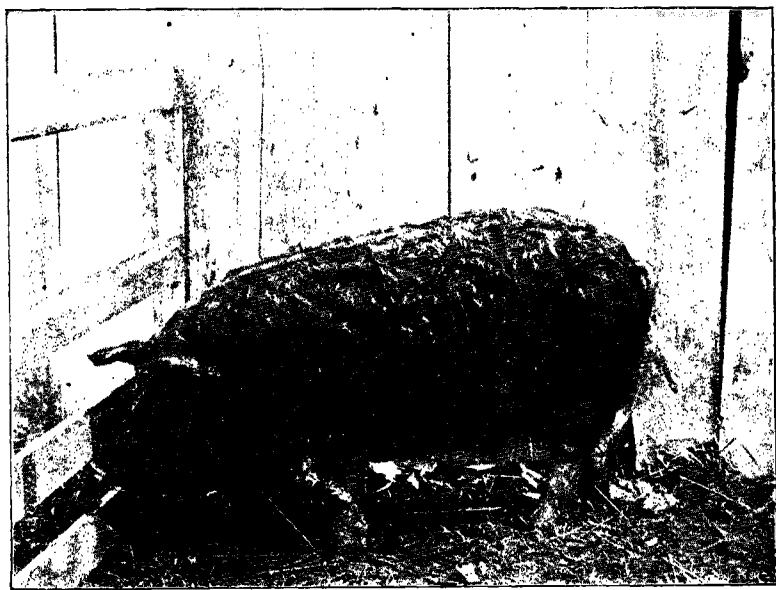


Plate 27. Medium hog used in slaughter test. Weight, 221 pounds.
Value per cwt., \$6.60.

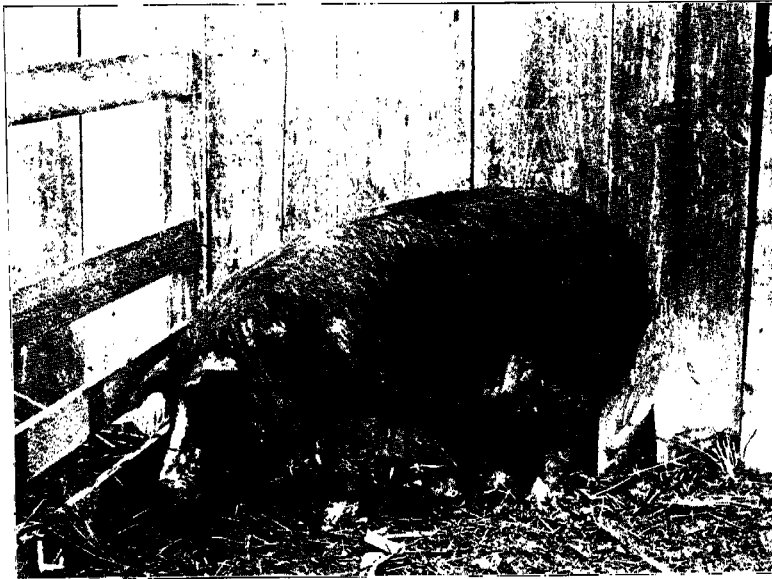


Plate 28. Lean hog used in slaughter test. Weight, 222 pounds.
Value per cwt., \$6.

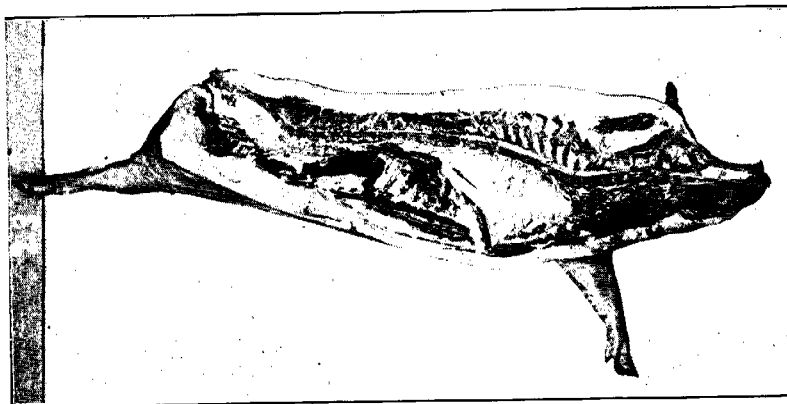


Plate 29. Left half of Berkshire.

