[PUBLIC—No. 15.]

AN ACT providing for the public printing and binding and the disposition of public documents.

SEC. 73. Extra copies of documents and reports shall be printed promptly when the same shall be ready for publication, and shall be bound in paper or cloth, as directed by the Joint Committee on Printing, and shall be the number following in addition to the usual number:

Of the report of the Bureau of Animal Industry, 30,000 copies, of which 7,000 shall be for the Senate, 14,000 for the House, and 9,000 for distribution by the Agricultural Department.

Approved, January 12, 1895.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., August 28, 1906.

Sir: I have the honor to transmit herewith the Twenty-second Annual Report of the Bureau of Animal Industry for the year 1905, and recommend that it be forwarded to the Public Printer for printing, as provided by section 73 of the act of Congress approved January 12, 1895.

In September, 1905, Dr. D. E. Salmon, who had served as Chief of the Bureau for more than twenty-one years, beginning with its organization in 1884, resigned that position, and his resignation was accepted by you to take effect November 1, 1905. The undersigned has been in charge of the Bureau work from the time of Doctor Salmon's retirement. The report of the Chief of the Bureau for the fiscal year ended June 30, 1905, is therefore by Doctor Salmon, as that period came entirely within his administration. Unless otherwise stated, the remainder of the volume represents the work of the calendar year 1905.

It has been thought best to omit from this report much of the miscellaneous information and statistical matter of the kind that has appeared in previous volumes. This material has been largely compiled from consular reports, reports of the Bureau of Statistics of the Department of Commerce and Labor, and publications of the Bureau of Statistics of this Department; and while such information is unquestionably of considerable interest and value, its reprinting in this report is considered unnecessary, since it is accessible in the other Government publications mentioned.

Respectfully,

A. D. Melvin,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

ORGANIZATION OF THE BUREAU OF ANIMAL INDUSTRY.

Chief: A. D. Melvin.
Assistant Chief: A. M. Farrington.
Chief Clerk: E. B. Jones.
Dairy Division: Ed. H. Webster, chief; Clarence B. Lane, assistant chief.
Inspection Division: Rice P. Steddom, chief; U. G. Houck, associate chief; Morris Wooden, assistant chief.
Quarantine Division: Richard W. Hickman, chief.
Experiment Station: E. C. Schroeder, superintendent; W. E. Cotton, assistant.
Animal Husbandman: George M. Rommel.
Editor: James M. Pickens.
Artist: W. S. D. Haines.
Librarian: Beatrice C. Oberly.

LABORATORIES.

Biochemic Division: Marion Dorset, chief.
Pathological Division: John R. Mohler, chief.
Zoological Division: Brayton H. Ransom, scientific assistant in charge.

CONTENTS.

ILLUSTRATIONS.

PLATES.

TEXT FIGURES.

TWENTY-SECOND ANNUAL REPORT OF THE BUREAU OF ANIMAL INDUSTRY.

REPORT OF THE CHIEF OF THE BUREAU FOR THE FISCAL YEAR ENDED JUNE 30, 1905.

By D. E. SALMON, D. V. M.

TUBERCULOSIS.

TUBERCULOSIS OF HOGS.

The increasing proportion of tubercular hogs found by the meat-inspection service is a matter of grave concern for the producer, for the packer, and for the consumer. During the past fiscal year 0.25 per cent of all carcasses inspected were condemned and destroyed because affected with this disease. During the month of July, 1905, the condemnations for tuberculosis were 1.47 per cent of all the hogs killed at one of the largest packing houses in this country, while at another equally large establishment the condemnations for the same month reached 1.35 per cent of all carcasses. In addition to the carcasses condemned there were as many more slightly affected which were not condemned. In other words, about 3 per cent of the hogs coming to some of our largest abattoirs are affected with tuberculosis.

This fact indicates a rapid increase of the disease among this species of animals, and calls for a searching investigation as to the cause and the most certain means of control. No doubt the running of hogs in the same pastures with cattle, the feeding of unsterilized milk from the creameries, and the practice of many farmers of allowing their hogs to consume the carcasses of cattle which have died of disease are causes to which a part of the infection may be attributed; but the time has come to inquire if the breeding stock of purebred hogs has not become contaminated to such a degree that the disease is being disseminated by such animals and the stream of hog production poisoned at its source.

The hog carcasses destroyed on account of this disease last year would have cost the packers at present prices nearly $1,000,000, and at the present rate of condemnation there would be nearly twice as many seized. Up to this time the loss has fallen upon the packers, but undoubtedly a way will soon be found by them to shift the burden upon the producer. A loss of from $1,000,000 to $2,000,000 a year from this cause is a very serious one, and the farmers can ill afford to have this added to the other losses which they suffer from hog diseases.

The subject is one which calls for immediate inquiry and for adequate measures of control before the disease becomes so prevalent as to make repression a difficult or impossible task.

EXPERIMENTS WITH TUBERCLE BACILLI.

The comparative study of tubercle bacilli from varied sources which has been carried on for several years by the Pathological Division has been completed and the results of the investigation are in course of publication. In addition to the human and bovine cultures that were used in the above work, numerous other cultures have been obtained during the past year from birds and wild animals of varied species which have succumbed to tuberculosis while in captivity. These cultures are under such cultural inoculation tests as will determine their characteristics and locate them in their relation to the tubercle bacilli previously studied. It having been found that morphological and cultural characteristics are not always trustworthy as indicators of the origin of some particular cultures of tubercle bacilli, the method of reaching such determination by means of the chemical reaction in cultures growing upon glycerin bouillon has appeared worthy of investigation. Many cultures have been submitted to this test and the results will be recorded soon. The extent of the immunity from tuberculosis which may be given cattle by means of intravenous inoculations with attenuated cultures of tubercle bacilli is under study. This opportunity will also be utilized to determine if the tubercle bacilli so injected into the circulation of cows during the period of lactation are excreted in the milk as well as in the saliva and urine.

New regulations in regard to the condemnation of tuberculous carcasses have been sent to the inspectors of the Bureau for the purpose of gaining greater uniformity in the disposal of the slightly affected carcasses, and many tuberculous glands and other parts of hogs and cattle have been sent to the laboratory that the real extent of the disease might be determined through microscopical examinations and inoculation experiments. This has been very helpful in assisting inspectors at the abattoirs to estimate accurately from the naked-eye appearance of the dressed carcass the degree of progress which the disease has made within the tissues of the animal and has thus helped them in making proper disposition of the affected meat.

The results of the experiments in the Biochemic Division concerning the infectiousness of human tubercle bacilli for cattle were published during the past year as Bulletin 52, Part II. Certain observations published as Circular 60 of this Bureau show that tubercle bacilli of bovine origin may grow out into long filaments, the usual short form of bovine tubercle bacilli becoming long when the organism is grown upon a specially prepared medium. A number of experiments are in progress now looking to a better understanding of the chemical changes produced in nutrient media by the growth of tubercle bacilli upon them.

THE DISTRIBUTION OF TUBERCULIN.

During the past year 75,041 doses of tuberculin were prepared in the Biochemic Division and shipped to authorized health officers in the States named below and in the quantities indicated:

Doses of tuberculin distributed, fiscal year 1904–5.

	Doses.		Doses.
Arizona	12	New Jersey	1,783
California	278	New Mexico	108
Colorado	126	New York	99
District of Columbia	604	North Carolina	351
Georgia	132	North Dakota	340
Idaho	48	Ohio	327
Illinois	42	Oklahoma	78
Indiana	3	Oregon	425
Iowa	534	South Dakota	60
Kentucky	56	Texas	3
Maine	81	Utah	44
Maryland	46	Virginia	186
Massachusetts	17,080	Vermont	17,236
Michigan	773	Washington	5,138
Minnesota	18,717	Wisconsin	4,600
Missouri	815		
Montana	4,700	Total	75,041
Nebraska	216		

At the Experiment Station of the Bureau considerable time has been spent in collecting and preparing for publication the data of the tuberculosis investigations of the past three or four years. Cow No. 218, mentioned in my last two reports, is still on hand. This cow received an injection of human tubercle culture into one quarter of her udder, and on June 27, 1905, nearly three years and nine months after the injection was made, the material secreted by the injected quarter of her udder was infectious for guinea pigs on subcutaneous injection. Mention was also made of her having produced a calf. This calf sucked its mother until it was 12 months old, and is now in excellent condition. Tuberculin tests of both cow and calf were made in February, 1905, and both were negative. The unaffected quarters of the cow's udder produced a considerable quantity of normal milk, which was tested on guinea pigs with negative results. The injected quarter of the udder remained very much shrunken, and at best did not secrete above 6 c. c. of material per day. This material had the appearance of very poor milk, but on standing threw down a gray precipitate.

THE TUBERCULIN TEST IN ENGLAND.

The Department regulations in Bureau of Animal Industry Order 109 provide for the tuberculin testing of all cattle over 6 months old to be imported for breeding purposes from Great Britain and Canada. Those from Great Britain must be tested by an inspector of this Bureau who is stationed in that country; those from Canada are admitted upon a certificate of tuberculin test by a Canadian official veterinarian or an inspector of this Bureau. Cattle tested with tuberculin by the Bureau inspector in Great Britain, with the results, during the fiscal year ending June 30, 1905, are given below:

Results of tuberculin test in England of cattle for importation.

Breed.	Passed.	Rejected.
Ayrshire	7	5
Guernsey, in England	3	2
Highland	3	0
Dexter Kerry	7	3
Shorthorn	2	1
Total	22	11

BLACKLEG.

IMPORTANCE OF DISTRIBUTING BLACKLEG VACCINE.

During the last seven years the Bureau has been distributing blackleg vaccine to the stock raisers of the country, who use it to protect their young cattle from the disease known as symptomatic anthrax, or, popularly, as blackleg. At the beginning of the distribution the losses from this disease were very serious, amounting to 10 to 15 per cent of the young stock annually. By the use of the vaccine the loss has been reduced to one-half of 1 per cent, and the disease seems to be disappearing. It was anticipated that by continuing the vaccination for a series of years the infection in the soil, not being renewed, would gradually die out, and in the course of time it would be possible to dispense with the vaccination. As the bacillus of this disease forms spores, it lives for a long time in the soil, and only experiments continued for a considerable number of years could determine how long a time would be required for the eradication of the contagion.

This distribution of vaccine is, therefore, very important both to prevent the annual losses and as a means of eradicating the contagion from the infected pastures; and, in fact, the cattle industry in some sections is dependent upon it, as cattle could not be profitably raised without vaccination, owing to the heavy losses from this disease. The Bureau should consequently continue to supply this vaccine as one of the cheapest and most efficient means of protecting the stock raisers from the ravages of disease.

DISTRIBUTION OF VACCINE DURING THE YEAR.

The preparation of vaccine and its free distribution to cattle owners in all parts of the United States has been continued in the Pathological Division during the past year. The large number of doses distributed and the small cost of production to the Government, in comparison with the immense saving afforded cattle raisers and feeders, render this the most important routine work of the pathological laboratory. The table below shows that the demand for vaccine has increased 59,130 doses over that supplied during the previous year. As usual, the greatest call for the material occurred during the fall and spring, the highest monthly output being recorded in October, when over 245,000 doses were distributed. During the entire year a total of 1,395,970 doses were sent out, and the distribution of these among the various States, as well as the general results obtained from the vaccine supplied during the preceding year, may be seen in the tables.

Doses of vaccine distributed during the fiscal year ended June 30, 1905.

	Doses.
July 1 to December 31, 1904:	
July	32, 875
August	68, 665
September	99, 170
October	245, 050
November	235, 065
December	132, 245
January 1 to June 30, 1905:	
January	95, 920
February	69, 435
March	152, 540
April	132, 940
May	67, 540
June	64, 525
Total	1, 395, 970

Results obtained from vaccine distributed during the fiscal year ended June 30, 1904.

State or Territory.	Number of reports.	Number of cattle vaccinated.	Deaths same season previous to vaccination.		Died after vaccination.					
			Number.	Per cent.	Within 48 hours.	From 2 to 7 days after.	Within 1 year.	Number of cases due to mistakes.	Total number.	Percentage of deaths.
Arizona	40	4,653	92	1.97	2	8	13	......	23	0.49
Arkansas	22	1,165	71	6.09	......	3	11	......	14	1.20
California	478	61,261	812	1.32	38	46	221	2	307	.50
Colorado	567	68,560	856	1.24	11	84	290	12	397	.57
Idaho	49	3,057	86	2.87	3	......	4	2	9	.29
Illinois	60	2,699	101	3.77	1	......	15	......	16	.59
Indiana	6	252	10	3.96	......	......	14	......	14	5.55
Indian Territory	48	3,812	133	3.48	1	6	20	......	27	.70
Iowa	116	6,701	171	2.55	8	5	27	......	40	.59
Kansas	898	76,493	1,479	1.29	34	110	201	7	352	.46
Kentucky	52	1,178	63	5.34	1	......	1	......	2	.16
Michigan	5	504	9	1.78	......	1	......	......	1	.19
Minnesota	40	2,922	74	2.53	......	......	1	......	1	.03
Missouri	704	101,300	802	.79	19	47	204	1	271	.26
Montana	345	35,489	676	1.90	8	16	70	18	112	.31
Nebraska	1,793	139,003	2,520	1.81	95	152	612	33	892	.64
New Mexico	25	4,398	144	3.27	2	3	55	22	82	1.86
New York	14	482	29	6.01	......	......	5	......	5	1.03
North Carolina	27	1,267	32	2.52	1	......	1	......	2	.15
North Dakota	469	42,494	740	1.74	12	39	155	2	208	.54
Oklahoma	84	7,225	148	2.04	1	5	26	......	32	.44
Oregon	79	10,846	144	1.32	3	4	10	......	17	.15
South Dakota	484	48,383	881	1.82	19	36	154	......	209	.43
Tennessee	42	1,002	86	8.58	10	......	7	......	17	1.69
Texas	876	145,113	2,368	1.63	69	155	718	11	953	.65
Utah	19	3,522	33	.93	1	2	9	......	12	.34
Vermont	7	113	24	21.23	1	......	6	......	7	6.19
Virginia	274	8,612	215	2.48	1	5	40	......	46	.53
Washington	105	3,632	145	3.99	......	6	15	......	21	.58
West Virginia	103	3,183	85	2.67	4	4	23	......	31	.97
Wisconsin	9	281	17	6.04	......	......	6	......	6	2.13
Wyoming	299	50,912	472	.92	14	69	152	4	239	.44
Other States	6	274	2	.72	......	......	......	......	......	......
Total	8,125	840,788	13,520	1.60	359	806	3,086	114	4,365	.51

There are several interesting features connected with the above table. For instance, the annual loss from blackleg before vaccination in those localities where cattle are not immunized yearly or where they have not been vaccinated in time is lower than ever, indicating that there is less blackleg in the country than in any year since vaccination began. It is also gratifying to know that the number of cattle which died as a result of carelessness or of any other acknowledged mistake has been reduced to 114 cases. In estimating the merits of the vaccine it is necessary to deduct this number of deaths admittedly due to mistakes and the number of cattle which died within two days after inoculation as a result of having been infected prior to vaccination from the total number of deaths following inoculation. We would therefore have 3,892 deaths following the injection of over 840,000 animals, or a mortality of 0.46 per cent.

HOG CHOLERA.

Further experiments in the biochemic laboratory have thoroughly substantiated the statement in Circular 41, to the effect that a filterable virus is chiefly, if not wholly, responsible for the outbreak of the highly infectious form of hog cholera met with in southwestern Iowa. This filterable virus is present in the blood of sick hogs and is capable of inducing an attack of the disease when injected subcutaneously. When the blood serum of sick hogs is diluted with ten volumes of salt solution or with beef broth the virus readily passes through the finest porcelain filters, and this filtered serum is then capable of bringing on a typical attack of disease in hogs when injected subcutaneously, although it is without effect upon rabbits, guinea pigs, white rats, gray rats, white mice, gray house mice, and chickens. The disease produced in hogs by the filterable virus possesses all the characters seen in the natural disease, viz, contagiousness, infectiousness of the blood upon subcutaneous injection, immunity in those hogs which recover, and also the characteristic lesions and symptoms. All efforts to discover an organized form in the filtered serum have failed, and attempts to cultivate the unknown virus on the various media were equally fruitless.

Parallel with the experiments with the filterable virus a series of experiments was carried out with pure cultures of *B. choleræ suis*, which has been heretofore regarded as the sole cause of hog cholera. The use of that organism, however, failed to produce a disease which was contagious or which showed the characteristic infectiousness of the blood during the course of the disease and immunity in those which recover. The details of these experiments are given in Bulletin No. 72. At the Experiment Station of the Bureau the endeavor has been made to produce a vaccine with virulent blood attenuated by mixture with glycerin and subjecting it for varying periods to a temperature somewhat above the fever temperature of animals or allowing it to age at room temperature or at a lower temperature. It was found that the germicidal and attenuating powers of different glycerins vary greatly, probably due to impurities in the glycerin. It was also found that blood left at ordinary room temperature and exposed to diffused sunlight loses its virulence much more rapidly than that kept in a dark chamber at a fairly constant but slightly lower temperature. This applies to dried blood as well as glycerinated blood. In a number of instances immunity was conferred by injections of either heat or time attenuated glycerinated blood, but these results have not been constantly confirmed.

Several remedies reported to have given excellent results were tested, but all proved valueless as remedies for hog cholera.

TEXAS FEVER.

In the Division of Zoology ticks have been studied to determine their habits and rôle in the transmission of disease, especially Texas fever. The Texas fever tick ordinarily remains upon one host during its development from the larva to the replete ovigerous female, but experiments show that this is not always the case. If ticks are removed from a cow shortly after the first molt and placed upon another cow, they will attach themselves and mature upon the latter, and the same is true in regard to ticks thus transferred at the time of the second molt. These facts may explain certain cases of Texas fever, which sometimes develop in susceptible cattle within a few days after exposure to the tick-infested animals, the interval of time between exposure and appearance of symptoms being so short that it is impossible for infection to take place in the usual manner; that is, through the second generation of ticks, which require, under the most favorable circumstances, not less than two weeks and usually much longer to hatch out. In such cases it seems not improbable that ticks which have been rubbed off or otherwise detached from infested animals have fastened upon the susceptible cattle and infected them. Texas fever ticks removed from a cow just before the second molt molted and remained alive in the laboratory over two weeks, and ticks thus removed readily attached themselves to human beings and to rabbits and sucked blood. This indicates that other animals than cattle and horses may, under a proper combination of circumstances, act as disseminators of Texas fever ticks. Heretofore the Texas fever tick, *Rhipicephalus* (*Boophilus*) *annulatus*, has been the only species of the genus known to occur in this country, but a second species, *Rhipicephalus sanguineus*, has recently been collected in Texas. The occurrence of this form in the United States is worthy of note for at least two reasons—first, it is a member of a genus several species of which are known to act as transmitters of disease among domestic animals, and, second, the females of the Texas fever tick and of *Rhipicephalus sanguineus* bear a striking superficial resemblance to one another, so that they are liable to be confused by the careless observer.

At the Experiment Station southern cow No. 1, though removed from all sources of infection for ten years, still carries the parasite of Texas fever, but injections of her blood made into two susceptible animals seem to produce only a mild type of disease. Cow No. 113, mentioned in my last report as having lost her infectiousness, after being removed fifteen years from sources of infection was injected early in the year with virulent blood to determine whether she had lost also her immunity. No disease that could be detected developed, but that her blood became reinfected as a result of this injection is shown by the fact that her blood injected into a susceptible animal produced rapidly fatal disease.

MYCOTIC STOMATITIS.

During the summer and fall of last year numerous letters were received relative to a disease affecting the mouth and feet of cattle in the Southwest, where it caused alarm among the stockmen owing to its similarity to foot-and-mouth disease of Europe, and gave rise to the fear that the contagion of this latter malady had spread to that section from the recent outbreak in New England. The disease was carefully investigated and found to be mycotic stomatitis, caused by grasses containing the red and black rusts. Later reports were received which indicated that this affection had made its appearance in northern California and in Oregon. An inspector sent to those points confirmed the above diagnosis. In order to give correct information concerning mycotic stomatitis, to assert its noncontagiousness, and to differentiate it from the virulent foot-and-mouth disease, which it so closely simulates, Circular No. 51 has been issued.

RABIES.

During the past year 45 suspected cases from various parts of the country have been examined. Of these, 22 resulted positively. Fourteen of this number, comprising 13 dogs and 1 cat, were received from the District of Columbia. Of the remaining 8 cases, 2 were forwarded from Georgia, 4 from Virginia, 1 from West Virginia, and 1 (the brain of a heifer) from Indian Territory. A tabulated list of these positive cases is given in the accompanying table:

Results of inoculation tests and microscopic examination for rabies.

Date.	Record No.	Kind of animal.	Received from—	Result of inoculation.	Diagnosis by histological examination.	Persons or animals bitten.
1904.						
July 6	343	Dog	District of Columbia	Positive	None made	
July 7	344	do	Savannah, Ga	do	Ganglia not forwarded.	Several persons.
July 8	345	do	District of Columbia	do	do	
July 12	346	do	Norfolk, Va	do	Not typical	1 boy.
July 18	347	do	Savannah, Ga	do	None made	
July 30	349	do	Hatton, Va	do	Ganglia not forwarded.	2 persons.
Aug. 12	350	do	District of Columbia	do	Positive	1 person and 8 dogs.
Aug. 30	351	do	do	do	do	1 person.
Sept. 22	352	do	Huntington, W. Va	do	Ganglia decomposed.	Several dogs and children.
Sept. 27	353	do	District of Columbia	do	Positive	1 person.
Nov. 1	356	do	do	do	None made	
Nov. 7	357	Heifer	Coalgate, Ind. T.	do	do	
Nov. 23	358	Dog	District of Columbia	do	Positive	1 person.
Dec. 13	361	do	do	do	do	Several persons.
1905.						
Jan. 23	368	do	do	do	do	Several dogs.
Mar. 13	370	do	Manassas, Va	do	Ganglia not forwarded.	1 girl.
Mar. 14	371	Cat	District of Columbia	do	None made	
May 10	376	Dog	Norfolk, Va	do	Positive	Several dogs.
May 13	377	do	District of Columbia	do	do	1 person.
May 20	379	do	do	do	do	Several dogs.
June 14	385	do	do	do	do	Do.
June 25	387	do	do	do	Ganglia decomposed.	1 person.

NECROBACILLOSIS.

The study of the *B. necrophorus* has occupied considerable attention, resulting in a paper on the economic importance of this widely distributed micro-organism. It had been recovered previously in the Division of Pathology from multiple liver necrosis in a deer, disseminated liver abscesses in cattle, from the ulcers of the mouth and tongue in cases of necrotic stomatitis in calves and pigs, from ulcerative anovulvitis in cattle, and from cases of foot rot in sheep. This was the first demonstration of *B. necrophorus* as the cause of these two last-named disorders. During the last twelve months the economic importance of the necrosis bacillus has made itself still further apparent in the work of the division. Rabbits suffering with Schmorl's disease, a cellulitis of the face and neck caused by *B. necrophorus*, have been brought to the laboratory for investigation, and two guinea pigs, likewise affected, were received from the Zoological Park. Chickens and a European kite from different sources, supposed to have died with so-called avian diphtheria, showed at the necropsy the presence in the exudate of *B. necrophorus.* Inoculations of the deep-seated intestinal ulcers of hog cholera and of the cheesy nodules inclosing the heads of *Echinorhynchus gigas* demonstrated the presence of the necrosis bacillus in these lesions in the pig. Two enzootics of foot rot in cattle furnished the same bacillus, and inoculation experiments showed it to be the causative factor.

In addition to the above, European observers have demonstrated *B. necrophorus* as the cause of the necrotic dermatitis of horses; of necrotic pocks found in the severer varieties of variola of cattle and swine; joint ill and necrotic omphalophlebitis of calves and foals; necrotic vaginitis and metritis of cattle; necrotic scratches and quittor of horses; necrotic inflammation and dry gangrene of the skin and subcutis of the teats and udders of cows; necrotic turbinated bones of a horse; deeply penetrating caseo-necrotic patches in all four stomachs of cattle, the paunches of deer and antelopes, small intestines of calves, cecum and colon of horses; necrotic processes on lips and nose of sheep. When it is remembered that the presence of only one of the morbid conditions noted may be the starting point of an enzootic outbreak of necrobacillosis in any of its forms among any of the domestic animals, there can be no question as to the importance of keeping the stockman fully informed as to the imminence of the infection and the prophylactic and therapeutic measures which can successfully cope with it.

CONTROL OF CONTAGIOUS DISEASES.

TEXAS FEVER.

During the quarantine season of 1904, 40,389 carloads of cattle, shipped from points below the quarantine line and intended for immediate slaughter, were received at packing centers; the number of animals carried in these cars was 1,087,474. In the noninfected areas of Texas and Oklahoma, 228,277 head of cattle were inspected and permitted to be moved north for purposes other than immediate slaughter. Supervision was exercised over the dipping with crude petroleum of 99,040 head of cattle and over the cleaning and disinfection of 37.120 cars.

SCABIES IN SHEEP, CATTLE, AND HORSES.

The total number of inspections of sheep for scabies was 53,680,786, and the total number of dippings was 16,873,659, of which 2,703,845 were redippings. As will be seen from the following tabulation, this shows an increase over the previous fiscal year of 31 per cent in inspections and 76 per cent in dippings.

Number of inspections and dippings of sheep for scabies, and cars cleaned and disinfected, fiscal years 1900 to 1905.

Year.	Inspections.	Dippings.	Cars cleaned and disinfected.
1900	1,801,392	626,838	....
1901	7,912,724	1,034,368	....
1902	11,186,661	1,017,162	791
1903	16,444,370	2,167,002	752
1904	40,967,961	9,578,476	2,732
1905	53,680,786	16,873,659	7,965

The total number of inspections of cattle for scabies was 14,085,267, and the total number of dippings was 563,394, of which 114,463 were redippings. Cars cleaned and disinfected, 29,897.

The total number of inspections of horses for scabies was 15,971, and the total number of dippings was 577, of which 207 were redippings.

VENEREAL DISEASE OF HORSES.

Work in connection with the venereal disease of horses, the so-called maladie du coït, has progressed satisfactorily. During the annual round-up last year in the Indian reservations of South Dakota not one diseased animal or suspect was found; and while careful and vigorous work has been continued through the year, no new case of the disease was discovered, either in the regular work or during the round-up in June. In view of these facts I have recommended that the quarantine maintained in this section be discontinued.

The work of stamping out the same disease in Van Buren County, Iowa, has likewise been successful. Reports from the quarantined area of Nebraska and South Dakota, included in the Pine Ridge and Rosebud Indian reservations, and portions of the counties of Fall and Custer, S. Dak., and Dawes, Sheridan, and Sherry, Nebr., show that 8,705 horses were inspected. One stallion and eight mares, all suspects, were slaughtered, for which $165, an average of $18.33, was paid. Nine stallions were castrated, for which $37.50 was paid, an average of $4.16. In Van Buren County, Iowa, 410 horses were inspected, 2 directly exposed stallions were castrated, and 12 directly exposed mares were slaughtered at a cost for those slaughtered of $565, or $47.08 each; these mares were breeding animals of a much better grade than those in the above-named territory of South Dakota and Nebraska.

THE ARTIFICIAL CULTIVATION OF PROTOZOA.

The *Trypanosoma equiperdum* (the parasite which has been supposed to be the cause of the maladie du coït), which was referred to in the last report as having been imported from France in an inoculated dog, has not only been injected experimentally into various species of animals during the past year, but has been successfully grown on artificial culture media by the methods suggested by Novy and McNeal. Great difficulty was at first encountered in getting the original culture started, and numerous failures were recorded before the organism finally developed on a medium containing three volumes of defibrinated rabbit's blood to one of nutrient agar, a larger percentage of blood than is required for *Trypanosoma lewisi.* Subcultures have since developed with much greater ease and have now been cultivated artificially for over three months and to the fifth generation. The success that has followed the artificial cultivation of the trypanosomes naturally suggested the feasibility of growing other protozoa by the same or similar methods. An endeavor is now being made to find a medium suitable for the development of the *Piroplasma bigeminum* and *Plasmodium malariæ;* samples of blood containing them have been placed under what it is hoped will prove suitable conditions. The benefit to be derived from obtaining cultures of the Texas fever protozoan, for instance, can be readily appreciated when the possibility of thereby elucidating the life history of this parasite is considered, as well as the more important probability of so attenuating or controlling such cultures for the injection of susceptible animals as to produce a stronger immunity with less mortality than by blood inoculations.

MISCELLANEOUS WORK IN RELATION TO DISEASES OF ANIMALS.

During the past several years numerous specimens of tissue from various animals, principally from sheep and hogs, showing lesions of fat necrosis have been received at the pathological laboratory from the meat inspection force. Although this condition is quite distinct in its pathological picture and can be diagnosed with a fair certainty without the aid of a microscope, it seems to have caused some confusion as to the disposition of carcasses showing such lesions. With the object of reproducing the disease, as well as to attempt to ascertain its cause, a number of experiments on the dog and cat have been performed, and while the experiments are incomplete, the conclusion of previous investigators is confirmed that bacteria play no part, or at least are not essential, in the causation of the disease.

During the past year four specimens of pulmonary fat embolism in hogs killed at official abattoirs were forwarded for examination. In such cases the post-mortem reveals no other sign of disease, and yet here is a lung which at first appearance might be mistaken, sometimes for the lung of hog cholera, sometimes for that of swine plague. That this lesion does occur as a result of a fractured bone or the existence of an extensive destruction of the subcutaneous fat tissue has been proven; that it may occur in the less modern methods of hoisting and sticking the animals has been surmised. Further investigation is now in progress.

Last fall attention was called to a disease affecting a number of young hogs belonging to the Reform School of the District of Columbia. Nine animals had died. The trouble proved to be paraplegia or paralysis of the hind quarters, so common in the hog-raising districts of the Middle West. The point firing treatment was applied. This consists in making deep punctures with a hot iron about 2 inches apart over the lumbar region, on either side of the spinal column, from 14 to 16 punctures being made in all. The treatment was successful, all of the 14 affected hogs recovering.

A number of cases of so-called avian diphtheria have been received for diagnosis. Among the different species represented were the chicken, pigeon, kite, and quail. Various organisms were found apparently in casual relationship with the disease; for instance, *B. necrophorus* in the kite, *Actinomyces bovis* in a chicken, and several other bacterial forms similar to those described by other observers in this field. The net result of the investigations of this disease (or group of diseases) compels the assumption that different germs must be charged with the early inflammatory disease, leaving the later cheesy or pseudo-membranous lesions to be instituted by such organisms as the necrosis bacillus, the agent of actinomycosis, and such other pathogenic forms, protozoal, bacterial, or mycotic, as may find easy lodgment in the diseased tissues of the mouth and upper air passages.

An interesting experience was the finding of the actinomyces in the pseudo-membranous patches in the mouth of a chicken affected with a complication of avian diphtheria and chicken pox. In making numerous cultures from these necrotic patches in an endeavor to isolate a pathogenic organism, a growth was obtained from the mouth lesions which on being plated furnished among other micro-organisms several colonies of actinomyces. About three months later in working on similar patches in the pharynx of a second chicken sent in for examination and not showing any evidence of chicken pox, another member of the laboratory force isolated an actinomyces which corresponded in every particular to that first recovered. There appears to be no reference in the literature to indicate that actinomyces had ever before been found in relation to avian diphtheria, nor in fact to any other disease of chickens. Scarifications made in the mouths of healthy fowls and rubbed with the spores of actinomyces produced an evanescent exudative process, and this fact coupled with the presence of the micro-organisms in the two different outbreaks appears to warrant a more extended investigation of avian diphtheria along this line.

After Dunstan and Henry and Peters and Slade had shown that prussic acid might be produced in sorghum and some other plants by the action of an enzyme upon a glucoside, the Biochemic Division began a number of examinations of cornstalks with the object of determining whether or not some instances of so-called "cornstalk disease" might not be due to prussic acid produced in the manner mentioned above. These experiments showed that an enzyme resembling "emulsin" was present in all cornstalks examined and that it was capable of splitting off prussic acid from the glucoside "amygdalin." In the cornstalks, however, no glucoside capable of yielding prussic acid could be found and examinations were made of other field plants and grain, with the results similar to those obtained with corn. The details of these experiments appear in the Annual Report of the Bureau for 1904.

Many specimens of parasites sent in by correspondents have been identified in the Zoological Division, about 500 specimens added, and the entire collection—nearly 5,000 specimens—has been recatalogued after a new and more useful plan. In this division, also, arrangements have been made for a set of experiments to determine, if possible, practicable preventive methods against the roundworms so prevalent and injurious to sheep in many localities; bulletins have been issued on the subjects of external parasites of hogs, gid in the United States, and on certain parasites of chickens and pigeons, two of which are species new to science; publication of the Index-Catalogue of Medical and Veterinary Zoology is continued, the G, H, I, and J authors having been issued.

POULTRY-FEEDING EXPERIMENTS.

During the past year more than thirty individual feeding experiments with chickens have been completed. The chickens used were kept under as healthful conditions as possible, new houses having been erected especially for the digestion experiments and so constructed as to afford ample ventilation and sunlight. There have been completed this year experiments with the single grains, corn, wheat, and oats, and some with mixtures of these three grains. In addition, green food was made a part of the ration in certain experiments. The chemical portion of these experiments is not yet complete.

EXAMINATION OF STOCK DIPS.

The requirements of the Department that the lime-and-sulphur dips when diluted ready for use shall contain not less that 2 per cent of lime nor more than 1 per cent of sulphur combined in the form of calcium sulphides have necessitated a chemical examination of all concentrated lime-and-sulphur dips of that character which are to be used for official dipping. The samples analyzed are purchased by inspectors of the Bureau in the open market. In addition, examinations of sulphur and nicotine solutions which are used in compounding the lime-and-sulphur and tobacco-and-sulphur dips were made.

The Beaumont crude petroleum having been found effective as a dip for destroying Texas fever cattle ticks, the Biochemic Division has received for analysis samples of crude petroleum from most of the recently discovered oil deposits in the western portion of the United States. Another form of stock dip which has received considerable study is that known as the "carbolic dip." In addition to the analyses, considerable research work has been done, which had for its objects (1) increase of efficiency of dips and (2) decreased cost of dips. These experiments lead to the hope that both of these ends may be accomplished.

GLANDERS.

During the past year 8,999 doses of mallein have been prepared in the biochemic laboratory and sent free of charge to authorized health officers in the various States, this being a considerable increase over the 7,197 doses sent out during the preceding year.

Distribution of mallein to States and Territories.

	Doses.		Doses.
Arizona	24	North Dakota	712
California	726	Oklahoma	84
District of Columbia	1,966	Ohio	102
Iowa	310	Porto Rico	390
Kansas	132	Utah	66
Michigan	36	Vermont	48
Minnesota	3,012	Washington	314
Missouri	276	Wisconsin	27
Montana	720	South Carolina	6
Nebraska	42		
North Carolina	6	Total	8,999

AUTOPSIES OF WILD ANIMALS.

An investigation of the cause of death in all animals which died at the National Zoological Park during the fiscal year was made by the Pathological Division. No enzootic outbreak has occurred, the majority of deaths being due to gastral intestinal disorders, as a result of the unnatural conditions to which animals are necessarily subjected in captivity. Twenty-nine animals died of such disorders; tuberculosis was fatal to 12, pneumonia to 11, and helminthiasis to 16.

THE INSPECTION OF MEAT.

WHY THE SERVICE SHOULD BE EXTENDED.

In this connection it should be noted that there are numerous abattoirs killing hogs and other animals for the interstate trade where no inspection has been established, and where there are consequently no inspectors to condemn and remove the diseased carcasses. The inspection, which has been in operation for about fourteen years, has demonstrated beyond question that with the most careful buying of animals for slaughter there is found a considerable proportion so affected by disease as to be either actually dangerous to human health or offensive and unfit for human food.

Not only is there the large proportion of tubercular carcasses already mentioned, but there are numerous other diseases even more dangerous. In the year just closed there were found seriously affected with abscesses or pyemia 569 carcasses of beef, 230 of sheep, 70 of calves, and 4,044 of hogs—a total of 4,913 carcasses. There were found affected with enteritis, peritonitis, or metritis, 461 carcasses of beef, 191 of sheep, 59 of calves, and 994 of hogs—a total of 1,705 carcasses. There were also found affected with septicemia 239 carcasses of beef, 208 of sheep, 60 of calves, and 877 of hogs—a total of 1,384 carcasses. And, finally, there were found affected with hog cholera or swine plague 13,553 carcasses. In this group of acute septic diseases which can not but be regarded as extremely dangerous to the health of persons using the affected meat for food, there were discovered and destroyed by the inspectors not less than 21,555 carcasses.

It is inconceivable that abattoirs having no inspection are able to avoid the purchase of animals so affected, and without expert inspectors it may safely be assumed that few of these diseased carcasses are detected. There is consequently an urgent need of inspection at every abattoir, and as the Federal Government has undertaken to inspect all meat for the interstate and foreign trades it should extend the inspection until this object is effectually accomplished.

For two years there have not been sufficient funds available to place the inspection at all the abattoirs from which application has been made for inspection, and there are numerous others for which no application has been made and where inspection is not desired by the operators. The absence of inspection at these places not only permits uninspected meat to go into interstate and foreign commerce, but it gives an opportunity for unfair competition with the establishments which have the inspection. For example, if one abattoir, as is the case at present, has inspection and loses 1½ per cent of its hogs by condemnation for tuberculosis, amounting in value to over $200,000 a year, and another abattoir doing a similar amount of business without inspection puts these diseased carcasses on the market on the same terms as healthy ones, it is plain that the profits of the latter will be $200,000 greater than those of the former, unless an advance in price can be obtained for inspected pork, which apparently is not the case with that sold in our domestic markets. A house without inspection can therefore undersell a house that has inspection, and, instead of encouraging inspection and making it to the interest of all abattoirs to have it, the tendency of the system of partial inspection now adopted by the Government is to place a burden on the houses which have inspection and to encourage others to operate without it. It is a matter of great importance, both for the protection of the health of our people and for maintaining the reputation of our meats, that the inspection should be extended promptly and made as thorough as possible.

WORK OF THE PAST YEAR.

During the fiscal year 1905 inspection was inaugurated at 7 establishments. Three of these had previously had inspection and 4 had not. Of the former number 2 had been rebuilt after having been destroyed and the other was an abattoir that was reopened by a new firm after having been shut down for about two years. During the same period inspection was, for various causes, not conducted at 5 establishments which had had inspection in the previous fiscal year.

In the following table are shown the number of establishments and the number of cities where inspection was conducted each fiscal year since 1891:

Number of establishments and cities where meat inspection was conducted, 1891 to 1905.

Fiscal year.	Number of establishments.	Number of cities.	Fiscal year.	Number of establishments.	Number of cities.
1891	9	6	1899	139	42
1892	23	12	1900	149	46
1893	37	16	1901	157	52
1894	46	17	1902	155	50
1895	55	19	1903	156	50
1896	102	26	1904	152	51
1897	128	33	1905	151	52
1898	135	35			

The number of ante-mortem inspections of animals intended for slaughter and the number rejected on such examination are shown in the following table, and indicate an increase of 1,208,121 inspections as compared with the previous fiscal year:

Ante-mortem inspections for the fiscal year 1905.

Kind of animal.	For official abattoirs in cities where inspections were made.	For abattoirs in other cities and miscellaneous buyers.	Total inspections.	Rejected (subject to result of post-mortem inspections).	
				At abattoirs.	In stock yards.
Cattle	6,213,267	6,306,374	12,519,641	926	46,353
Sheep	8,023,659	6,795,627	14,819,286	1,558	9,702
Calves	791,650	591,537	1,383,187	961	11,817
Hogs	24,822,455	12,276,935	37,099,390	4,667	58,448
Total	39,851,031	25,970,473	65,821,504	8,112	126,320

The following statement shows the number of post-mortem inspections and the number of carcasses and parts condemned (exclusive of hog carcasses condemned for trichinæ):

Post-mortem inspections for the fiscal year 1905.