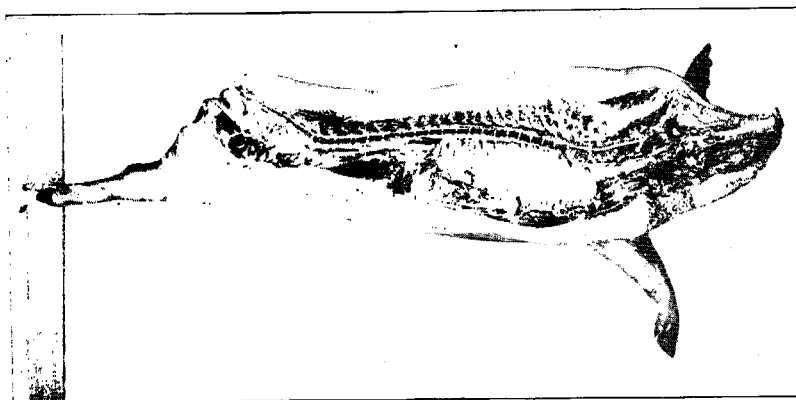


Plate 30. Left half of Duroc-Jersey.

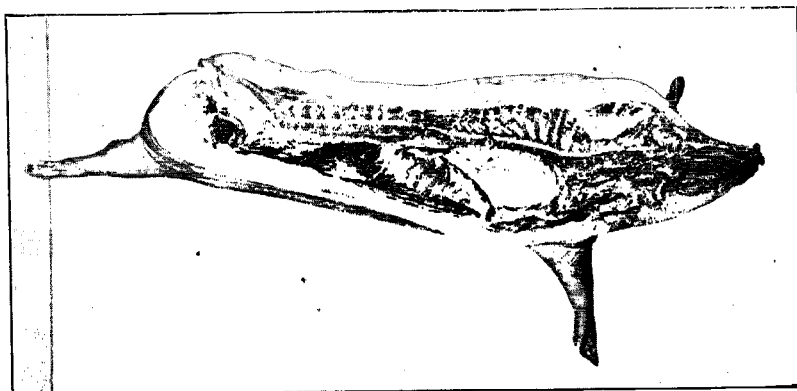


Plate 31. Left half of Poland-China.

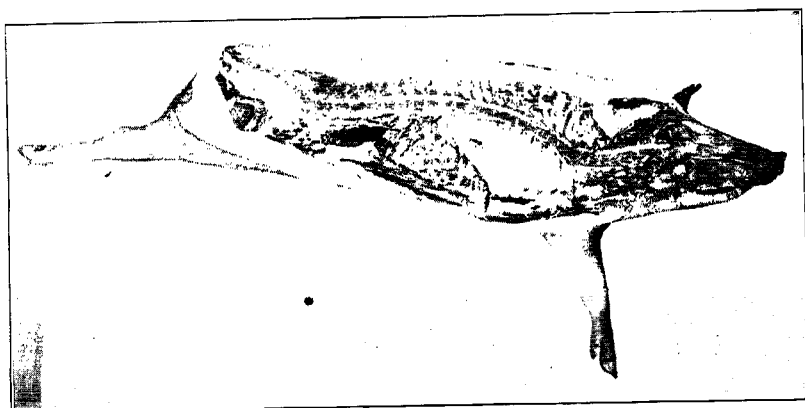


Plate 32. Left half of Tamworth-Poland-China cross.



Plate 33. Tamworth and Berkshire. Sides of large hogs.



Plate 34. Poland-China and Duroc-Jersey. Sides of large hogs.

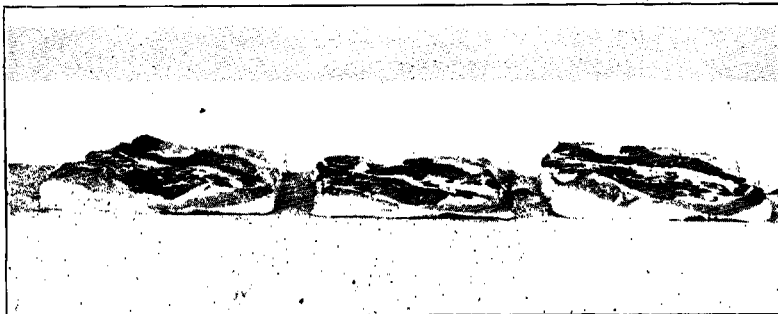


Plate 35. Poland-China, Duroc-Jersey, and Tamworth-Poland-China cross.
Sides of small hogs.



Plate 36. Tamworth-Poland-China cross, Berkshire, Poland-China, and Duroc-Jersey. Loins of large hogs.

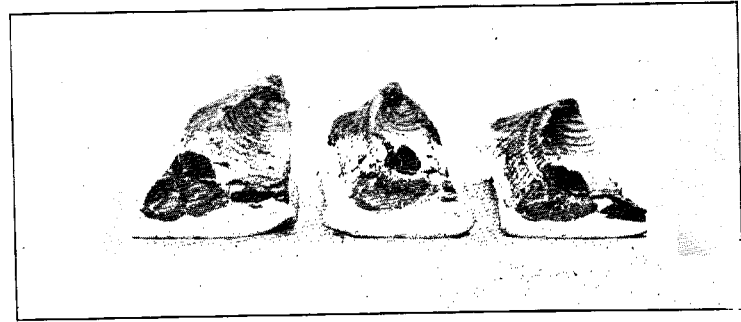


Plate 37. Tamworth-Poland-China cross, Poland-China, and Duroc-Jersey. Loins of small hogs.



Plate 38. Tamworth-Poland-China cross and Berkshire. Hams of large hogs.



Plate 39. Poland-China and Duroc-Jersey. Hams of large hogs.



Plate 40. Poland-China, Tamworth-Poland-China cross, and Duroc-Jersey. Hams of small hogs.

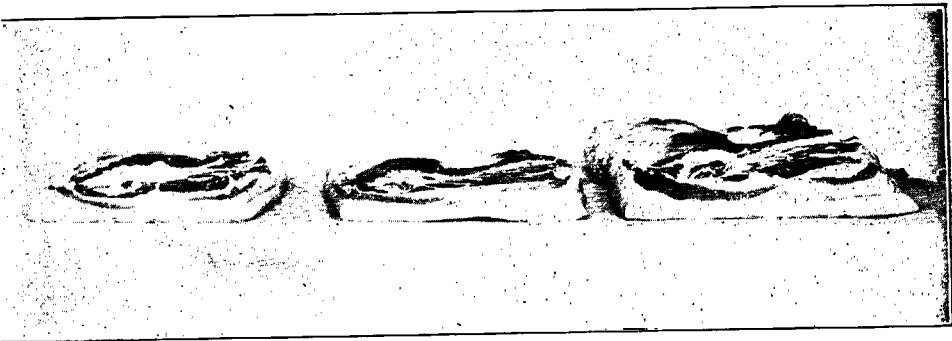


Plate 41. Lean, medium, and fat. Sides of hogs.



Plate 42. Lean, medium, and fat. Loins of hogs.



Plate 43. Lean, medium, and fat. Hams of hogs.