Kind of animal.	Number of inspections.			Carcasses condemned.			Parts of carcasses condemned.
	For official abattoirs.	On animals rejected in stock yards.	Total.	For official abattoirs.	Animals rejected in stock yards.	Total.	
Cattle	6,096,597	37,791	6,134,388	13,859	3,942	17,801	3,466
Sheep	7,872,671	6,302	7,878,973	4,900	1,351	6,251	2,973
Calves	845,862	4,365	850,227	2,224	2,229	4,453	75
Hogs	25,323,984	33,441	25,357,425	86,293	3,985	90,278	152,454
Total	40,139,114	81,899	40,221,013	107,276	11,507	118,783	158,968

While, according to the above statement, more post-mortem inspections were made in the past fiscal than in any previous year, reference to the comparative table on page 28 will show that the increase over 1904 was not up to the average. This was doubtless due to the very marked falling off in slaughtering done at the principal packing centers during the strike in 1904, this affecting the business of the first quarter of the fiscal year.

In addition to the regular and microscopic condemnations the following carcasses were tanked for reasons designated:

Animals lost otherwise than by disease.

Manner of death.	Cattle.	Sheep.	Calves.	Hogs.	Total.
Died in yards	831	872	290	1,698	3,691
Killed in yards	888	467	4,289	19,899	25,543
Died at abattoirs	359	2,149	290	14,387	17,185
Total	2,078	3,488	4,869	35,984	46,419

The following table shows in detail the various diseases and conditions for which carcasses and parts were condemned and tanked during the year and also includes those found dead and those killed by city inspectors:

Causes of condemnation of carcasses and parts of carcasses, fiscal year 1905.

Cause of condemnation.	Cattle.		Sheep.		Calves.		Hogs.	
	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.
Actinomycosis	1,246	1,755	2		2	2	24	131
Tuberculosis	10,956	647	27		28		64,919	142,105
Caseous lymphadenitis			988	1,922				
Cholera and swine plague							13,553	
Texas fever	229				148			
Echinococcus			1	196			5	1,248
Measles							11	
Scabies			3				49	
Eczema							3	
Erysipelas							37	
Cancer	56		2				8	
Tumor	7	5	4	1	1	1	445	321
Abscess	102	253	40	80	12	11	1,066	1,235
Pneumonia	261		322		21		1,147	
Pleurisy	15		26	31	4		120	10
Carditis			4					
Enteritis	52		85		22		304	
Peritonitis	327		73		36		585	
Metritis	52		33		1		155	
Nephritis	6		10		4		34	
Uremia	3		28		2		49	
Mammitis			2				4	10
Septicemia	239		208		60		877	
Pyemia	467		190		68		2,978	
Gangrene	14		5		8	16	19	
Anemia, emaciation, marasmus	1,945		2,876		350		643	
Ascites	14		32				52	
Jaundice	25		419		21		868	
Extreme temperature, various causes	3		67		3		1,785	
Pregnancy	56		26				173	
Recent parturition	53		13				46	
Hernia	1		1		1		21	
Downers, bruised, injured, etc	1,667	806	738	193	172	45	348	7,394
Dead from various causes	1,190		3,002		580		16,085	
Too young			1		3,483			

Causes of condemnation of carcasses and parts of carcasses, fiscal year 1905—Continued.

Cause of condemnation.	Cattle.		Sheep.		Calves.		Hogs.	
	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.
Killed by city inspectors	888		467		4,289		19,899	
Asphyxia	5							
Fistula					3			
Arthritis				1	1			
Blackleg					1			
Leucocythemia					1			
Pulmonary apoplexy			1					
Cysticercus tenuicollis			2					
Distoma			2	199				
Melanosis			1					
Flukes				87				
Cystic livers				263				
Total	19,879	3,466	9,701	2,973	9,322	75	126,262	152,454

The following statement shows, by years, the total number of the different classes of animals inspected post-mortem for official abattoirs since 1891, the total for the past year being greater than that of any previous year.

Number of animals inspected at slaughter for abattoirs having inspection, fiscal years 1891 to 1905.

Fiscal year.	Cattle.	Calves.	Sheep.	Hogs.	Horses.	Total.
1891	83,889					83,889
1892	3,167,009	59,089	583,361			3,809,459
1893	3,922,079	92,947	870,512			4,885,538
1894	3,861,594	96,331	1,020,764	7,648,146		12,626,835
1895	3,704,042	116,093	1,428,601	13,616,539		18,865,275
1896	3,985,484	256,905	4,629,796	14,250,191		23,122,376
1897	4,242,216	273,124	5,209,161	16,808,771		26,533,272
1898	4,418,738	244,330	5,496,904	20,893,199		31,053,171
1899	4,382,020	246,184	5,603,096	23,836,943	3,332	34,071,575
1900	4,841,166	315,693	6,119,886	23,336,884	5,559	34,619,188
1901	5,219,149	413,830	6,639,212	24,642,753	1,992	36,916,936
1902	5,559,969	555,836	7,434,878	25,277,107	1,649	38,829,439
1903	6,134,410	668,855	8,585,960	21,793,738	344	37,183,307
1904	6,350,011	764,590	8,261,051	24,128,462		39,504,114
1905	6,096,597	845,862	7,872,671	25,323,984		40,139,114

The meat-inspection tag or label was placed upon 21,835,655 quarters of beef, 7,849,200 carcasses of sheep, 844,979 carcasses of calves, and 1,025,676 carcasses of hogs. Sacks of meat were sealed as follows: Beef, 5,793; pork, 795,171.

White stamps, indicating the regular post-mortem inspection, were affixed to packages of meat and meat products as follows:

Meat-inspection stamps.

	Packages stamped (white stamp).
Beef	7,123,506
Mutton	29,273
Veal	8
Pork	15,252,508
Total	22,405,295

The number of cars sealed containing inspected meat and meat products was 66,846.

In the following table are shown the interabattoir consignments of inspected meat and meat products. The receipts especially represent much labor on the part of Bureau employees, as all products of every kind entering an official establishment must be identified as having received inspection.

Interabattoir consignments of inspected meat and meat products.

Class of product.	Shipments to official establishments.		Receipts from official establishments.	
	Number quarters and carcasses.	Smaller pieces (weight).	Number quarters and carcasses.	Smaller pieces (weight).
	Quarters.	*Pounds.*	*Quarters.*	*Pounds.*
Beef	1,660,216	149,261,488	1,343,027	321,547,043
	Carcasses.		*Carcasses.*	
Mutton	18,887	5,675,988	20,451	2,206,678
Veal	28,437	1,169,298	1,627	4,651,738
Pork	54,589	371,340,413	25,097	345,300,758

Inspection of export meats.—There were 36,097 certificates of ordinary inspection issued to cover meat and meat products for export, as follows: 1,216,077 quarters, 22,652 pieces, 20 carcasses, and 1,795,051 packages of beef, weighing 361,012,062 pounds; 1,592 carcasses and 3,553 packages of mutton, weighing 206,570 pounds; 18,319 carcasses and 498,735 packages of pork, weighing 155,513,776 pounds—a grand total of 516,732,408 pounds.

The following statement shows, by years, the quantities of the different classes of meat for export under certificates of ordinary inspection since 1898:

Quantities of meat for export under certificates of ordinary inspection, 1898 to 1905.

Fiscal year.	Beef.	Mutton.	Pork.
	Pounds.	*Pounds.*	*Pounds.*
1898	339,650,091	324,996	244,956,482
1899	360,843,356	525,705	278,696,435
1900	438,138,233	680,897	272,050,663
1901	452,830,373	894,648	231,144,938
1902	416,990,762	1,145,248	188,360,011
1903	371,920,787	2,729,013	133,122,610
1904	419,058,781	712,089	154,442,440
1905	361,012,062	206,570	155,513,776

The large decrease in beef exports as indicated above was doubtless due to the strike previously mentioned.

The total cost of the work of ordinary inspection for the year was $829,532.36.

THE MICROSCOPIC INSPECTION OF PORK.

IMPORTANCE OF INCREASING MICROSCOPIC INSPECTION.

The microscopic inspection of pork for export during the year has been far less than the requirements of the trade, and with insufficient funds for the work already in progress it has been impossible to increase this branch of the inspection service. The understanding with Germany and some other European countries at the time the prohibition on American pork was removed required a microscopic inspection for trichinæ by this Government and a certificate to accompany the pork stating that such inspection had been made. For a number of years, however, the German Government has not accepted the American certificate as having any sanitary value, and has reinspected, at the expense of the shipper, all pork received there from the United States. Nevertheless, it has appeared desirable to continue the microscopic inspection in this country in order to reduce to a minimum the percentage of trichinæ found on reinspection in other countries. This is an important measure for maintaining the reputation of our meats, and one which this country can not afford to neglect. But if a microscopic inspection is required for pork exported to the continent of Europe, a sufficient number of inspectors should be furnished to inspect all the meat that is called for by the trade, so that the effect of this inspection will not be to shut pork into this country rather than to aid in getting it out. It is an injustice to American pork producers to enforce measures which obstruct and lessen the export trade, as has recently been done; and either there should be sufficient funds provided fully to accommodate the trade or this inspection should no longer be required.

WORK OF THE PAST YEAR.

The number of hog carcasses examined for trichinæ was 346,026, classified as follows: Class A (free from all appearance of trichinæ), 336,623, being 97.28 per cent; class B (containing trichinæ-like bodies or disintegrating trichinæ), 5,666, being 1.64 per cent; class C (containing live trichinæ), 3,737, being 1.08 per cent.

The number of certificates issued for microscopically inspected pork was 1,960, covering 41,548 stamped packages, weighing 14,721,935 pounds, which, as will be seen from the comparative statement below, was an increase over 1904 of 5,701,414 pounds, being 63 per cent.

The number of trichinous carcasses disposed of was 3,652, weighing 819,922 pounds, 57 per cent of which was made into cooked meat products, the remainder, 43 per cent, being tanked.

The following comparative statement shows, by years, the quantity of pork exported to countries requiring microscopic inspection, from 1892 to 1905:

Quantities of pork exported to countries requiring microscopic inspection, fiscal years 1892 to 1905.

Year.	Pounds.	Year.	Pounds.
1892	22,025,698	1899	108,858,149
1893	8,059,758	1900	55,809,626
1894	18,845,119	1901	35,942,404
1895	39,355,230	1902	33,681,229
1896	21,497,321	1903	19,108,341
1897	42,570,572	1904	9,020,521
1898	120,110,356	1905	14,721,935

The cost of microscopic inspection was $56,313.02, being an average of 16.27 cents for each carcass examined and 0.38 cent for each pound exported.

OUR COMPETITORS FOR THE BRITISH MEAT TRADE.

As our most important market for dead meat is found in Great Britain, it is interesting to consider the condition of this trade for a number of years as compared with the development of this trade from other countries. The material for this comparison is found in the annual statement of the trade of the United Kingdom for 1904, from which the figures used in the following tables are taken:

Quantities of dead meat imported into the United Kingdom from certain countries from 1900 to 1904, inclusive.

Country.	1900.	1901.	1902.	1903.	1904.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*
Total imports of United Kingdom	17,438,576	18,372,564	16,519,565	17,022,482	16,983,788
United States	9,541,542	10,473,827	8,124,336	7,548,529	7,110,827
Argentina	1,612,456	2,152,283	2,412,923	2,821,930	3,327,841
Denmark	1,306,540	1,258,319	1,553,647	1,760,657	1,954,229
New Zealand	1,838,524	1,748,706	1,921,262	2,238,737	1,837,636
Canada	823,072	605,541	688,067	941,124	1,106,408
Holland	1,034,045	1,009,241	1,053,801	1,106,373	1,014,507
Australia	1,096,891	912,478	484,435	336,261	359,176

This table indicates that the annual imports of dead meat into the United Kingdom have not varied greatly during the five years from 1900 to 1904. The imports from the United States show a decrease each year since 1901. From 1900 to 1904 the decrease has been 25½ per cent, and from 1901 to 1904 it has been 32 per cent. The imports from Argentina have increased each year from 1900 to 1904. The total increase during these years has been slightly more than 100 per cent. The imports from Canada have increased 34 per cent.

The imports from Denmark have increased 49½ per cent. The imports from Holland and New Zealand have remained approximately the same, while those from Australia have decreased to about one-third of what they were in 1900. Our principal competitors in the British markets are, therefore, Argentina, Denmark, and Canada, each of which is rapidly increasing its trade, while our trade has been falling off.

By analyzing the trade more closely it is found that the only source from which our fresh-beef trade is threatened is the Argentine Republic. The imports from the two countries were as follows:

Imports of fresh beef into the United Kingdom from the United States and Argentina.

Country.	1900.	1901.	1902.	1903.	1904.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt*
United States	2,867,238	3,180,291	2,290,465	2,693,920	2,395,836
Argentina	412,262	771,929	923,748	1,152,211	1,675,271

This table shows that while the fresh-beef trade from the United States has decreased 16½ per cent from 1900 to 1904, that from Argentina has increased over 300 per cent. It also shows that whereas the trade of the United States has diminished 784,455 hundredweight since 1901 the trade of Argentina has increased 903,342 hundredweight in the same time. It is worthy of notice that in 1900 the beef imports from Argentina were but 14.3 per cent of those of the United States, while in 1904 they were about 70 per cent of those from this country. The shipments of fresh beef from Argentina are therefore rapidly gaining on those from the United States and our shipments are now falling off almost to the same extent as those from Argentina are increasing.

The bacon trade is one which is also worthy of special study. The following table shows the most striking figures on this subject:

Imports of bacon into the United Kingdom from certain countries.

Country.	1900.	1901.	1902.	1903.	1904.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*
United States	3,956,527	4,244,329	3,283,855	2,893,507	2,806,108
Denmark	1,094,626	1,060,909	1,255,627	1,496,101	1,723,884
Canada	529,864	398,697	462,487	665,249	829,883
Russia	5,655	27,168	34,721	45,964	41,918
Sweden	11,235	9,537	20,461	18,814	23,965

This table shows that the imports of bacon from the United States have decreased 1,150,419 hundredweight, or 29 per cent, since 1900; while increases have been made by Denmark of 629,258 hundredweight, or 57 per cent; by Canada of 300,019 hundredweight, or 56 per cent; by Russia of 36,263 hundredweight, or 641 per cent; and by Sweden of 12,730 hundredweight, or 113 per cent.

The bacon trade is deserving of more attention than it has been receiving, for our natural conditions are such that we should be able to produce this article at a cost which would permit it to compete successfully for many years with any other part of the world. If we are producing a kind of bacon which does not fully meet the requirements of the trade, it would not be a difficult matter to change our type of hog sufficiently to comply with the demand. We should not, however, remain inactive while this important branch of our export trade declines and our commodity is gradually replaced by the product of other countries. There appears to be a more promising field for effort in Great Britain than in the markets of other countries, many of which are less favorable to our trade.

CONDITION OF THE OCEAN CARRYING TRADE.

The ocean carrying trade for live animals is one to which particular attention is invited, the number of clearances of vessels carrying live stock last year being 731. At the time the Bureau of Animal Industry was given supervision over this traffic, in 1891, with authority to regulate the fittings of steamships, the ventilation, the amount of feed carried, and the number of attendants, the losses were so heavy that the British Government was seriously considering the prohibition of the traffic because of the cruelty to which the animals were subjected and the bad condition in which many of them arrived.

The losses of cattle in transit had been very high, probably about 4 per cent, although exact figures are not obtainable, and on sheep they were somewhat higher. The first year the regulations went into effect the losses of cattle were reduced to 1.6 per cent and the losses of sheep to 1.7 per cent. This loss has been further reduced from year to year until during the year just closed it was but 0.138 per cent for cattle and 0.751 per cent for sheep; that is, the losses on cattle were reduced the first year of the Bureau control to about one-half what they had previously been, and since that time they have been reduced to one-eleventh of what they were the first year. Similarly, the losses of sheep were reduced more than one-half the first year, and have been further reduced to less than one-half of the first year's figures. The insurance has been reduced from 8 per cent to one-third of 1 per cent—that is, to one twenty-fourth of the rate formerly charged—thus saving in this one item much more than the total appropriation for the Bureau of Animal Industry.

INSPECTION OF EXPORT ANIMALS.

The number of certificates of inspection issued during the year for American cattle exported to Europe was 1,269. The following statement, showing the number of live animals exported, indicates, when compared with the similar statement for the previous year, a falling off of about 5 per cent in the number of American cattle, 31 per cent in the number of American sheep, and 28 per cent in the number of American horses exported.

Number of inspections, etc., of American and Canadian animals for export, fiscal year 1905.

Kind of animal.	American.				Canadian.		
	Number inspected.	Number rejected.	Number tagged.	Number exported.	Number inspected.	Number rejected.	Number exported.
Cattle	783,721	2,850	409,101	[a] 395,695	41,193	12	41,181
Sheep	366,796	114	....	[b] 183,902	56,984	32	56,952
Horses	2,327	1	1,974	2,061	31	....	31

[a] 24,915 via Canada. [b] 6,302 via Canada.

All animals included in the foregoing statement were exported to Great Britain except 5,452 cattle, 2,074 sheep, and 97 horses to Belgium, 3 cattle and 142 horses to France, 21 cattle to South Africa, 131 horses to Germany.

In addition, other animals were exported as follows: 2,347 cattle, 2,465 sheep, 23 horses, 265 swine, and 6 mules, making a total of 5,106, destined as follows: 1,595 cattle, 1,941 sheep, and 12 horses to Bermuda; 700 cattle to Brazil; 445 sheep to Barbados; 10 cattle, 7 horses, and 5 swine to Argentina; 20 cattle, 4 horses, 6 mules, and 260 swine to Hawaii; 22 cattle to Mexico, and 79 sheep to West Indies.

Statement showing number of animals inspected at time of landing in London, Liverpool, and Glasgow, and loss in transit, fiscal year 1905.

From—	Cattle.			Sheep.			Horses.		
	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.
United States	368,648	508	0.138	178,236	1,348	0.751	1,680	9	0.536
Canada	32,975	103	.311	54,689	1,157	2.072	30	....	....
Total	401,623	611	.152	232,925	2,505	1.064	1,710	9	.526

In comparing the above statement with the preceding one, in which the numbers exported are shown, it is necessary to remember that many of the animals included in the former statement are not included in the latter, because they were landed at British ports where no Bureau inspector is stationed, and hence are not reported from the other side.

IMPORTS OF DOMESTIC ANIMALS.

THE DANGER OF IMPORTING DISEASE.

There is always danger of importing the contagion of one of the Old World plagues which have been so destructive to live stock in Europe, Asia, and Africa. With faster ships and increasing traffic this danger is greatly augmented.

There is at present foot-and-mouth disease in Europe, Asia, and South America; rinderpest in Asia and Africa; pleuro-pneumonia in Asia and Africa; and a variety of infectious diseases unknown to this continent which are destroying the farm stock in other sections of the world, and particularly in Asia and Africa. We are in especial danger from the Philippine Islands, where foot-and-mouth disease, rinderpest, and surra are known to exist, and from which it is very difficult to exclude all animals.

Our system of inspection and quarantine has been developed to a high state of perfection and gives great protection on the Atlantic coast, but the Pacific coast needs quarantine stations, and with continued traffic in susceptible species of animals there will always be the possibility of bringing contagion, even with the most careful inspection.

It should be the policy of any country having such tremendous investments in live stock as have been made in the United States to exclude so far as possible all animals liable to harbor the contagion of the plagues most destructive to the meat-producing animals. There are few who appreciate the vast losses which such plagues cause or their effect upon the prosperity of a country. Either rinderpest or foot-and-mouth disease, if allowed to spread over this country, would cause a loss of three hundred millions to five hundred millions of dollars during the first two years, and might remain to prevent the recovery of the cattle industry for an indefinite period. The damage would be felt not alone by the agricultural industry, but by all citizens, and particularly by the laboring classes and by the poor of our cities, to whom such a limitation of the food supply would mean great hardship and suffering. It is of supreme importance, therefore, that great care and watchfulness be exercised to exclude contagion, and that this supervision be maintained over dogs, which may bring surra, and menagerie animals, which may bring rinderpest, foot-and-mouth disease, surra, and pleuro-pneumonia, as well as over farm animals.