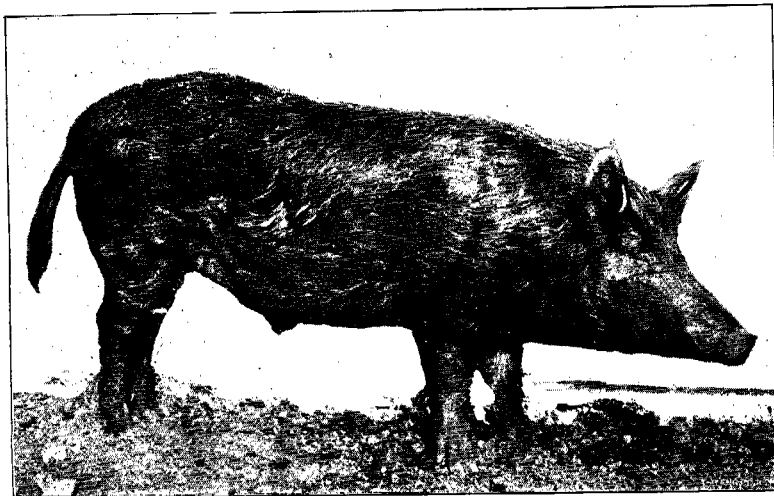


Plate 44. Pure-bred Tamworth boar.

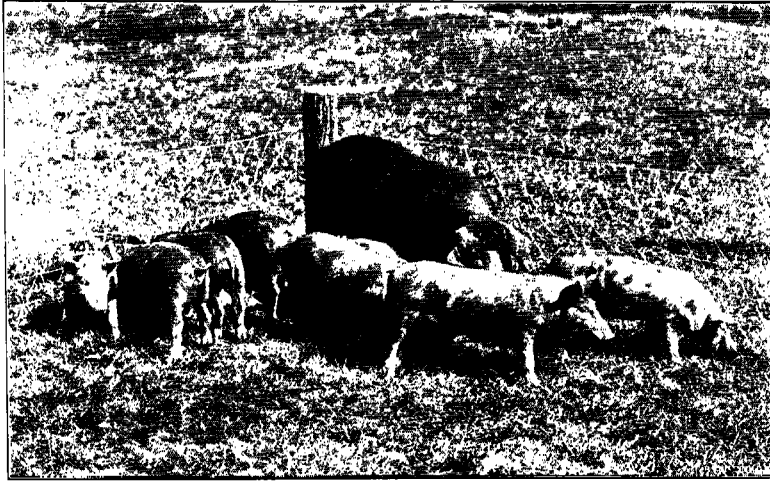


Plate 45. Litter of Tamworth-Poland-China crosses.
Average birth weight, $3\frac{1}{2}$ pounds.

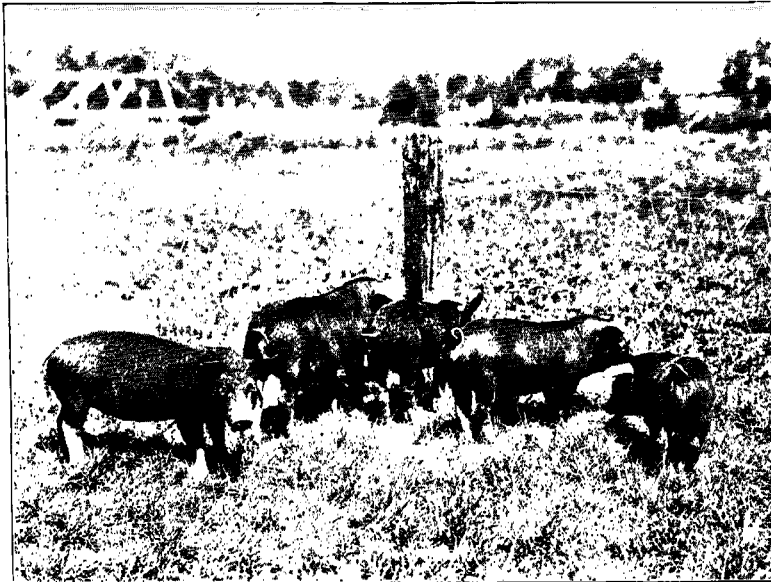


Plate 46. Runts before treatment. Age, three months.
Average weight, 37 pounds.