IMPORTATIONS DURING THE YEAR.

The imports of purebred cattle, sheep, and hogs during the year have continued light. Those quarantined at the several quarantine stations are as follows:

Number of cattle, sheep, and swine imported and quarantined.

Port of entry.	Cattle.	Sheep.	Swine.
New York	223	259	9
Boston	4	89	7
Baltimore	42	68	16
Canadian border ports	127	86	84

Animals imported from Canada, not subject to quarantine.

Cattle	2,642	Asses	11
Sheep	84,272	Goats	1
Swine	2,012	Deer	2
Horses	3,108	Lions	3
Ponies	26		
Mules	2	Total	92,081
Burros	2		

Imports of horses, mules, donkeys, and asses through ports on the Atlantic and Pacific coasts amounted to 2,642.

QUARANTINE ISLAND.

There has been in the past few years a growing demand for an isolated point directly accessible to ocean steamers, or by barge, where animals may be quarantined safely, even though from a country where foot-and-mouth disease prevails. In June such a place was brought to the attention of the Bureau. This land is located on the Fresh Kills, a tributary of Staten Island Sound, and is known as Simonson's Island, comprising about 28 acres of upland, and is separated from the mainland of Staten Island on its land side by a ditch and wide expanse of salt meadow. An agreement has been made with the owners of the island and of a dock on the New Jersey side of Staten Island Sound having connection with two railroads that may be used for shipping animals to destination when released from quarantine. This agreement gives the Bureau control, with but slight expense, as the owner will accept as rental or compensation a per capita fee, to be paid by importers, who will also, in accordance with the rule governing the quarantining of animals, pay for necessary feed, bedding, and animal attendants.

PRINCIPAL QUARANTINE STATIONS.

At the quarantine station for the port of New York, located at Athenia, N. J., the improvements on the grounds have progressed satisfactorily, and the work of grading yards and roads has advanced to such a degree that the whole property, consisting of 53 acres, presents an attractive appearance and is equipped in a thoroughly modern manner. At the station for the port of Boston eight of the best and most conveniently located stables have been thoroughly repaired and painted.

Animals imported from Mexico, fiscal year 1905.

Port of entry.	Cattle.	Sheep.	Swine.	Goats.	Horses.	Mules.	Asses.	Burros.	Deer.	Total.
San Diego, Cal	256	4,740	1	3	112	17	62	4	....	5,195
Calexico, Cal	1,467	....	....	....	23	53	....	....	....	1,543
El Paso, Tex	9,459	....	1	2	9	....	2	....	....	9,473
Eagle Pass, Tex	....	....	....	202	9	5	1	....	10	227
Laredo, Tex	....	....	....	....	12	39	....	....	....	51
Nogales, Ariz	11,828	1	10	....	103	26	18	....	1	11,987
Total	23,010	4,741	12	207	268	140	83	4	11	28,476

Inspections were also made of animals imported from Mexico in bond, as follows: At El Paso, 3,172 cattle, 486 sheep, 30 horses, and 49 swine, in transit to Mexico; 902 cattle, 820 horses, 81 mules, and 23 asses, in transit to Canada; 364 mules, in transit to South Africa; at Laredo, Tex., 3 horses and 96 mules in transit to Cuba, and at Calexico, Cal., 133 American horses and 146 American mules returned from work on irrigation canal and railway in Mexico.

EXPERIMENTS IN FEEDING AND BREEDING.

The experiments in feeding and breeding, in cooperation with the State experiment stations, first provided for in the appropriation bill for the year just ended, open a field of work which, if wisely directed, should prove of the greatest value to the American stock raiser. There are many problems of this kind which urgently need solution, and perhaps there is no section of the country where the early investigation of feeding and breeding problems promises more for the welfare of agriculture than in the Southern States. The problems of the southern stock grower are peculiar to his section and can only be solved by experiments conducted in that section and under the conditions which there prevail. It is necessary to learn how the best breeds of cattle and sheep may be developed and maintained in the South without paying a too heavy tribute to the insect pests and parasites which find peculiarly favorable conditions for multiplication in the mild climate of that region. There is no doubt that much can be accomplished toward making the live-stock industry of the South more profitable, and the probability is that the great obstacles which have heretofore existed, such as the cattle tick (*Rhipicephalus annulatus*) and the internal parasites of sheep and cattle, may be brought under control, while the feeding problems may be elucidated with comparative ease.

Breeding problems exist in all parts of the country, and the farmers need especially to be assisted in developing our breeds to the highest efficiency and in fixing the types of highest excellence. Our conditions are such that the stock raisers of this country have not developed, established, and maintained distinct types of animals from our native stock, as has been the case in some other countries; and in cases where marked progress has been made toward this object the herds and flocks have been dispersed just at the time when they gave promise of future usefulness.

We have been depending too much upon the constant importation of breeding stock to keep up the excellence of our animals, and have introduced new types in our herds so frequently that the power to transmit the parents' qualities to the offspring has not been properly developed and, as a result, the animals do not breed as true to type as they should.

It consequently appears necessary that the Government should aid in such work if there is to be sufficient permanence and singleness of purpose in the efforts to achieve success; but whether the required continuity of purpose and permanence can be secured even through Government aid is a question which only the future can answer. The importance of the matter is such, however, that it is well worth the experiment, even at considerable cost.

Several lines of investigation are in progress. The poultry-breeding work in Maine is proceeding and will be continued until definite results are reached. At the Pennsylvania Experiment Station experiments are continued with the respiration calorimeter in the study of animal nutrition. In Alabama a steer-feeding experiment has been conducted, the results of which seem to indicate that small amounts of cotton-seed meal and corn-and-cob meal are of equal feeding value, that the introduction of corn into the customary cotton-seed meal ration is not advantageous, and that cotton-seed hulls, corn stover, and coarse sorghum hay have about equal feeding value.

Under the contract with the Colorado Experiment Station 6 mares were purchased in Wyoming, 12 in Chicago, and 1 stallion in Chicago. The Wyoming mares were selected from a large band of horses which were bred up from stock brought in from States farther east and which carried considerable Morgan blood. The mares and stallion purchased in Chicago vary considerably in their breeding; all, however, are trotting bred, and some of them standard bred. The object of these experiments is to increase the tendency which the trotting horse possesses to develop large, strong, well-made animals, the best of which will answer every requirement of the horse show for heavy harness horses, and the average of which will meet the demand for a good, general-purpose horse.

NEW INVESTIGATIONS.

The following new lines of cooperation have been arranged for: At the Storrs Experiment Station, in Connecticut, investigations will be started in milch-goat breeding with foundation stock brought from abroad. At the Rhode Island Experiment Station studies will be begun in breeding turkeys resistant to infectious entero-hepatitis. In cooperation with the Maryland Experiment Station and the National Zoological Park experiments will be begun in breeding hybrids between the zebra and the mare. Six farm mares have been bought and will be bred to the Grévy zebra presented to the President by the Emperor of Abyssinia. This animal stands 13.2 hands and is strong and well built.

SUPERVISION OF PEDIGREE-RECORD ASSOCIATIONS.

A closer supervision over pedigree-record associations has been brought about and regulations upon the subject published as Bureau of Animal Industry Order 130, dated October 14, 1904. These regulations require from each certified American association an annual report, the publication of books of record, and their submission to the Department on publication. The associations must submit complete sets of the published volumes of their books of record and complete statements of their business methods and financial condition. Foreign associations are obliged to keep complete sets of their books on file with the Department. Books of record are now certified as follows:

Animals.	American.	Foreign.
Cattle	14	31
Horses	17	23
Asses	1	2
Sheep	21	13
Hogs	13	2
Dogs	1	4
Cats	2	....
Total	69	75

MILCH GOATS.

During the year the Bureau has taken up the project of the establishment of the milch-goat industry in this country. In Europe this is an important and profitable interest, while in this country it amounts to but little. It is recognized that could the industry be established here it would benefit several classes of citizens, particularly that large number of families in modest circumstances living in the outskirts of cities and unable, by reason of the limited ground space available, to keep cows. The milch goat is hardy, subject to few diseases, and requires but a small amount of food as compared with the cow; the milk is produced in large quantities, when the size of the animal is considered, and has peculiar value as food for children, convalescents, invalids, and those suffering from tuberculosis or other wasting diseases. The manufacture of cheese from goats' milk annually brings thousands of dollars to many communities in the Old World.

Recognizing these facts, the Bureau has labored to arouse and stimulate popular interest in the milch goat. The publication of a bulletin (No. 68) served this purpose. Following this, Mr. George F. Thompson, editor of the Bureau and author of the bulletin, was sent to Malta to bring a number of the best milch goats from that island. Upon their arrival in this country these animals will be placed at the experiment station at Storrs, Conn., where, in cooperation with the authorities at the station, the Bureau will conduct experiments to determine their adaptability to climatic and other conditions of this country and to ascertain the value of their milk, particularly in the manufacture of cheese and as a food for the sick.

WORK IN THE INTEREST OF THE DAIRY.

During the past year the Dairy Division of the Bureau, in addition to the routine work, has carried on experiments so far as possible with the means at its command. The magnitude of the dairy interest and the improvement that would result to it by the solution of a number of questions which can be solved only by a long-continued experimentation make it seem best, in the report submitted below, to give more prominence than usual to the mention of features of work which, as soon as possible, should be taken up.

MANUFACTURE AND STORAGE OF BUTTER.

One of the pertinent questions in relation to this topic is that of the control of the amount of water, salt, casein, and fat which butter contains. Creamery men desire to work all moisture possible into the butter, while Bureau of Animal Industry Order 127 makes it necessary to consider butter as adulterated which contains more than 16 per cent moisture. Very few butter makers know how to regulate the amount of moisture, and this fact, with the tendency in butter contracts toward a specification as to the amount of moisture (butter packed for the Navy must have less than 13 per cent), creates an urgent demand for a short method of determining moisture in butter. The accurate chemical methods require too much time and are not within the reach of the practical butter maker in the field.

A peculiar development in the large quantities of butter annually stored, and one which causes a loss of thousands of dollars, is the fishy flavor. The cause of this and of the other undesirable flavors which develop should be sought out and corrected.

Temperature is another thing which should be carefully studied, as it is yet undetermined just what temperatures are best for cold storage.

The effect of the amount of moisture on the keeping quality, the effect of the amount of salt, and the result of the presence of a large quantity of casein are practical and difficult questions, the solution of which will require a long time and the services of the best men obtainable. The exact cause of fine flavors in cream, the question of the pasteurization of cream, the question of the farm separator and its effect on quality, are all pertinent problems. The introduction of the farm separator has lowered the standard of creamery butter, and this fact must be met by an improved system of handling and manufacture. Centralization of the creamery business into large churning plants has given rise to unsolved problems of the transportation of cream for long distances, and the introduction of a better line of machinery.

Recently C. E. Gray, formerly chemist and expert for a large centralization plant, was employed as an expert to study these questions. L. A. Rogers, bacteriologist in the Dairy Division, was associated with him, and the work has been taken up in cooperation with the Iowa Experiment Station, at Ames, Iowa. Professor McKay will be directly connected with the investigations. During the summer (1905) several thousand pounds of butter were placed in storage in Chicago, where excellent storage facilities in especially constructed rooms were turned over to the Dairy Division for its sole use. Here the butter is stored at 32° and 10° F. above zero and 10° below. A parcel of cream was divided equally—one part being pasteurized and the other part churned without pasteurization. Half of each lot of butter was salted normally and half with a higher percentage. Some of each lot was packed in 3-pound tins and the rest in 20 and 30 pound tubs. Some investigations have been made in Wisconsin as to the fishy-flavored butter in evidence in that State.

EXPERIMENTS IN CHEESE MANAGEMENT AND STORAGE.

Although in some respects more work has been done in the manufacture of cheese than in that of butter, there are many points that require investigation. Naturally the commercial tendency is to force greener cheese upon the consumer. This fact makes a study of the early ripening important. The questions of using more rennet, of incorporating more moisture, and of making a softer grade have a direct bearing on the time when the cheese is edible. There is need also for study into the question of flavors and their causes, the effect of pasteurizing the milk, the digestibility of various types of Cheddar cheese; and a systematic effort should be made to encourage a greater use of cheese by the American people, inasmuch as this country consumes less per capita than any other.

C. F. Doane, formerly dairyman and bacteriologist for the Maryland Agricultural College, has been appointed an expert in the Dairy Division for the study of these problems, and a cheese factory in Wisconsin selected as the place where a series of experiments on the lines indicated will be carried on.

Cooperation with the laboratories of the Department has been established so that samples of cheese of different ages may be artificially digested and analyses made, and experiments with this cheese on human subjects is also planned.

SOUTHERN DAIRYING.

The South presents many problems in dairying peculiar to that section. At present the South is supplied with dairy products almost entirely from northern States. Condensed milk, cream, and butter, and practically all the cheese consumed, are from the North, while the southern farmer devotes practically his whole attention to raising cotton. This cultivation of cotton upon the same fields year after year rapidly exhausts the soil, which must be restored by the use of commercial fertilizers at high prices. The great need of all this section is live stock; and dairy cattle should be among the first live stock introduced. The South can produce greater quantities of feed at less cost than can any other section of our country, but the lack of knowledge regarding the handling, care, and feeding of dairy stock and the kinds of crops to grow is the great drawback, and one with which the Dairy Division should be in a position to cope, both by sending its own men directly to the farms and by cooperation with the State experiment stations and State dairy organizations.

To study these questions, B. H. Rawl, dairyman at the Clemson Agricultural College, South Carolina, has been appointed as an expert. His work thus far has been to travel from point to point, studying the field and lending what encouragement he can to those who desire to go into dairying. Mr. Rawl has met with an enthusiastic reception, and he should be given several assistants, as hundreds of farmers have already shown themselves anxious for information and guidance. At Easley, S. C., a number of men have organized a cheese factory, and through the efforts of Mr. Rawl have been induced to build silos. Great interest is taken in the work by other dairymen in the South, many having indicated a desire to go to Easley and learn the methods, and it is expected to make this an objective center for dairy information. The establishment of other similar points for the diffusion of information in all the States would undoubtedly be attended with good results.

EXPERIMENTS IN THE MANUFACTURE OF EUROPEAN VARIETIES OF CHEESE.

Nearly all the cheese consumed in this country is of the Cheddar and Swiss varieties. In Europe, however, many fine varieties of cheese are made with which the average American is entirely unfamiliar, but the manufacture of which is very desirable in this country, inasmuch as the methods are simple and little machinery is required. Professor Clinton, director of the Storrs Experiment Station, with this end in view, began an investigation, but, encountering many difficulties, he called upon this Department for assistance and three men were detailed to work under his direction along these lines. During the past year most of the time has been given to the Camembert type of cheese, and the work has been quite successful. Bulletin No. 71 has been published, detailing the difficulties and showing that it is possible to make this cheese in the United States. Another bulletin is in preparation which will give specific instructions for manufacture. The experimental work at present is on the Roquefort type, and complete information will soon be available to the public regarding details of manufacture and the difficulties that beset the average maker who desires to enter this line.

THE CITY MILK SUPPLY.

This live and important subject is receiving more attention in many cities to-day than any other special feature of dairying, but it has been practically neglected by the experiment stations. The milk supply of cities is a serious question, and the problems in connection with it urgently demand investigation and solution. The Department has numerous calls for information and assistance, and it should be in a position to supply men who could go from place to place to study the laws of municipalities regulating milk supply, to give lectures to the people as to what they should demand in the way of pure milk, to investigate sources of the supply with special reference to the sanitation of barns and premises, and to inform producers as to the best methods. The value of pasteurization should be studied both in the field and the laboratory, as well as the methods of the producers of what is called " certified " milk. In connection with transportation, the principles of refrigeration, proper vessels for the milk in transit, receiving by railroads, and the several methods of distribution are all questions which should be investigated and information regarding them obtained and spread. Frequent application is made to the Department for information as to regulations of the various municipalities on these subjects, and a compilation of such regulations would be a convenient document.

The publication of our bulletin No. 70, on "The Milk Supply of Twenty-nine Southern Cities," and the preparation of our bulletin on the milk supply of Philadelphia, New York, and Boston practically cover the work done by the Bureau on this subject during the past year.

DAIRY HUSBANDRY.

The fact that 50 per cent of the registered stock in dairy herds of this country should be regarded as scrubs because of low production shows that something along the line of breeding should be undertaken upon a broad and comprehensive basis, such as has been done, for instance, in the breeding of plants. As special lines along which such work might profitably proceed, the following may be mentioned: A study of the adaptability of the different breeds to different localities, involving questions of climate, character of country, and feed conditions; investigation of the perplexing question of whether or not the so-called "dual purpose" dairy animal is or can be made more profitable for certain sections than other types; encouragement of the use of ensilage and other coarse feeds; a study of how much grain—the most costly part of the cow's ration—can be replaced by these cheaper feeds; a study of the amount of concentrated feeds that can be fed without injury; the effect of feeding the by-products of distilleries and breweries—in short, the whole question of the effect of feeds on the quality of all dairy products; questions of breeding the proper time and season, the methods of handling breeding stock, shelter, exercise, cleanliness, the feeding of young stock; a systematic line of work in various States, whereby farmers might be induced to keep books of record showing quantities of feed eaten and the amount of products secured, so that unprofitable individuals may be thrown out of the herd. In these lines a vast improvement would result could the work be taken up and prosecuted by the Bureau. Investigation should also be made of the principles underlying the mechanism of farm dairy machinery, and the information obtained should be made public; an endeavor should also be made to secure plans and specifications of the best buildings for dairy purposes.

During the past year very little work has been done by the Bureau along these lines. Two bulletins have been prepared, showing great numbers of records of individual animals and of dairy herds, and an investigation of a milking machine, largely from a sanitary standpoint, is now in progress. It can readily be seen, therefore, that there is room for considerable expansion.

RESEARCH WORK CONTEMPLATED.

Creamery and cheese-factory management.—Aside from answering correspondence, nothing has been done by the Dairy Division on this subject, yet the field is broad and the possibilities great. For instance, upon the introduction of the factory system of manufacturing butter and cheese this country was thought to be a good place to employ the cooperative plan, and many such factories were established. Hundreds of these organizations have been failures. Among other concerns in the business there have also been many failures. These are not due to lack of business capacity, but to a lack of knowledge of the exceedingly numerous and sometimes obscure details of dairy work. Again, the tendency is now toward centralization in the creamery business, and this is looked upon by the producers with considerable misgiving. Could not the Dairy Division of the Bureau profitably investigate these matters and give out accurate and definite information as to the management of creameries? Persistent effort should also be made to induce manufacturers to make such dairy machinery as can be easily kept in a sanitary condition. Makers do not now seem to realize the importance of this point. For the benefit of small concerns investigation should be made as to the kind of equipment necessary to be used, so far as the principles of construction are concerned, and as to cold storage and the disposition of sewage. Important, also, especially where the centralization system has been adopted, is the problem of the transportation of milk and cream to the factory and of the manufactured product to the consumer, and any light thrown on this point would be welcomed both by manufacturers and by the railroads.

Inspection of dairy products in the markets.—From one-half to three-fourths of the butter that comes to the great markets will not score as "extras," which means that it is not a good quality of butter. Inquiry among butter dealers and officials of State dairy organizations, dairy schools, and State dairy commissioners leads to the belief that the Bureau, through the Dairy Division, has here a great field for operation. Competent men should be placed in the large markets to score the poorer grades of butter as they come in and report back to the particular State and creamery. The continued shipment of poor goods might be met by sending an expert from the Bureau or from the State to the creamery to study the reasons and to give instruction. The same possibilities are open in the cheese business, though perhaps to a less extent. Thus far the Bureau has done nothing along such lines. In connection with the plan proposed something should be done also toward studying conditions for foreign countries. The Dairy Division has to a limited extent attempted to export butter abroad, but the knowledge gained has not been practical. A thorough study of the conditions and requirements of foreign markets where our butter is likely to find sale would be a benefit.

Dairy products other than butter, cheese, and milk.—This is another field in which the Bureau has done practically nothing. The manufacture of ice cream is a great industry, but much of the ice cream placed on the market is inferior in quality. The Department should be in a position to investigate this question with a view to improvement. The manufacture of condensed and evaporated milk should also be studied. Experiments should be carried on in the manufacture of skim-milk cheese in order to determine if a cheese of this character should not be placed on the market, so that those who are forced to economy may be able to buy a product that is both cheap and wholesome. Numberless food products made in whole or in part of casein of milk should be investigated. The use of milk products in the arts could be studied with profit, and there should be wide experimentation to find profitable outlets for the skim milk and whey of creameries and factories. The use of buttermilk as a drink should receive attention and means be devised to put this wholesome product more generally on the market.

Dairy statistics.—The need of information of this kind is aptly shown by the speculation as to the cause of the high prices of dairy products during the past winter. Shortage of production, the effects of the oleomargarine law, a greater relative increase in consumption than production, etc., were all alleged as reasons, but satisfactory information was not obtainable. During the storage season buyers who would put butter in storage can not know how the make of the particular year compares with that of previous years. This has a bad effect on prices. These subjects, along with those of the quantities of dairy products manufactured in the country, the quantities put in storage for future consumption, and the amounts of exports and imports, all seem to be proper questions for investigation by this branch of the Bureau. The only work thus far done is the publication of figures based on the Eleventh and Twelfth censuses, and there has been a large demand for these publications.

Indexing and classifying dairy literature.—No comprehensive index of dairy literature exists in this country. Information on any dairy topic is obtained only by an examination of numberless books and pamphlets. The great mass of literature should be indexed and classified, including the current literature, so that all the knowledge on any branch of the subject might be easily and quickly made available at any time.

INSPECTION OF RENOVATED BUTTER.

Under the law of May, 1902, and the regulations of the Department made in accordance therewith, regular inspection of renovated-butter plants has been carried on during the year by inspectors appointed for that purpose. Reports of such inspection on file in the Dairy Division show a tendency among makers to conform to the rules and to endeavor to improve the quality of their goods. The duties of the Bureau inspectors have included a thorough sanitary inspection of plants, inspection as to marking and packing of goods, and inspection of export renovated butter. Inspectors have reported few violations of the rules on the part of manufacturers, but this, unfortunately, is not true of dealers selling renovated butter. Many of the latter have contended that they have a right to remove all marks from such goods and to sell them for whatever they please. A recent decision in the United States district court of southern New York has sustained in every particular the rules and regulations of the Bureau as set forth in Order 127. This decision has been appealed by the defendants to a higher court, and a final decision will probably be reached during the coming winter.

The total amount of renovated butter made during the twelve months ending June 30, 1905, was 60,164,783 pounds, as compared with 54,171,183 pounds made during the twelve months ending June 30, 1904. The demand for all grades of butter was so great during the past year that all the packing stock available was used by the manufacturers, and there is, consequently, little old stock now used. In this line it is recommended that experiments be taken up to improve the general quality of the product. Renovated butter is a legitimate article of food, and it is not the policy of the Department to destroy its manufacture or its market, but to enforce the law which has for its purpose the protection of the consumer against fraud. The consumer could aid in this if he would in all cases ask whether or not the butter sold him is renovated. He could be assured that butter bearing the Government renovated stamp was made under sanitary conditions and from goods containing nothing deleterious to health.

NOTES ON THE CATTLE TICK AND TEXAS FEVER.

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The southern cattle tick (*Boophilus annulatus*) and the various other species of ticks with which it may be confounded are so well known and have been described with so much care and detail in previous publications of the Bureau of Animal Industry[a] that an additional description at the present time is not believed to be necessary. While the same is true to some extent of the life history of this tick, it seems desirable, for the sake of convenience, to repeat it here in a general way, as the purpose of this article is to deal specially with some of the phenomena regarding it.

LIFE HISTORY OF THE CATTLE TICK.

The life history of the cattle tick (*Boophilus annulatus*), concisely given, is as follows: The adult female tick produces from 1,500 to 2,000 eggs, frequently more, of a brown color and with a glistening surface. From the eggs are hatched six-legged embryos—larval or seed ticks—which are quite active and attach themselves to a host as soon as an opportunity presents itself and begin to grow. During their attachment to the host, the body of which they do not leave until complete maturity is reached, the ticks molt or shed their outer covering twice. From the first molt they emerge as eight-legged, and from the second as sexually mature, organisms. After the second molt copulation occurs, the female ticks continue to grow and finally drop to the ground, ready to produce eggs in a few days, after which the tick dies and the process begins over again.

The common and most favorable hosts of these ticks are cattle, but they will also grow on various other animals. At the Experiment Station they have grown on horses and donkeys, and have been found attached to dogs and cats. Many attempts made to grow them on guinea pigs, domestic rabbits, and poultry failed to show that a single tick had attached itself to any of these animals. On horses and donkeys they grow more slowly than on cattle, but actually reach fertile maturity. On dogs and cats the observation of the Experiment Sta-

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[a] Seventeenth Annual Report (1900), pp. 380–488; also Bulletin 78, 1905.

tion is that they grow very slowly and fail to reach maturity. For example, a number of kittens were placed in iron cages with an enormous number of recently hatched ticks. The kittens became heavily infested—in fact, so much so that they eventually died as the result of the irritation of their skin and, probably, the general drain on their bodies. Although the ticks remained on the kittens longer than the time required to reach full maturity on cattle, not one was found to have developed to the stage of the second molt—that is to say, they failed to reach sexual maturity. Among wild animals it is probable that ruminants, like the deer, may serve the purpose of hosts almost if not quite as well as cattle.

The average length of time required for the various stages in the life history of the cattle tick is:

	Days.
For oviposition, or egg laying	7
For incubation, or hatching	25
For growing from the larval (freshly hatched) to the adult stage	22
Total life cycle	54

These figures are based on observations extending over more than a dozen years and which were made on ticks and cattle under conditions which guarantee practical accuracy for the climate of Washington, D. C. The surprising variations from the above figures that may occur merit special attention just now, because they have an important bearing on the question of tick extermination, and because the keenness with which the southern cattle growers are beginning to realize the true magnitude and significance of the tick evil promises that all efforts for extermination will receive much additional support and encouragement in the future.

The following observations were made on ticks and tick eggs, which were confined from the time the adult female was detached from her host to the time when her progeny was placed on a host, in cotton-stoppered, narrow-mouthed, conical, broad-bottomed flasks of thin glass (500 c. c., or 1 pint, Erlenmeyer flasks). No soil, vegetable mold, leaves, or other substances were placed in the flasks. Cattle ticks may be termed strictly obligatory parasites, as they require and take no nourishment at any period during their lives beyond that obtained while they are attached to their host.

VARIATIONS IN THE TIME OF EGG LAYING.

Under normal conditions of warmth in the summer the average length of time that passes before the adult female cattle tick has completed laying eggs is seven days. Half-grown females that have passed through the second molt also lay eggs, but more slowly than fully matured females, and the eggs are less numerous relative to the size of the tick, smaller, lighter in color, less opaque, and frequently fail to hatch. The actual time that may pass, under various conditions of temperature and moisture, before the fully matured female begins to lay eggs is from one to ninety-six days. That is to say, the female tick may begin to produce eggs on the day she drops from her host, or she may remain dormant for more than three months and then produce the customary number of eggs, which will hatch perfectly under normal conditions. This statement, equally with all the other statements made in these notes, is based on actual observations and is a simple record of fact. Warmth hastens egg production and cold retards it. On exposure to cold the tick becomes torpid and insensitive, and if the temperature falls sufficiently low every trace of animation is suspended. On removal from the low to a higher temperature the processes of life are resumed without delay. This constitutes a very nearly perfect case of hibernation, and shows conclusively that ticks may pass through the winter in the infested territory in the form of adult females.

The exposure of adult ticks to a low temperature for more than ninety-six days was not tried, hence it does not necessarily follow that this is the maximum length of time during which animation may be suspended without injury to the egg-laying function of the tick or to the eggs that are eventually produced. The lowest temperature to which adult ticks may be exposed without suffering material injury has not been determined, but it is considerably below the freezing point of water.

VARIATIONS IN THE TIME OF HATCHING.

The average time in which cattle-tick eggs hatch is twenty-five days. The shortest observed period of time at the Experiment Station in which they are positively known to have hatched is twelve days, and the longest is two hundred and nine days. The records given in these notes deal only with eggs from which ticks were hatched that afterwards matured into fertile adults on cattle. Tick eggs have been kept a longer time than two hundred and nine days and have then been hatched, but the young ticks failed to take hold of and grow on cattle, hence the fact is of no economic importance. Among the Experiment Station records only one instance occurred of hatching in twelve days after oviposition; hatching on the eighteenth to the twentieth day is not uncommon. It is somewhat difficult to determine the minimum time in which the eggs may hatch, because of the time variations in oviposition, or egg laying. The twelve-day record here given was made by beginning to count on the day when the very first eggs were produced by the adult female tick.

If the time had been counted from the completion of egg laying the number would have been one or even two days less.

Hatching, like egg laying, is largely dependent upon temperature. The time during which the embryo develops in the egg is not identical with the time that may elapse between laying and hatching; the actual time of incubation and the age of the egg are two separate and distinct facts, as is the case, for example, with the hen's egg, which incubates in about three weeks, but may be several weeks old before incubation begins. During actual incubation several changes can be seen in the tick eggs with the unaided eye; their color becomes lighter, a white spot forms on the interior of each shell, and finally the outline of the young tick is visible. As these changes do not occur under conditions unfavorable for hatching, it is reasonable to conclude that the eggs remain in a real state of dormancy or rest, the existence of which may be regarded as a provision of nature for the more successful perpetuation of the species, and which shows that, in addition to the tick's power to hibernate through the winter in its adult form, it may also pass through the winter in the form of an egg.

The lowest temperature to which the eggs may be exposed without destroying their vitality has not been determined. They may be exposed without injury to a temperature below the freezing point of water for several weeks, and for several months to a temperature at times below and at other times a little above the freezing point, and still hatch out vigorous ticks when favorable temperature conditions for incubation are provided. In connection with the prolonged preservation of vitality in a dormant state, the amount of moisture in the air is apparently of more importance than the degree of temperature, within reasonable limits. A moderately low temperature—not colder than a few degrees below the freezing point of water—merely suspends, and does not destroy, the vitality of the eggs. Exposure to an exceptionally dry atmosphere causes them to shrink rapidly in size, and visibly shrunken tick eggs rarely hatch. It has been observed in the Experiment Station tick fields that the mother tick instinctively provides against the destruction of her eggs through drying by crawling under stones or into other accessible shady and moist places before beginning the process of laying. It is questionable whether eggs exposed to the direct rays of the sun during dry weather will hatch very rapidly or at all.

VITALITY OF THE YOUNG CATTLE TICK.

Young ticks, hatched in captivity, as soon as they have freed themselves from the eggshells, crawl up the sides of the flask and congregate in thick layers on and about the cotton stopper. On exposure to warmth they are very active and move about freely, and on exposure to low temperature they remain very quiet, and may even fall to the bottom of the flask and huddle together in thick clumps in which, if the temperature is sufficiently low, no signs of life can be detected. In this torpid condition they may remain for long periods of time, and almost immediately resume full activity when they are warmed. Like the eggs, the young ticks can bear more exposure to low temperature than to drying; they live longer without reaching a host in cool than in warm weather, and in a moist than in a dry atmosphere. They can hibernate as well as the adult and resist freezing as well as the eggs. They are ready to take hold of a host and attach themselves on the day they are hatched, and may still possess the necessary vigor to do so when they have reached the age of 186 days.

An important fact about larval ticks that have failed to find a host for a long time, and about young ticks from eggs of which the incubation has been greatly delayed, is that when they do attach themselves to a host they grow and mature as rapidly and perfectly as freshly hatched ticks from eggs laid and hatched under the most favorable conditions. Apparently it makes no difference how much adversity the mother, eggs, or larval ticks have experienced. If the ticks reach a host and have the strength to begin their career of parasitism, their chance to grow vigorously and to reproduce their kind is assured and unaffected. The adverse conditions they have survived are strictly matters of the past and are not preserved as a constant handicap in their lives. That this is true with ticks from eggs the oviposition of which has been delayed, with ticks from eggs the incubation of which has been delayed, and with ticks which have been delayed in reaching a host, shows conclusively that the cattle tick is excellently prepared to make a fight against extermination.

TIME REQUIRED TO MATURE ON CATTLE.

Cattle ticks may reach full maturity on cattle in fifteen days, or may require as long as forty days. This observation was made on artificially infested cattle under conditions that exclude the probability of error. Only two observations were made on ticks that matured in fifteen days, during very warm weather, and only one observation when the time was prolonged to forty days, during cold weather. Numerous observations that were made during all kinds of weather show that twenty-two days is the average and that from thirty to thirty-six days is not an uncommon length of time for ticks to remain on the bodies of cattle. As has already been stated, cattle ticks mature more slowly on donkeys, horses, mules, and other less favorable hosts than on cattle, but unfortunately the observations made at the Experiment Station are insufficient to justify more than this general statement. The subject is of some importance, as horses, mules, donkeys, and other animals may prove themselves agents for reinfesting fields and stables from which the ticks have been removed at considerable labor and expense.

The growth of the tick with regard to size may be divided into two stages—one from the embryo to not quite half grown and the other from not quite half grown to full maturity. The former stage requires about as many days as the latter requires hours. For this reason the number of ripe ticks present on cattle at any one time is relatively small. Half-grown ticks have repeatedly been marked on cattle in the morning and found to have matured and dropped off before evening. Fully or almost fully matured ticks are very conspicuous objects on the body of a cow, and probably some birds enjoy picking and eating them. Chickens have been observed to do so a number of times, and hence the rapid maturity during the second stage of growth may be looked upon as another natural provision for the preservation and multiplication of the species.

The time variations in the different stages of the life history of the cattle tick, as observed at this station, are presented in the following table:

Stage.	Normal time.	Minimum time.	Maximum time.
	Days.	*Days.*	*Days.*
Oviposition, or egg laying	7	1	96
Incubation, or hatching	25	12	209
Time required to reach host	(a)	(a)	186
Time required to mature on host	22	15	40
Time required for complete life history	54	28	531

[a] The ticks will attach themselves, if opportunity offers, the same day they are hatched.

The table must not be taken as an assertion that the life history of the tick in nature is ever actually completed in the short period of twenty-eight days, or protracted to the long period of five hundred and thirty-one days. The shortest actually completed life history recorded at the Experiment Station is thirty-eight days, and the longest three hundred and twenty-two days. The significant fact about the longest period is that no special pains were taken to produce the result obtained or to make a record. A number of adult female ticks were collected from a cow and placed in a flask at the end of September; the flask, properly labeled, was put away in a large unheated attic of a frame building, in which the temperature compared very well with that of an ordinary barn. Nothing was thought about the flask until the following July, when it was found to contain live larval ticks, which were at once placed on cattle, on which they matured early in August. It will readily be seen that this occurrence has a specific bearing on what may happen in an ordinary barn in which tick-infested cattle are stabled. The protection afforded by the barn, especially if it is warmed during the coldest portions of the day and during the days when the weather is most severe, by the heat radiated from the bodies of the cattle, is sufficient to enable the ticks to live, or hibernate, through the winter even in a climate where they have no chance to survive in open fields and other unprotected places.

SIGNIFICANCE OF THE CATTLE TICK AS AN EXTERNAL PARASITE.

If we lay aside temporarily the fact that the cattle tick is the only known agent through which the disease commonly known as Texas fever, or southern cattle fever, is transmitted from animal to animal, that the perpetuation of this disease is entirely due to the tick, and that the destruction of the tick will be attended by the entire removal of the disease, and consider the tick as simply an external parasite of cattle, we will find that its record from this point of view alone is sufficiently bad to justify and encourage the most strenuous efforts for its extermination.

The cattle tick is not small compared with external parasites generally. It is small enough in its larval stage when it first emerges from the egg, but very large when it has become an adult at the expense of its host. It does not grow slowly, but in the course of twenty to twenty-five days increases its bulk and weight fully 10,000 times. During its parasitic period it molts, or casts its skin, twice, and the cast-off skins—which are also produced at the expense of the host—are not included in the enormously increased bulk of the adult tick. A single female larval tick, hatched from one of the 2,000 or more eggs produced by one mother, has become a mature, fully developed tick in from eighteen to twenty-five days, and is prepared to lay 2,000 or more eggs herself, and shortly begins to do so. Her body shrinks during the process of laying, but after she has produced her thousands of eggs, each as large as the one from which she was hatched, a considerable amount of dry, hard tick still remains, showing that she is not simply an egg bag. This last statement is made to emphasize the fact that it is not an exaggeration to say that the volume of the tick increases at least 10,000 times during the three weeks (approximately) spent by the parasite on and at the expense of the body of its host. The weight of a fully matured female cattle tick, as it drops from the body of its host, is about 300 mg. (approximately $4\frac{2}{3}$ grains). The weight of 2,000 tick eggs is about 115 mg. ($1\frac{5}{8}$ grains). That is to say, the adult female tick weighs a little more than $2\frac{1}{2}$ times as much as the total number of eggs she produces. The eggs probably weigh twice as much as an equal number of larval ticks.

Relative to the damage that cattle ticks may do to cattle that are immune from Texas fever, there are several records at the Experiment Station of cattle that died from no other discoverable cause than extreme infestation with cattle ticks, and among these animals is one southern cow that was strictly immune from Texas fever. The post-mortem examination of the cow showed extreme emaciation and great pallor of all the organs, but absolutely no lesions of Texas fever or other disease. We also have records of calves that were exposed to cattle ticks that failed to cause Texas fever in susceptible adult cattle—that is, strictly noninfectious ticks. The calves became very heavily infested, and were so stunted in growth that as yearlings they had barely the size they should have had at half their age; they looked rough and unthrifty, whereas, except for their exposure to the ticks, they should have been sleek and fat as a result of the care they received.

A large number of cattle were used in experiments at this station to find a satisfactory cattle-tick dip, more than 40 different dips and various modifications of these dips being tested. It was invariably observed during these investigations that when the cattle became heavily infested with ticks they lost rapidly in condition, and this loss in condition could not be attributed to Texas fever, as the ticks used were in most instances noninfectious. Some of the cattle were carefully examined ante-mortem and post-mortem and failed to show symptoms or lesions of Texas fever, and some of them were subsequently tested as to their immunity from the affection, the result being that no other conclusion could be drawn than that the ticks, acting simply as external parasites, were the sole responsible cause of the unthriftiness.

DRAIN ON THE BLOOD AND IRRITATION OF THE SKIN.

The short time in which the ticks mature, the rapidity with which the eggs are laid and hatched, and, it may be added, the certainty with which they hatch (in flasks at room temperature in summer practically every egg hatches), insure that the cattle in infested fields will have to do much extra foraging to replace the blood drained from their bodies by the constantly multiplying number of parasites. Nor does this extra foraging tell the whole story. The tick does not eat coarse food. After the cow or steer has collected the extra forage it is masticated, digested, absorbed, and converted into the complex substance we know as blood, and it is the blood that fattens the tick. This extra work imposed on cattle, mostly in warm weather and in a warm climate, is not done under favorable conditions, but with a skin that is irritated by numerous—in most cases innumerable—minute punctures. That foraging is work no one will deny, and every stock feeder knows that the mastication, digestion, and absorption of food and its conversion into tissue are the equivalent of a very positive amount of work. Stock growers are also aware that irritation may be regarded as an equivalent of work, quite independent of whether it is due to flies, ticks, or other causes. Animals exposed continuously for months to a mild form of suffering fail to make a sufficient return for the money and labor expended upon them. They move about unnecessarily, do not eat as well as they should, and can not possibly develop into the fine specimens that may reasonably be expected from the breed to which they belong.

When a cattle tick is detached from the skin of a cow (and this is especially noticeable in the perineal region, or that portion of the body extending downward from the rectum and the genital opening to the udder) a small, circular spot, sometimes partly denuded of hair and slightly reddened, is seen, with a minute, barely visible puncture in its center, from which a drop of blood may ooze. When examined under the microscope the skin in a narrow circle about the puncture is found to be densely packed with infiltrated cells. Hence we have not only to consider the drain on the blood for the development of the tick, but also the drain associated with the changes that occur in the punctured and irritated skin. Each of the little injuries to the skin considered by itself is small, but the ticks are frequently so numerous that the skin on some portions of the body is completely covered, and the result is therefore a very general and severe irritation.