Plate 47. Runts no longer. Age, six and one-half months. Average weight, 155 pounds. Daily gain per head, 1.12 pounds.

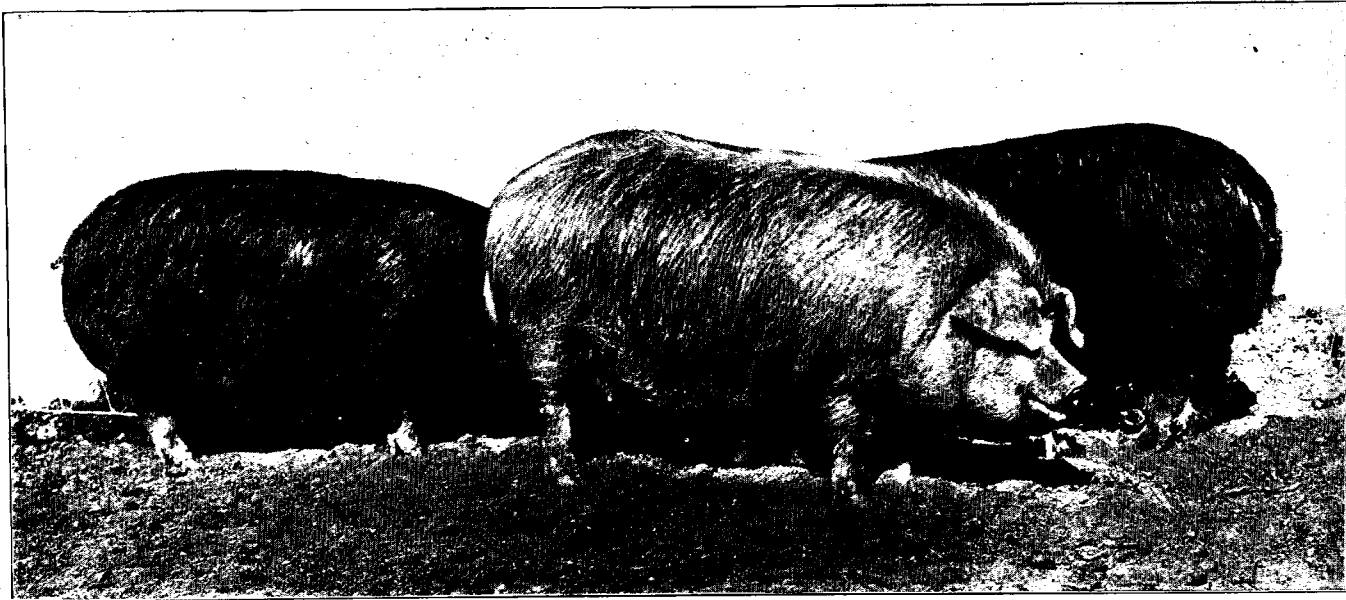


Plate 48. Former runts ready for market. Age, twelve months. Average weight, 309 pounds.