When the ticks are numerous it has been observed that a sticky substance frequently accumulates on the skin of cattle; this may be either an exudate from the irritated skin or an accumulation of the discharges from the ticks. After a while this substance hardens into dark, granular flakes and peels off. It is best seen in the creases of the skin. Whether it exudes from the skin or is discharged by the tick does not alter the fact that its original source is the body of the cow or steer. If it exudes from the skin it is strong evidence that the skin is extremely irritated, and if it is discharged by the tick it shows that the well-marked anal opening of the parasite is something more than a purely ornamental feature, and that the blood drawn from the cattle is not wholly used in an economical way to bring about the great increase—from 1 to 10,000 or more—in size of the tick from larva to adult.

It is practically impossible to determine the daily amount of loss to a bovine animal in the infected territory caused by the ticks that feed on its body. The weight of the ticks that matured daily on single animals at the Experiment Station ranged, with different degrees of infestation, from one-half ounce to several ounces; and this means not merely the loss of that number of ounces of blood—it means the loss of the amount of blood required to develop that weight of ticks.

DESTRUCTION OF BLOOD CORPUSCLES BY THE TICK.

All cattle ticks (*Boophilus annulatus*) are not necessarily always carriers of Texas fever. The infectious agent of the disease is absent from the progeny of this species of ticks when they have grown on animals—like the horse or donkey—that are strictly immune from Texas fever. On a number of occasions at the Experiment Station cattle were exposed to ticks that had been deprived of their infectious character, and the most careful examination demonstrated beyond a doubt that the cattle did not become affected with Texas fever. The number of blood corpuscles in the blood of the cattle was determined before and after their exposure to the ticks, and it was found that the maturing of from 100 to 150 ticks daily on the skin of a cow of average size, if continued a week or more, caused a reduction in the number of blood corpuscles equal to from 7 to 8 per cent of the total number in circulation. This means that the weight of the blood corpuscles lost is much greater than the weight of the matured ticks—from 1 to 1½ ounces daily—that are responsible for the loss.

The studies that have been made of the blood of cattle affected with and convalescent after Texas fever show that the destruction of red corpuscles is very great during the active stages of the disease, and that the restoration, after the disease has subsided, from the reduced to the normal number is surprisingly rapid. The rapidity with which lost red blood corpuscles are restored after an attack of Texas fever was found, from investigations made for the purpose, to hold true when the loss was caused by simple hemorrhage. In this connection the records of two cows that were bled from the jugular vein will serve as an illustration.

On November 12, 1905, about a gallon and a half of blood was drawn from the jugular vein of each of two cows, Nos. 135 and 140. Two days before the blood was drawn the number of corpuscles per cubic millimeter in the the blood of each cow was carefully determined, and again three hours, one day, three days, eight days, and thirteen days after the drawing of the blood. The accompanying table gives the results:

Number of corpuscles in blood of cows before and after drawing 1½ gallons of blood on November 12.

Time before or after drawing blood.	Corpuscles per cubic millimeter.	
	Cow No. 135.	Cow No. 140.
2 days before	6,335,000	6,550,000
3 hours after	5,616,000	5,107,000
1 day after	5,031,000	4,600,000
3 days after	5,103,000	5,022,000
8 days after	5,860,000	5,518,000
13 days after	Normal.	Normal.

It is well known that the volume of fluid in the blood vessels after a loss of blood or a hemorrhage is much more rapidly restored than the number of blood cells. The larger number of blood corpuscles per cubic millimeter of blood three hours after bleeding than on the succeeding day is explained by supposing that the blood vessels were somewhat contracted shortly after the cattle were bled and that the volume of blood withdrawn was not fully replaced by an equal volume of fluid until the next day.

The loss of blood corpuscles sustained by cow No. 135 because of the bleeding is about 20 per cent, and by cow No. 140—the smaller of the two animals—about 30 per cent of the total number in circulation. This large loss was made good in the short time of thirteen days, or less than two weeks.

If we now return to the statement regarding the loss of blood corpuscles sustained by a cow because of the maturing of from 100 to 150 ticks on her body daily, the figures—7 to 8 per cent—appear in a new light. For the two cows that suffered a reduction in the number of blood corpuscles through simple bleeding from a vein the restoration was at the rate of about 2 per cent a day. The examination of the blood of cattle convalescent after Texas fever has in many instances shown a more rapid restoration. If the restoration in cows infested with ticks is equally rapid—and no good reason can be given for a contrary view—we must add the loss of 2 per cent of blood corpuscles daily to the total loss shown at the end of a week. The tick infestation specified here must not be regarded as representing an extreme condition as to the number of ticks present; it is, in fact, a mild form compared to actually existing conditions in the tick-infested territory. As an example of what may occur it is only necessary to mention that cases of infestation with ticks have been frequently seen in which 50 ticks, either matured or ready to mature within twelve hours, could be counted on a patch of skin 6 inches square, to say nothing of the innumerable ticks of younger stages that loaded the same patch of skin.

If the maturing of from 100 to 150 ticks daily on the body of a cow of average weight caused the abstraction of a volume of blood equal to and no greater than the volume of the total mass of ticks, the capability of the blood to replace its lost corpuscles would be sufficient to make the loss imperceptible, as seen with the best available apparatus for determining the number of corpuscles in blood.

The cause for the excessive destruction of blood corpuscles for which the tick must be held responsible has not been determined. The parasite may secrete some substance during the process of feeding that acts as a solvent for blood corpuscles and dissolves many more than the tick requires for food, or it is possible that the tick feeds exclusively on blood corpuscles and incorporates only a small portion of those it destroys in its body. The irritation of the skin and the consequent nervousness and reduced vitality of the cattle may to some extent also account for the impoverished condition of the blood. But these are mere conjectures, and have no immediate bearing on the economical aspect of the fact that the corpuscles are reduced in number by the presence of the ticks and that it requires food and work to replace them.

SUMMARY OF DAMAGE CAUSED BY THE TICK AS AN EXTERNAL PARASITE.

To sum up the facts about the tick regarded simply as an external parasite of cattle we reach the following conclusions:

(1) The growth of the tick from a small embryo to a large adult is very rapid, representing an increase in weight and volume in approximately three weeks of from 1 to 10,000 or more.

(2) The irritation of the skin, as shown by the loss of hair, infiltration with cells, and a puncture visible to the naked eye, must be very great and cause the cattle much suffering and make them nervous and restless.

(3) The drain on the blood is excessive, and represents a loss the magnitude of which is not proportioned to the number and weight of the ticks, but is much greater. The loss from a given number of ticks is so great that it is difficult to understand how cattle only moderately infested with ticks can be grown profitably, unless it be under the most favorable counterbalancing circumstances, the latter, of course, representing an additional profit which is sacrificed to the ticks.

The tick has been considered merely as an external parasite, not as a carrier of Texas fever, and not as the cause of numerous regulations that increase the difficulties of the southern cattle grower in his competition with cattle growers north of the Texas fever quarantine line. And the statements that have been made are not abstract estimates of the injury sustained by cattle through the tick operating as an external parasite; they are the direct conclusions derived from concrete, material investigations. It is therefore truly creditable to the southern cattle grower that he has survived in the face of what the ticks have done to force him into retirement.

THE TICK AS DISSEMINATOR OF TEXAS FEVER.

It has been shown that the cattle tick, regarded as an external parasite only, is an evil of the first magnitude. To this must be added the fact, of perhaps greater significance in the line of evil, that the tick is the sole responsible cause for the perpetuation of the disease best and most commonly known as Texas fever. Without the tick the disease would cease to exist. The tick is the only known means by which it is transmitted from animal to animal. The quarantine line for cattle that stretches across the United States and divides the tick-infested from the tick-free territory is absolutely necessary for the protection of the cattle north of it from Texas fever, although it imposes considerable hardships on the cattle growers south of it, because it interferes with the free movement of their cattle. Without the tick there would be no reason for maintaining this quarantine line, because there is nothing pernicious about tick-free southern cattle that can be regarded as a sufficient reason to prevent them from mingling freely at all seasons of the year with northern cattle. The extent to which the quarantine line influences the cattle industry is too well known to need more than this passing comment. Cattle south of it are handicapped by having to be confined in special pens when they reach the various stock yards, and also by special slaughter regulations and other necessary but burdensome penalties—all due to the tick. The extermination of the tick will mean a simultaneous cessation of all these evils.

Texas fever is a disease that is caused by a microscopic organism (*Piroplasma bigeminum*) that lives in the blood of cattle and destroys the red blood corpuscles. In nature this micro-organism is carried from infected to noninfected cattle in only one known way, and that is through the agency of the cattle tick (*Boophilus annulatus*). The disease can be produced artificially by withdrawing a portion of the blood of an infected bovine animal and injecting it into the body of a noninfected bovine animal that has passed beyond the earliest stage of calfhood. Some investigators assert that even very young calves may become affected, and that the organism of Texas fever has been found in the bodies of fetal calves. These assertions, however, are contrary to the observations made at this station. Our investigations specifically indicate that calves when first born are practically immune from Texas fever, and that the susceptibility to the disease develops later on and increases with age.

INFECTIOUS AND NONINFECTIOUS TICKS AND IMMUNITY OF CATTLE.

It has already been stated that all cattle ticks of the species *Boophilus annulatus* are not necessarily infectious. The ticks derive their infectious character relative to Texas fever from growing on the so-called immune, but really chronically affected, cattle of the South. If we place noninfectious ticks upon cattle that are susceptible to Texas fever no specific disease is caused, and the ticks may grow generation after generation on these cattle without producing other inconvenience than as external parasites. But if we remove these same ticks from the nonimmune and grow them one generation on immune southern cattle, and then return the next generation to live again on the nonimmune cattle, the result will be an outbreak of acute, typical Texas fever.[a]

This illustrates the relation of the cattle tick to Texas fever. The tick absorbs the infectious organism in some form from the immune cattle and transmits it through its egg to its progeny.

The cattle that are born and raised in the tick-infested portions of the Southern States are immune from Texas fever, and the same is true of cattle that have recovered from an attack of the affection. This immunity is not of the same kind as that gained after an attack of anthrax or blackleg, or by man after an attack of smallpox or any one of a number of other infectious diseases. A man recovered from smallpox enjoys a very positive immunity from a subsequent attack of that disease, without retaining in his system any living portion of the specific virus present at the time of his affection. He is immune, but wholly free from the living poison of smallpox in any form in which it can be taken from his body and cause an attack of the disease in another individual, no matter how strongly the latter may be predisposed to become affected with it. Immunity from Texas fever is not an immunity in this sense; it is, on the contrary, merely a toleration for the infectious organism of Texas fever, and the immune cattle of the South, as well as those that have survived an attack of Texas fever, for all practical considerations permanently carry the organism of the disease in their blood. The injection of a small amount of blood from a southern immune animal or from an animal that has once suffered an attack of Texas fever into the body of a nonimmune cow is invariably followed by an attack of Texas fever. Hence the so-called immunity of cattle from Texas fever may be regarded rather as a very mild chronic form of the affection than as a true immunity.

The so-called immunity of southern cattle that are exposed to Texas fever from their birth on is established so gradually by reason of their resistance to the affection in early life that the process is completed unattended by visible symptoms of disease and is consequently unobserved. Such cattle are not a menace to nonimmune cattle as long as no cattle ticks are present. They may associate with the nonimmune cattle in every way, in stables, in fields, and elsewhere, without affecting them. The tick is the necessary factor for the transmission of the disease.

The losses that are caused by outbreaks of Texas fever are not confined to cattle that are born and raised north of the quarantine line. We all know that such cattle can not be taken into the tick-infested

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[a] See report of an experiment relative to this subject in the Sixteenth Annual Report of the Bureau of Animal Industry (1899), pp. 33–41.

area and that southern tick-infested cattle can not be introduced among them in the North without causing disease. South of the quarantine line, in the quarantined area itself, there are many regions in which the conditions relative to Texas fever are precisely identical with those existing north of the line.

The continued persistence of cattle ticks in any region depends, among other things, upon the severity and duration of the winter. In the higher altitudes of the South the winters are colder and longer than in many portions of the North, and in these higher altitudes cattle ticks do not survive the winter. These regions are normally tick free. The failure of the tick to survive in these localities means that the cattle raised in them will not become immune from Texas fever in the gradual and unobserved manner that occurs in the permanently tick-infested localities, and when such cattle are exposed to infectious cattle ticks they will become affected with acute Texas fever. The losses annually among these cattle are very great and can not be effectually guarded against by any practically applicable form of quarantine excepting such as owners may choose to impose on their herds of their own free will.

In addition to the regions in which the cattle tick can not live permanently because of the higher altitude and consequent severe winters, there are in the South a number of localities in which cattle ticks live permanently without producing immunity from or causing Texas fever. These are simply localities into which Texas fever has never been introduced, and cattle from these localities contract the disease immediately when they are exposed to ticks carrying infection. Regions of this kind are probably growing fewer in number and smaller in extent very rapidly, because once the infection has been introduced all the cattle that remain alive become immune and permanently carry the piroplasma of Texas fever in their blood.

On several occasions this station has been requested to explain why certain cattle that had always been exposed to and infested with ticks should suffer an outbreak of acute Texas fever after being removed from their native locality to another not very remote place, and why similar cattle should suddenly suffer acute disease with a high rate of fatality after the introduction of new cattle among them. Careful inquiry into these cases showed that the cattle were infested with noninfectious ticks, and hence were nonimmune. In the first instance the cattle were moved to localities in which the ticks were infectious, and in the other instance the newly introduced cattle were immune and consequently either carried infectious ticks on their bodies or infectious material in their blood, by the absorption of which the formerly noninfectious ticks became infectious.

The perpetual presence of the piroplasma of Texas fever in the blood of so-called immune southern cattle is a phenomenon the significance of which to the cattle, aside from the protection it ordinarily affords them from acute Texas fever, has not received careful study. We know that when ticky southern cattle are dipped in oil to remove the ticks they occasionally die as the result of an attack of acute Texas fever, and that southern cattle at times when they are free from ticks also occasionally contract acute and fatal Texas fever after they have been driven long distances or been exposed to considerable changes of climate. Beyond the practical recognition of the existence of these peculiar phenomena, our knowledge about them is purely speculative. The suggestion has been made that this development of acute Texas fever in so-called immune cattle may be attributed to extreme exhaustion, lost vitality, etc., which occasionally may be sufficient to convert the mild, perpetually present form of the infection that we call immunity into an acute and fatal infection.

The occurrence of acute fatal Texas fever among so-called immune cattle under some not well-defined conditions suggests that the so-called immunity is itself an evil that is tolerated only because it counteracts a greater evil. The losses caused by death among immune cattle because they contract Texas fever are not sufficient in number to give the subject much importance, but we may justly reason as follows:

If there are conditions that increase the activity of the infection always carried in the blood of southern immune cattle so much that it causes fatal disease, then there may be, and probably are, conditions that increase the activity of the infection to any degree short of that necessary to cause acute and fatal disease, and no doubt from the nature of the case the latter would be much more common and frequent than the former. This form of reasoning finds an additional justification in the fact that the conclusion reached explains many puzzling phenomena about Texas fever in the permanently tick-infested territory that remain without a proper solution.

SOME CHARACTERISTICS OF THE TEXAS FEVER MICROPARASITE.

The microparasite of Texas fever, as it has been observed in the blood of affected cattle, has several different forms. When we carefully study under the microscope the blood of a cow that has been exposed to infectious ticks or has received an injection of infectious blood either from a southern immune cow or a cow that has at some previous time been affected with Texas fever and has recovered, it is first observed that some of the red corpuscles contain ameboid bodies—that is, bodies that have no definite constant shape, but change their outline by alternately protruding and contracting portions of themselves. The ameboid bodies are about one-sixth to one-third as large as the blood corpuscle in which they are contained, and under the best magnification that can be brought to bear on them are wholly without internal structure in appearance. A day or two after the ameboid bodies have been seen in the blood some of the corpuscles are found to contain somewhat pear-shaped objects; these are more commonly present in the form of pairs, and single corpuscles may contain two or more pairs. The pear-shaped bodies under high magnification seem to have a distinct internal structure, the definition of which even with the best magnification is not sufficient to give a perfectly clear impression of its precise character. It is this form of the microparasite that has been seen in the blood of southern immune cattle in the few instances in which any parasites have been detected after a long and laborious search in thousands of preparations of blood under the microscope.

In very acute, rapidly fatal cases of Texas fever it is only the two above forms of the microparasite that are usually seen. When the affection is of longer duration another form appears, which in the earlier works of the Bureau of Animal Industry on Texas fever was given the name of the peripheral coccus form, because of its resemblance to a micrococcus, and its location, in most instances, at the extreme peripheral portion of the blood corpuscle.

The number of blood corpuscles at one time affected with the ameboid stage of the parasite is small, rarely more than 1 per cent of the total number. The number of pear-shaped bodies present may amount to an infection of 75 per cent of all blood corpuscles, but is more commonly not above 3 to 5 per cent, and an infection of more than 5 per cent of the corpuscles may be regarded as a condition that will very probably terminate in the death of the affected animal. The peripheral coccus form of the microparasite, when it appears, is usually present in a much higher proportion of the blood corpuscles than either of the other forms. It is the form that is seen in the blood of cattle during the time preceding convalescence from Texas fever, and is associated with what is usually regarded as the chronic form of the affection.

In what form the micro-organism exists in the cattle tick, whether it undergoes any developmental or other changes, how it is transferred from the adult tick to the egg, or from the egg to the larva, or by the larva to the cattle, are not known. In fact, the only definite knowledge we have of the relationship between the tick and the piroplasma of Texas fever is that the tick abstracts it somehow from the bodies of cattle in which it is present and introduces it somehow into the bodies of other cattle, and that the piroplasma has no known natural way to get out of or into the bodies of cattle without the agency of the tick.

DAMAGE CAUSED BY THE TEXAS FEVER ORGANISM IN THE BLOOD.

We know that a parasite can not live in the body of an animal without absorbing some of the material and energy of its host, and the piroplasma of Texas fever, which is a permanent parasite in the bodies of the so-called Texas fever immune cattle, can not be regarded as an exception to the general rule. Hence, the simple presence of this parasite in the blood of cattle, even though it fails under ordinary conditions to produce determinable symptoms of injury, must be regarded as militating against their highest welfare and productivity. The harm the piroplasma actually does and the drain due to it are unknown quantities. We do not know how frequently only one red blood corpuscle in a number of millions contains a parasite, nor how frequently the rate is increased to one to a thousand or even one to a hundred.

From microscopic examination of and injection experiments with blood we conclude that the number of parasites in immune and recovered cattle kept under the most favorable conditions as to food and shelter is not above one parasite in several millions of corpuscles. From observations of fatal Texas fever among so-called immune cattle, in which the affection was induced by the conditions previously referred to, we know that the number of parasites may be increased to one or more in every fifty corpuscles. How many conditions are there, and what is the nature of the conditions, that may increase the number of parasites to any point between these two extremes? We have no answer to these questions, but it is not unreasonable to assume that with varying conditions to which southern and all other cattle are exposed from time to time the number of parasites in the blood varies materially. Enormous variations may occur without producing positive symptoms of disease, or, at most, such symptoms and disease as would, in cases in which the naturally occurring variations in the number of parasites reached its ordinary maximum, cause the cattle to be classed as simply unthrifty.

The certainty with which cattle ticks that have been deprived of their infectious character again become infectious when they grow only one generation on an immune cow indicates that the presence of the ticks on a cow may, and probably does, cause a considerable increase in the number of Texas fever organisms in her blood.

It is not worth while going into this subject at greater length. It has been sufficiently shown that the condition known as immunity from Texas fever, as it is possessed by cattle, is really an undesirable and unprofitable condition, and that it would be regarded as a positive evil if it were not an absolute necessity in the presence of the cattle tick. It is one more argument, although additional arguments are not needed, for the extermination of the cattle tick at any price.

EXTERMINATION OF THE TICK.

The enormous vitality of the cattle tick, its surprising power to survive adverse conditions, and the possession in its life circle of three distinct stages during which animation may be temporarily suspended and it may go to sleep and rest uninjured until adverse conditions expire naturally with the passage of time, leave no doubt that its extermination will be accomplished only after many trials and disappointments. But these facts should not be used as arguments against undertaking extermination, because, whether we regard the ticks either as simply external parasites of cattle or as carriers and disseminators of Texas fever—and they are both—they are sufficiently objectionable pests to make it worth while going to the very limit of trouble and expense to be rid of them. That they can be exterminated is a fact that has been placed beyond reasonable doubt by the able work already done in some portions of the infested territory by men whose endeavors have not received the full measure of merited support and encouragement.

Some facts which may be mentioned as offsetting the difficulties to be overcome in the extermination of the tick are as follows: The tick is strictly an obligatory parasite; the number of species of animals on which it can live well enough to perpetuate itself effectually is limited; it must eventually succumb if a host is not obtained, and it does not spread far from the point at which the adult female is dropped and her eggs are produced and hatched.

Young ticks are very active during warm weather and can crawl quite rapidly, but their tendency is to move upward and only short distances in a horizontal plane. When they travel any great distance from the point at which they are hatched, it is on the body of a host, and the host supplies the means of locomotion. In heavily infested tick fields at the Experiment Station it was a common experience during warm weather to see from 3 or 4 to 50 or 100 young ticks stationed at the extreme upper ends of spears of grass, with their legs in motion, and to find large clumps or colonies at or near the tops of fence posts. During cold weather they are found more commonly on the under sides of pieces of wood or vegetable rubbish. Ticks are known to have reached neighboring fields from fields that were heavily infested when the two were separated by double lines of fence 12 feet apart, but is more probable that they were carried by strong currents of air from their elevated position on the fence posts than that they crawled along the ground or were blown from the grass. When the ticks in the fields were so numerous that the cattle became heavily infested, but it was difficult to find many ticks on the ground, grass, or fence posts, no observation was made to show that before reaching a host they traveled by their own power of locomotion or otherwise as far as 10 feet from the point where they were hatched.

The adult ticks, after they drop from the bodies of cattle, also have some power of locomotion, but they move very slowly, especially over the irregularities of surface that occur in all fields. They probably move no farther than is necessary to find a little grass, a stone, or a fallen leaf under which they can hide.

A number of years ago the opinion was very generally entertained that a simple wire fence was sufficient to prevent the spread of Texas fever. This opinion, regarded in connection with the knowledge we have to-day of the way in which the infection of Texas fever is carried, is very nearly equivalent to an assertion that cattle ticks do not move at all in a horizontal direction. While it is not altogether true that a wire fence can hold back the fever and the "fever tick," the very fact that an opinion of this kind should have found acceptance among many men of large experience shows conclusively that the ticks move only short distances in their search for a host, at most a few feet from the point where the mother tick is dropped and the young leave the eggs.

METHODS OF ERADICATING THE TICK.

The various methods that may be used to free cattle and fields from ticks have been so recently described in publications of the Bureau of Animal Industry[a] that it is not necessary to enter into the subject again at this time. The methods in question are all based on the various known facts of the life history of the tick. To be effective they must take into consideration the maximum and minimum periods of time required by the tick to pass through its various phases, from the time it drops from its host a mature, fertile adult until the time when the progeny of the adult have in turn reached maturity. The variations in the time required for the completion of the different life stages of the tick teach us that, to free a cow entirely from ticks, and to be quite sure that she is absolutely free, she should be removed from all sources of infestation for forty days. In most instances a shorter time may be sufficient, particularly in warm weather, but for all seasons of the year forty days must be accepted as the minimum.[b]

After a cow has been made free from ticks, to keep her free she

[a] Bulletin No. 78; Farmers' Bulletin No. 258.

[b] It may be possible that cattle can be made free from cattle ticks if kept in one small inclosure the entire forty days, provided a number of chickens are also confined in the inclosure. Chickens eat the ticks greedily, and their eyes are too sharp to overlook many adult female ticks in a small, confined space. This is offered simply as a suggestion.

should not be allowed to enter an inclosure or field on which mature ticks have been dropped within six or eight months.

Although the ticks that lived at this station three hundred and twenty-two days without reaching a host did so without special provisions to keep them alive, and afterwards matured into fertile adults when placed on a cow, the fact remains that they were inclosed in a cotton-stoppered flask, in which the circulation of air, and consequently their exposure to death through evaporation of moisture from their bodies, was reduced to a minimum without preventing the access of sufficient fresh air to sustain life. Cattle ticks, notwithstanding their enormous resistance to adverse influences generally, are so prone to suffer when exposed to conditions that cause rapid evapcration or drying that the writer is inclined to doubt that they ever find an environment in nature which will insure their persistence much longer than six months without the intervention of a host.

In the various experiments made at the Experiment Station with ticks and tick eggs it was discovered that the amount of moisture that evaporates from the bodies of the ticks and the clumps of eggs is very great. If too many adult ticks (above 20 to 25) were confined in a 500 c. c. conical flask (capacity about 1 pint), the moisture that accumulated on the inner sides of the flask during humid weather was frequently sufficient to drown the eggs and freshly hatched larval ticks. On the other hand, if single ticks, or the egg clumps from single ticks, were placed in similar flasks the air in the flasks during the dry weather did not become sufficiently saturated with moisture to protect the eggs from fatal drying.

But the conditions in nature are so varied that it is impossible to assert with confidence just what may happen.

CONCLUSION.

The history, distribution, symptoms, diagnosis, treatment, pathology, etc., of Texas fever have been repeatedly and quite recently treated in publications of this Bureau, and as the Experiment Station has nothing new to add to what has been said on these subjects they will not be discussed here.

Likewise it does not seem necessary to enter into a calculation of the loss in dollars and cents caused directly or indirectly by the cattle tick. Every cattle grower and feeder and every dairyman of the tick-infested territory can form some estimate for himself of the losses he personally sustains through the agency of the tick. His personal losses are very much nearer to him than any interest he may have in knowing the aggregate losses in the industry in which he is engaged. The enormous total of these losses, so large with even the most modest estimates that it is almost beyond belief, shows mainly the great magnitude of the industry affected, while the individual losses will give each man a basis from which to determine how far he will lend his aid to promote the extermination of the cattle tick and to break away from a condition that forces him to feed a considerable portion of the profit of his labor—and not infrequently a share of the capital he has invested—to a brood of obnoxious parasites.

Persons interested in cattle in the South should consider the losses sustained under the several heads mentioned below:

1. Losses due to the tick as an external parasite:

(*a*) As a blood sucker.

(*b*) Because of injury to the skin of cattle.

(*c*) Because of the pain and irritation suffered by the cattle.

2. Losses due to the fact that the tick is the carrier of the infectious material of Texas fever:

(*a*) In producing acute and fatal Texas fever.

(*b*) Because of the permanent existence of the parasite of Texas fever in the blood of so-called immune cattle.

3. Losses due to the difficulties attendant upon the introduction of new stock into the tick-infested territory:

(*a*) For breeding purposes.

(*b*) For grazing and feeding purposes.

4. Losses due to legislative interference with the free movement of cattle, including the extra expense of special means of shipping, separate cattle pens, etc.

THE PERSISTENCE OF THE TEXAS FEVER ORGANISM IN THE BLOOD OF SOUTHERN CATTLE.

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References have been made from time to time in the annual reports of the Bureau of Animal Industry to the long-continued persistence of the infectious material of Texas fever in the blood of southern cattle, and investigations relative to this subject have been carried on with more or less regularity since the first publication regarding it was issued, in 1893. The results obtained in the investigations during the last five years are exceptionally interesting and are worthy to be reported with some detail.

THE COWS USED IN THE EXPERIMENTS.

The southern cows used to test the persistence of the infection of Texas fever in their blood are three in number, as follows: Cow No. 113, received from North Carolina in 1889, at which time she was between 3 and 4 years old; cow No. 214, received from the same region in North Carolina in 1892, at which time she was about 4 years old; cow No. 1, received from the same region in North Carolina in 1895, at which time she was about 5 years old.

The three cows were protected from every form of exposure to ticks and Texas fever after their removal from the South, excepting that in 1897 a single generation of strictly noninfectious ticks[a] was grown on their bodies in order to test whether the ticks would become infectious. The noninfectious character of the ticks, before they were placed on the bodies of the cows, was repeatedly tested by growing them generation after generation on the bodies of cattle susceptible to Texas fever without causing disease, and by afterwards exposing some of the susceptible cattle to infectious ticks to make sure they did not possess natural immunity from Texas fever and that they did not acquire immunity through their exposure to the noninfectious ticks.

[a] Wherever the term ticks is used in this article the species of tick referred to is *Boophilus annulatus*.

The growth of the noninfectious ticks for one generation on the bodies of three southern cows thoroughly reinfected them.[a]

METHOD OF MAKING THE BLOOD TESTS.

The method used to test the infectious character of the blood of the southern cows was the withdrawal of the desired quantity of blood through a large hollow needle directly from the jugular vein and the immediate injection of this fresh blood under the skin of the susceptible cattle. This process was used in all instances excepting the first injections made with the blood of cows Nos. 113 and 214, which were made from the jugular veins of the southern cows directly into the jugular veins of the susceptible cows. Intrajugular injection, as shown in the earlier work of the Bureau of Animal Industry, does not constitute a severer test of the infectiousness of the blood than subcutaneous injection, and hence, after the first two tests, the latter method was always practiced because of its being somewhat simpler. In all the injections the greatest care was taken to prevent the introduction of foreign infectious material into either the cow that supplied the blood or the cow that received it.

RESULTS OF THE TESTS.

For the sake of convenience the results of the various injections have been condensed in the following tables:

Tests of the infectious character of the blood of cow No. 113 (received from the South in 1889).

No. of cow injected.	Date of injection.	Amount of blood injected.	Red blood corpuscles destroyed.	Texas fever parasites in the blood.	Remarks.
		c. c.	Per cent.		
235	Oct. 29, 1892	28	39	None found	Mild Texas fever.[b]
9	July 19, 1895	10	(?)	50 to 75 per cent of corpuscles infected.	Texas fever, fatal on eleventh day after injection.[c]
219	June 26, 1901	16	None.	None found	No disease.
	July 17, 1901	20	None.	do	Do.[d]
218	Aug. 7, 1901	20	20	do	Very mild Texas fever.
100	July 9, 1902	10	None.	do	No disease.
180	Aug. 28, 1902	18	None.	do	Do.
175	Mar. 23, 1904	20	None.	do	Do.
188	do	20	None.	do	Do.[e]
317	June 6, 1904	20	None.	do	Do.
325	do	100	None.	do	Do.

[a] For a more detailed account of this experiment see the Sixteenth Annual Report (1899), Bureau of Animal Industry, pp. 33–40.
[b] See also record in Bulletin No. 3, Bureau of Animal Industry, 1893, p. 69.
[c] See also record in Sixteenth Annual Report (1899), Bureau of Animal Industry, pp. 39–40.
[d] Susceptibility to Texas fever afterwards tested—see table showing tests made with the blood of cow No. 1.
[e] Susceptibility to Texas fever afterwards tested—see table showing tests made with the blood of cow No. 214.

On June 6, 1904, immediately after cows Nos. 317 and 325 had received an injection of blood of cow No. 113, the last-mentioned cow was injected with 100 c. c. of infectious blood drawn from the jugular vein of cow No. 188.

Cow No. 188, as an examination of the above table will show, was injected in March, 1904, with blood from cow No. 113, without contracting Texas fever, and in May, 1904 (see next table), with blood of cow 214. The time that elapsed between the two injections was thirty-two days, or about two weeks more than was required for some symptoms of Texas fever to have presented themselves if the blood of cow No. 113 had been infectious. As a result of the latter injection the cow contracted a severe attack of Texas fever, and at the time her blood was used to inject cow No. 113 it contained many large single and paired Texas fever parasites. Cow No. 113 showed no symptoms of disease as a result of the blood injection, but in the following year her blood was found to have regained its infectious character, as is shown by the injection of cow No. 371, whose record is given below.

Cow No. 371, injected on June 23, 1905, with 50 c. c. of blood drawn from the jugular vein of cow No. 113, died on the seventeenth day after the injection. The autopsy showed typical lesions of acute Texas fever. On the day before death the number of red blood corpuscles was found to have been reduced 50 per cent, and 33 per cent of the remaining corpuscles contained large single and paired Texas fever parasites.

Tests of the infectious character of the blood of cow No. 214 (received from the South in 1892).

No. of cow injected.	Date of injection.	Amount of blood injected.	Red blood corpuscles destroyed.	Texas fever parasites in the blood.	Remarks.
		c. c.	*Per cent.*		
237	Jan. 12, 1893	28	80	50 per cent corpuscles contain large parasites.	Severe Texas fever.[a]
123	Mar. 23, 1904	20	86	40 per cent of corpuscles contain large parasites.	Fatal Texas fever.
132	do	20	75	Large parasites numerous	Very severe Texas fever.
188	May 24, 1904	15	60	do	Severe Texas fever.[b]

[a] See also record in Bulletin No. 3, pp. 70–71.
[b] Previously injected with blood from cow No. 113; see preceding table.

Unfortunately for the continuation of the tests with the blood of cow No. 214, she died on August 12, 1904, as the result of generalized tuberculosis. Her blood remained highly infectious from 1892 up to and including the year 1904, or a total period of twelve years. Between three and four years before her death she became affected with tuberculosis, as determined by testing her from time to time with tuberculin, showing that there is nothing incompatible between progressive tuberculosis and the persistence of the Texas fever infection.

Tests of the infectious character of the blood of cow No. 1 (received from the South in 1895).

No. of cow injected.	Date of injection.	Amount of blood injected.	Red blood corpuscles destroyed.	Texas fever parasites in the blood.	Remarks.[a]
		c. c.	*Per cent.*		
219	Aug. 7, 1901	20	60	Small number of large parasites.	Severe Texas fever.[b]
131	July 30, 1902	12	(?)	.....do	Mild Texas fever.
135	Sept. 9, 1902	15	(?)	.....do	Do.
104	Mar. 23, 1904	20	50	No parasites discovered[c]	Do.
118	.....do	20	70	.....do.[c]	Severe Texas fever.
366	June 3, 1905	20	15	.....do.[d]	Texas fever (?).
375	July 17, 1905	50	22	Small number of large parasites.	Mild Texas fever.

[a] In 1898 eight cows received injections of blood from cow No. 1 in connection with another experiment, and all contracted more or less severe Texas fever. For further record, see Sixteenth Annual Report (1899), Bureau of Animal Industry, pp. 43–52.
[b] Had been twice previously injected with blood from cow No. 113—see table giving injections with blood from cow No. 113.
[c] The failure to find parasites in these cases is due less to their absence than to insufficient time to make careful microscopic examinations of the blood.
[d] The failure to find parasites in the blood of this animal, unlike the failure in the cases of cows Nos. 104 and 118, was not due to insufficient time spent in the microscopic examination of the blood.

The various injections show that the infectious agent of Texas fever persisted in the blood of cows Nos. 113 and 214 for twelve years and in cow No. 1 for ten years after these cows were removed from the South and given protection against reinfection. The severity of the disease produced with the blood of cow No. 214 was generally greater than that produced with the blood of the other two cows; in fact, an injection of the blood of No. 214 into a cow susceptible to Texas fever produced disease as severe in character in the year 1904 as at any other time during her life north of the tick-infested territory.

The record of cow No. 113 shows that the infection in her blood during the later years of its persistence was very mild. Of two cattle injected in the year 1901—the eleventh year of the persistence of the infection—one, No. 218, contracted a very mild and doubtful attack of Texas fever, the diagnosis of which depended entirely on a moderate reduction in the number of blood corpuscles, and the other, No. 219, although she received two injections of blood, failed to become infected, and also failed to acquire immunity from Texas fever, as is shown by the severe attack of the disease she suffered after subsequent injection with the blood of cow No. 214. Subsequently, in 1902 two cows and in 1904 four cows were injected with blood from cow No. 113, and all six remained free from Texas fever, and this is taken as positive evidence that the infection had for some unknown reason disappeared from her blood between the twelfth and thirteenth years after her removal from the South.

Cow No. 188, one of the four cows injected with blood from cow No. 113 in 1904, was afterwards injected with blood from cow No. 214, in consequence of which she suffered severely with Texas fever, and while the affection was in its most active stage 100 c. c. of her blood was injected into cow No. 113 in order to test whether the termination of the infectious character of the blood of a southern cow was associated with a recurrence of susceptibility to Texas fever. Cow No. 113 was found to be entirely immune from Texas fever, but when her blood was tested in the following year, 1905, it was found to have regained its infectious character, and that the newly established infectiousness was sufficiently virulent to cause fatal Texas fever in cow No. 371.

We have here the following interesting condition:

Cow No. 188.

March 1, 1904. Injected with blood from cow No. 113. No disease.	May, 1904. Injected with blood from cow No. 214. Severe disease.
Three other cattle in 1904 and two in 1902 also injected from cow No. 113. No disease.	June, 1904. Cow No. 113 injected with blood from cow No. 188. No disease.
	June, 1905. Cow No. 371 injected with blood from cow No. 113. Fatal disease.

In addition to the reinfection of cow No. 113 in this experiment, we have the passage of the Texas fever infection, by means of blood injections, to the fourth generation without attenuation, namely, from (1) 214 to (2) 188 to (3) 113 to (4) 371. This is all the more remarkable when it is remembered that the first-mentioned generation had already lived twelve years in the blood of cow No. 214.

DIFFERING DEGREES OF VIRULENCE IN THE BLOOD OF THE CATTLE.

We have no explanation for the marked difference in virulence of the blood of the several southern cattle used in the experiments. The cattle all gained their infection, though at different times, in the same region in the South, and after their arrival at the Experiment Station received precisely similar treatment. It is equally difficult to find a satisfactory explanation for the disappearance of the infection from the blood of cow No. 113. The marked difference in virulence may be put to some use in connection with the various blood-injection immunizing processes against Texas fever that are now in use.

If we take into consideration the average number of years that cattle live, we may conclude that the experiments here presented show that the parasites (*Piroplasma bigeminum*) of Texas fever, once they have entered the bodies of cattle, thereafter remain present in the blood as permanently established factors. The constant presence of the microparasite—this living infectious agent—must have some influence on the welfare of cattle which, except for the immunity from Texas fever it confers, can not be regarded as beneficial.

But under existing conditions it is impossible to keep the cattle industry alive in the tick-infested portions of the Southern States without immunity from Texas fever, although this thing that we call immunity from Texas fever is not a true immunity and is termed immunity simply for want of a better and more descriptive name. It is, in fact, a very mild chronic form of Texas fever, positively associated with the infectious agent of the affection, and undoubtedly accompanied by the destruction of a greater or lesser number of red blood corpuscles. What the destruction of the red blood corpuscles amounts to we do not know, but as there are conditions, such as dipping cattle in oil to remove cattle ticks, sudden great changes of climate, and long drives, that occasionally convert the mild chronic affection—the so-called immunity—into acute, fatal Texas fever, we may assume that the destruction of red blood corpuscles by the ever-present micro-organism varies from time to time, dependent upon the conditions to which the cattle are exposed.

The destruction is so small under the most favorable conditions for the cattle that it has no perceptible effect on their health; but between this and the conditions that produce fatal disease there are many stages, and we are convinced that the oftentimes unaccountably unthrifty character of southern cattle must be attributed to their exposure to an environment, or to something in their environment, that causes an unusual increase in the number of blood parasites and a consequent increased destruction of blood corpuscles. We do not know what the causes are that are responsible for the increased multiplication of the micro-organisms; the three causes that have been mentioned, namely, dipping in oil, change of climate, and long drives, are not constant in their adverse effect; it is only a small percentage of the cattle subjected to them that becomes affected with and dies of Texas fever, but that this small percentage does become affected and does die is an unalterable fact.