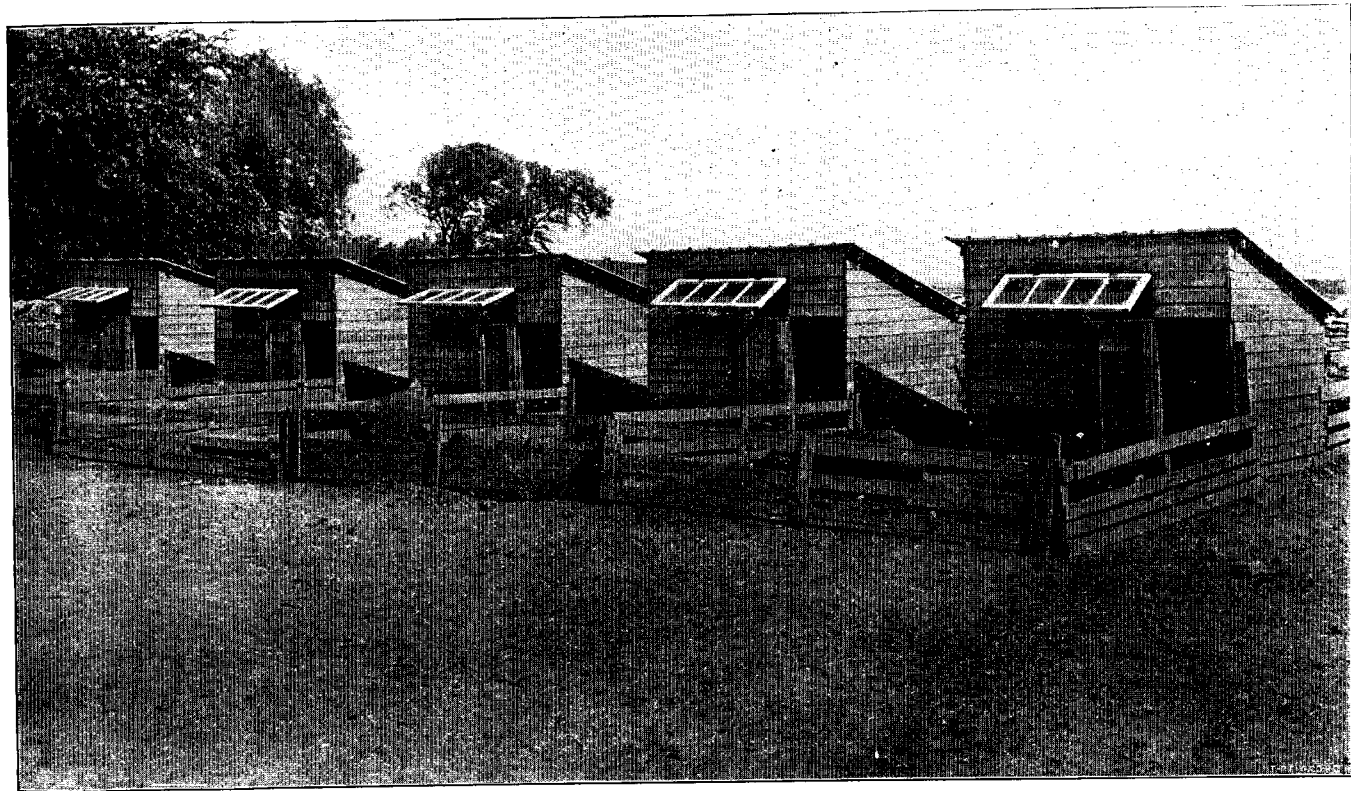


Plate 49. Farrowing-houses and yards.



Plate 50. Farrowing-houses used for shade and storing grain in pasture.

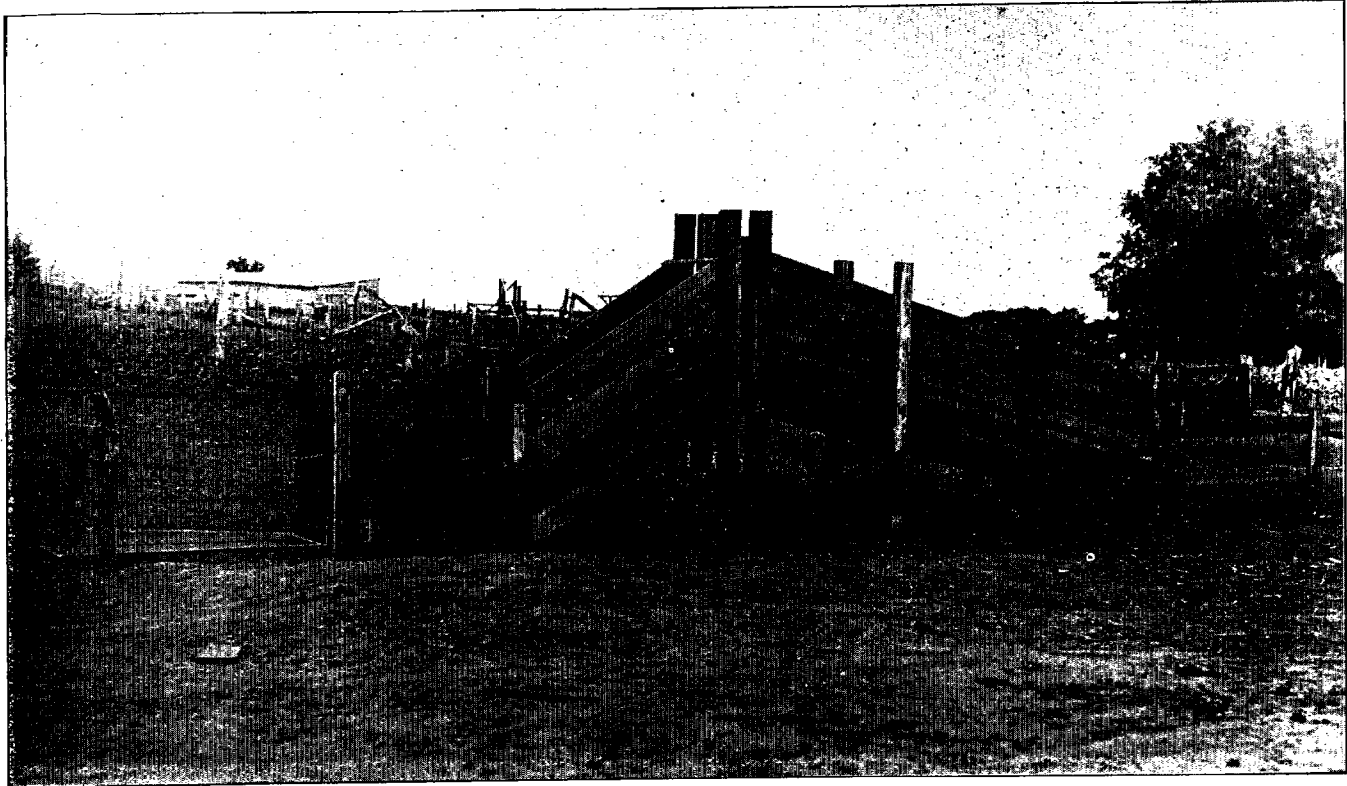


Plate 51. Chute and dipping-tank.

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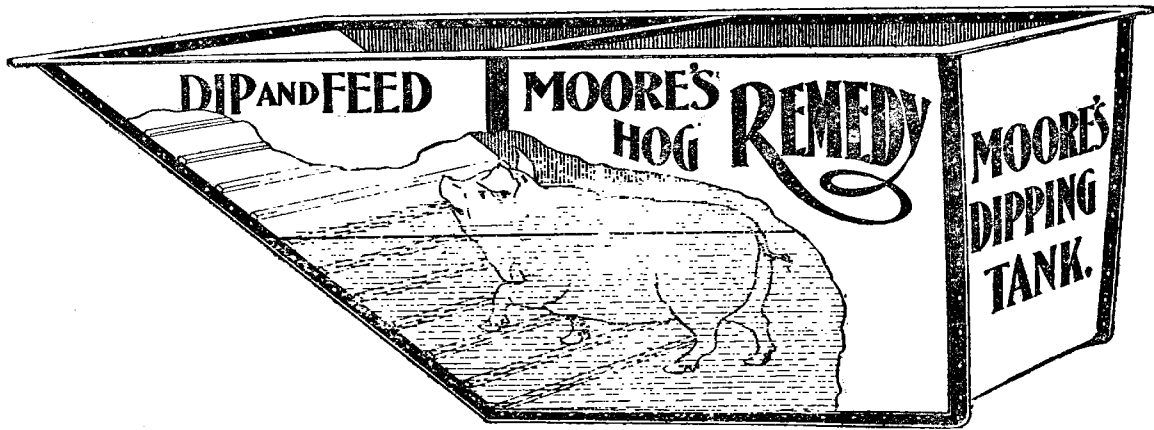


Plate 52. Dipping tank exposed to full view.