The following occurrence at the Experiment Station a number of years ago is very interesting in this connection:

In the summer of 1899 two cows were exposed to cattle ticks without contracting disease of a sufficient degree of virulence to be diagnosed after the most careful macroscopic and microscopic examination. Beginning in November, 1899, the progeny of the ticks that matured on the bodies of the two cows were used to reinfest them, together with 20 other bovine animals. This made a total of 22 head of cattle, none of which had previously been exposed to Texas fever or cattle ticks in any other way than is here stated. The reason for infesting the cattle with ticks was to prepare them for testing a number of cattle-tick dips, and they were infested in the fall of the year in order to push the dipping investigations as much as possible, irrespective of the season or the character of the weather.

Some of the cattle were kept in artificially warmed stables in order to have the ticks grow vigorously, and others in ordinary stables. The ticks grew plentifully on all the cattle, and after the first infestation the cattle were reinfested periodically, so that a good crop of ticks was on their bodies at all times until May, 1900. The ticks used for reinfesting the cattle were the progeny of the ticks that matured on their bodies. There were no other cattle ticks at the Experiment Station at the time.

On May 1, 1900, all the cattle were turned out together in a small pasture, and were reinfested again with the same kind of ticks about the third week in May, after which no further artificial application of ticks was necessary, because the cattle remained very heavily infested with ticks that hatched naturally in the pasture. During the following August this herd of 22 cattle contracted Texas fever, with absolutely no other exposure than has been here presented. The affection was sufficiently severe in character to cause the death of 6 animals, or $27\frac{3}{4}$ per cent of fatalities, and among the cattle that died was one of the two cows on which this particular strain of ticks had been growing continuously since the previous summer. The other cow of the two mentioned suffered a very severe attack of Texas fever, but eventually recovered. The post-mortem examination of all the cattle that died showed lesions of acute Texas fever.

We have, consequently, an occurrence with the following facts: Cattle ticks of one particular strain growing for twelve months on 2 cows and nine months on 20 other cattle without producing disease, and then suddenly producing a form of Texas fever sufficiently severe to cause the death of more than one-quarter of the animals.

The presumption is that all the cattle became affected with a mild, long-continued form of Texas fever, comparable to the so-called immunity of southern cattle, and that this mild disease would have remained so if the cattle had not been subjected to an extraordinary condition in the form of extreme infestation with ticks. How severe the tick infestation was may be judged from the fact that all the ticks dropped from the cattle were allowed to produce young, and that the field in question was very small for the number of animals confined in it.

If our presumption is correct—and we have no other explanation to give for the occurrence of this outbreak of Texas fever—we may conclude that, among the various conditions that cause an increase in the number of Texas fever organisms in the blood of so-called immune cattle, is their infestation with ticks, and that the cattle ticks, in addition to the part they play as the sole carriers of the infectious agent of the disease, may so reduce the resistance of cattle to Texas fever that acute disease will develop from the infectious material that has long been carried in their bodies as a tolerable and comparatively benignant substance.

In this connection we quote from an article by Mr. W. R. Dodson,[a] director of the Louisiana State Agricultural Experiment Station, who is thoroughly acquainted with the Texas fever and cattle tick question from both the practical and theoretical points of view:

Recent experiences prove that the fever germ becomes more virulent if perpetuated in ticks bred upon recently immunized or partially susceptible animals, and that the so-called native animals, usually accepted as naturally immunized, when reduced in flesh from intense infestation of ticks of the virulent type or from other causes, show more or less distinct symptoms of Texas fever.

The following quotation is also made from Mr. Dodson's article in the same publication, on page 13:

The excessive tax of gross infestation of ticks is not only shown by the great loss of flesh of animals attacked, but in the slower development of ticks on animals intensely infested.

It is our desire to emphasize especially that the so-called immunity of southern cattle to Texas fever is really a chronic affection, which, from the meager evidence we can bring to bear on the subject, apparently varies in severity from time to time for causes that are not well defined, and occasionally varies so much in intensity that instead of resistance to the acute form of Texas fever there is a fatal attack of the disease.

A number of years ago an attempt was made to count the corpuscles per cubic millimeter in the blood of several members of an immune herd of cattle in the tick-infested territory, but this work had to be abandoned before it was completed. A systematic count of the blood corpuscles per cubic millimeter of, say, a score of southern cattle in a region where cattle ticks are plentiful, continued for at least a year, would probably throw much light on the significance to the welfare of cattle of the constant presence of the piroplasma of Texas fever in their blood.

EXTERMINATION OF THE TICK THE ONLY REMEDY.

Finally, the only remedy that we can recommend against the constant presence of this infectious organism in the blood of cattle in the tick-infested territory is the extermination of the cattle tick. This remedy will not help the cattle that are already infected, but it will confine the infection to them, as it can not in nature get out of their bodies in any other known way than through the agency of the tick. After the extermination of the tick, cattle with infectious blood will eventually disappear as their place is taken by succeeding generations of tick-free cattle with wholesome blood.

[a] Bulletin of the Louisiana State Experiment Station, second series, No. 82, page 6.

SOFT-CHEESE STUDIES IN EUROPE.

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THE QUESTIONS STUDIED.

The studies described here are the results of a few weeks' visit to the cheese markets and cheese factories of England, France, Italy, and Germany. No attempt is made to include a general survey of all the questions of the making and handling of the many kinds of soft cheese found in the European market. The study was restricted from the first to the two groups of cheese in which the molds or fungi are the active ripening agents of most importance. Our studies of these types of cheese at the Storrs (Conn.) Agricultural Experiment Station, in cooperation with the Dairy Division of the Bureau of Animal Industry,[a] had emphasized the advantage of a first-hand series of observations in Europe by one technically familiar with the processes involved and the characteristics of the types of cheese under investigation. Further, a review of the literature in the light of the results of two years of experimental work had produced a list of definite questions upon which first-hand knowledge of the practices of European makers and the preferences of the European trade were very desirable. These questions may well be stated at the outset to show the exact nature of the information sought.

I. The cheese market.—1. The appearance, texture, and flavor of first-class cheeses of each kind as found in the trade in cities where they are best known. 2. The demands and ideals sought by the several peoples. 3. The prices paid for comparative amounts and qualities of cheeses of different varieties and for milk.

II. Cheese making and cheese ripening.—1. Making: (*a*) The character and ripeness of the milk used; (*b*) the temperature and time of curdling; (*c*) treatment of the curd; (*d*) handling of the newly made cheese; (*e*) inoculation with various organisms; (*f*) equipment. 2. Ripening: (*a*) Type of ripening rooms and conditions sought there—(1) Temperature, (2) light, (3) humidity, (4) situation; (*b*) handling of cheese in cellar; (*c*) development and appearance of molds; (*d*) exactly what condition is sought at time of marketing; (*e*) time required for ripening; (*f*) further treatment.

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[a] See Bulletins Nos. 71 and 82, Bureau of Animal Industry.

THE SOFT CHEESES IN GENERAL.

Numerous varieties of highly flavored soft cheese have been described in the books upon cheese making. This number is said to be fully two hundred and fifty. From five to twenty of these can be readily recognized in the markets of any of even the smaller continental cities. A more critical study of the descriptions of their making fails to disclose vital differences in very many of them. The impossibility of expressing subtle differences in the appearance, flavor, and texture of a cheese by any description makes it necessary to see and handle large numbers of them before one begins to understand these descriptions. But the examination of large numbers of these cheeses in the market only adds to the conviction that many of the distinctions are those of size, shape, and packing, where the material might come from the same vat. Even real differences, such as the percentage of fat in the milk used, are often so skilfully concealed as to be difficult to detect in the final product. More often some minor detail of making, insignificant in its effect upon the ripened product, is made the basis of a separate nomenclature. However small the differences they represent, these names are interesting because they may nearly always be traced back to particular localities and often to particular factories. They thus record the history of the types of cheese they designate. Nearly all the well-known names are so derived—Limburger, Roquefort, Camembert, Brie, Gorgonzola, Cheddar, Stilton, Neufchâtel, Muenster, Edam, Cheshire. It is just as interesting to note that of all these well-known names (to which many others could be added) the town of Roquefort is the only place that has succeeded in maintaining a monopoly in the production of the cheese which bears its name. Several well-known cheeses are scarcely produced at all now in the places whose names they bear.

For the purpose of this discussion we may roughly class these numerous kinds of cheese into two heterogeneous groups according to the biological groups of their ripening agents—(1) the bacterial cheeses (this ignores the presence of *Oidium lactis*, which is commonly found on all of them), and (2) the mold-ripened cheeses.

In the first class some of the best known are Limburger, Livarot, Port du Salut, Pont l'Eveque, Bäckstein, and Harz. There is a long list of others. Limburger is largely made and used in America. The cheese made and sold in America under the names Brie and d'Isigny (designated "American Brie" in a previous paper [a]) is closely related to the French Livarot. Some cheese resembling Port du Salut is also made in America. Few of the others are either made in this country or imported in any quantity. The best varieties when exactly ripe

[a] Bulletin No. 82, Bureau of Animal Industry.

command an excellent price in a special market, but the average price is lower than that of the mold-ripened cheeses.

In this group there are numerous varieties of cheese made from milk which is separated, or, at least, well skimmed. These are found to a very large extent in Germany. They are mostly sold in a very restricted market. Very few of them are known even by name at much distance from the localities in which they are made. The making of these cheeses affords an outlet for a larger amount of separated milk, to the questionable enjoyment of the consumer of cheese. The quality of the product is not sufficiently attractive to suggest their introduction into America. Their best claim as a food is that they correspond to the requirement of a "food for the family," as stated by an Italian guide; they are "cheap and filling." The possibility of producing a fairly palatable cheese from partially skimmed milk is not questioned. To determine the minimum of fat possible in such cheese and to protect the consumer against frauds is a more serious problem. Dairy experts in England assured the writer that they had found no type of cheese that could be satisfactorily made entirely from separated milk. In other words, they considered skim-milk cheese hardly fit to eat. The continental consumer seemed to be less particular, but there are manifestly many varieties of cheese masquerading as whole-milk cheeses which have contributed to the butter trade.

All the varieties of cheese involved in our study belong to the second or mold-ripened class. The mold-ripened cheeses can be subdivided into two sharply marked groups—the Brie-Camembert group and the Gorgonzola-Roquefort-Stilton group—which must be discussed separately. In this discussion the order in which the studies were made will be ignored and the data upon each variety brought together.

THE BRIE-CAMEMBERT GROUP.

This head may conveniently include Brie (French), Camembert, certain brands of Coulommier, ripened Neufchâtel, and some brands of lesser interest. The best makes of German Kaiserkäse often approximate real Camembert. A small amount of cheese found in Lombardy under the name of Robbiola had some of the qualities of this group.

But the reputation of this group of cheeses rests upon Brie and Camembert. These highly prized cheeses, when fully ripe and at their best, are scarcely distinguishable from each other in appearance, texture, and flavor, although they are very different in size. As handled in the large markets, however, much variation is found. So great is this variation that large dealers who cater to the special trade commonly buy only from particular factories whose product is satisfactory to that trade. Brie and Camembert are made in such quantities as to become the principal product of whole districts in northern France.

The cheeses of this group are superficially recognized by their moldy rind. In the earlier stages of ripening this is white, cottony, with the mycelium of a species of Penicillium. At the end of one or two weeks the color becomes a gray-green from the ripening of the fungus spores. Frequently whole cheeses are fairly uniformly covered with this mold in a few days. After the first two weeks the mold ceases to grow actively on the surface, though large numbers of spores are still produced for some days. The delicate fibrous mycelium is largely torn away later by the handling of the cheese in the cellar. The places so exposed become centers for rich developments of bacteria and *Oidium lactis* in reddish-brown areas, which sometimes entirely cover and obliterate the Penicillium. The rind may then vary from a surface comparatively dry, moldy, and gray through every stage to entirely viscid, slimy, and red or reddish-yellow with scarcely a visible trace of mold. Internally, at first the cheese should be a fairly firm homogeneous mass of curd soured in one or two days by lactic organisms; then a digestion and softening of this curd, beginning just under the rind, should gradually progress inward until the entire mass is changed. The extent of this change is readily visible, so that in a cut cheese the exact stage of ripening is at once apparent. The texture of the resulting ripe cheese varies exceedingly, apparently, with the conditions. In certain brands of Camembert imported to America, wrapped in tin foil, the interior when ripe is so soft that when cut the entire mass flows out of the rind as a liquid. Certain connoisseurs prize this particular form of ripening. In other brands, and, so far as seen, universally in France, the cheese is so ripened that the texture is waxy or buttery soft, to be spread easily upon bread with a knife, but solid enough never to "run," never liquid. The very soft brands nearly always have very high flavor, even sharp and biting. The waxy brands are much milder, not so intense, and with less odor. But since there is no standard for tastes or smells except every man's senses, it is possible only to define these as unique, peculiar to Camembert and Brie, to be experienced, not described.

Camembert cheeses are usually made in two sizes: Camembert, 4¼ inches (10 to 11 cm.) in diameter, and half Camembert, about 3 inches (7.5 cm.) in diameter; both sizes are about 1¼ inches (2.5 to 3 cm.) thick. Brie is made about the same thickness, but in much larger diameters.

For detailed discussion, Camembert will be considered first.

CAMEMBERT.

The Camembert cheese industry is scattered over the section of France north and west of Paris nearly as far as Cherbourg, with perhaps its largest development in the section about Lisieux and from Lisieux to Caen. Here dairying may be said to be the largest industry and Camembert cheese making to be the largest item in dairy production. In this area the practice of making cheese upon the farm has been almost completely superseded by the factory system, in which the producer of milk sells to the factory. The prices given sometimes fall as low as 8 centimes a liter (1.8 cents a quart) in July, but are said to average from 10 to 12 centimes a liter (2 cents a quart) in summer and 15 centimes a liter (3 cents a quart) in winter for milk which tests 4 to 4.4 per cent of fat.

The factories vary greatly in size. There are many small factories which use only the product of a few dairies and produce 200 to 600 cheeses a day. These are limited usually to meager equipment and rather primitive methods, yet many of them produce the highest quality of cheese. Other factories handle from 2,000 to 10,000 cheeses a day and have plenty of skilled labor and all the improvements in equipment which accompany abundant capital.

The name Camembert is attributed to superiority in the quality of the cheeses of this type at one time produced by a dairy 2 or 3 kilometers from the Église Camembert, a country church situated a short way off the main road, 3 kilometers southwest of Vimoutiers. The product of this dairy, bearing the name Camembert, something over a century ago gave its name to this whole type of cheese. The dairy referred to still exists as a factory making a few hundred cheeses a day, and is shown in plate 1, figure 1. The same rooms, with some modern additions, are still used for cheese making, but with very little change in methods.

The making of such cheese was rather the development of the region than the work of a single maker. Originally confined to portions of Normandy, the making of Camembert has spread in various directions. Excellent cheese is made and ripened in a few places in Germany, as well as in various parts of France, but the amounts produced in Normandy still constitute by far the largest part of the Camembert cheese found in the market.

PRICES OF CAMEMBERT CHEESE.

Camembert cheese in the retail market varies in price from 13 cents each in some places to 16 or 17 cents for the best cheese in Paris. Each cheese roughly represents the product of 2 quarts (2 liters) of milk, with a weight of somewhat less than half a pound. The same cheese sells when imported to America at from 25 to 30 cents.

MILK USED IN MAKING CAMEMBERT CHEESE.

The milk used in making Camembert cheese is commonly a mixture of the night's and morning's milk as it reaches the factory. The night's milk is often partially skimmed for the making of butter. In such factories the normal fat content of the milk—about 4.4 per cent for the best Normandy cattle—is reduced to 3 to 3.5 per cent, possibly less. Many of the makers contend that milk with 3 to 3.5 per cent of fat is better for cheese making than that containing a higher percentage. Others deny this. It may be accepted, however, that a common practice involves the removal of a part of the fat from evening's milk. The claim is also made that the milk of races of cows which produce a high fat content, such as the Jersey and Guernsey, is not suitable for the making of this variety of cheese. The writer has not been able to determine whether this belief depends upon real data or not. We find skimming carried on to such an extent that the name "Camembert cheese" does not guarantee whole-milk cheese. Particular brands are undoubtedly whole milk, but many others are not, and there is no indication in many cases by either brand or price to guide the consumer in his purchase.

FACTORY EQUIPMENT.

The equipment of cheese factories is exceedingly varied. The larger and newer concerns have ample rooms, with steam or electricity, or both, and the best of utensils, such as vats, fat tests, butter-making equipment, with trucks, elevators, automatic regulators for temperature; in fact, every labor-saving device to be had for money. The older and smaller establishments reduce the outlay for equipment to a trifling sum and use hand labor entirely.

Stripped to the bare necessities, a cheese-making room in Normandy provides:

(1) Receiving vats of some kind for the milk to be used each day, with provision for heating cold milk to the required temperature. For this purpose steam is most desirable, as it can be used for sterilizing utensils and heating as well, but many factories produce good cheese without it.

(2) Table surface to accommodate the entire number of cheeses to be made in one day. In the well-equipped factories the table surface is made with cement and slants toward one end, with edges guttered to facilitate the drainage of the whey from the curd. Additional table surface to accommodate the product of two days more is provided at the same level, or by wooden shelves above the draining table.

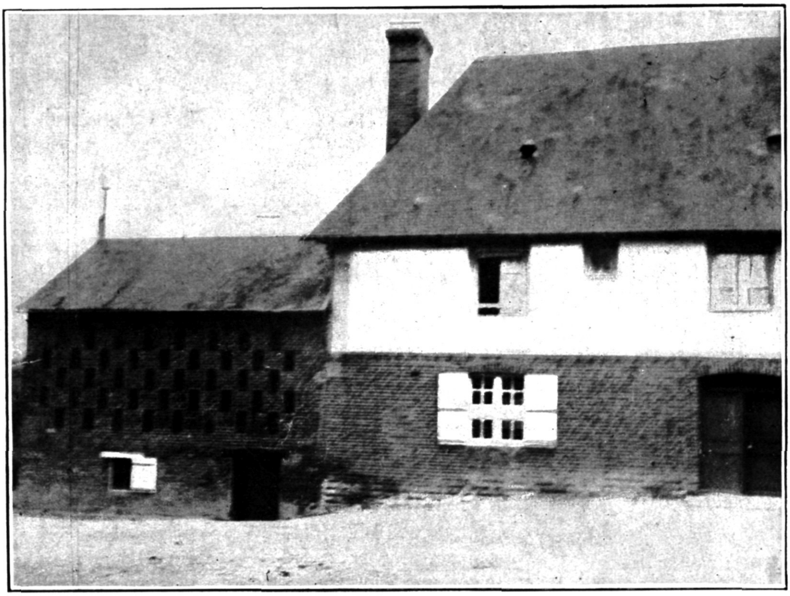


FIG. 1.—THE ORIGINAL CAMEMBERT CHEESE FACTORY.

Located near l'Église Camembert (the Camembert Church), Normandy, France. The product of this factory gave the name "Camembert" to that type of cheese. Now operated by Mme. Lainé.

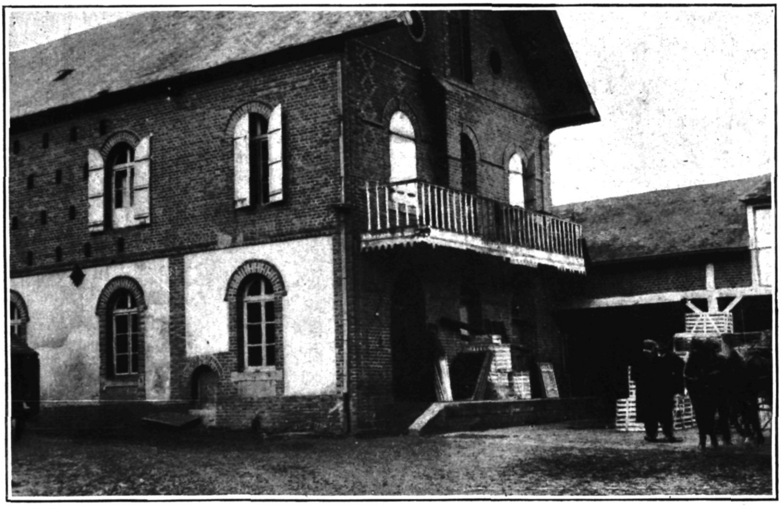
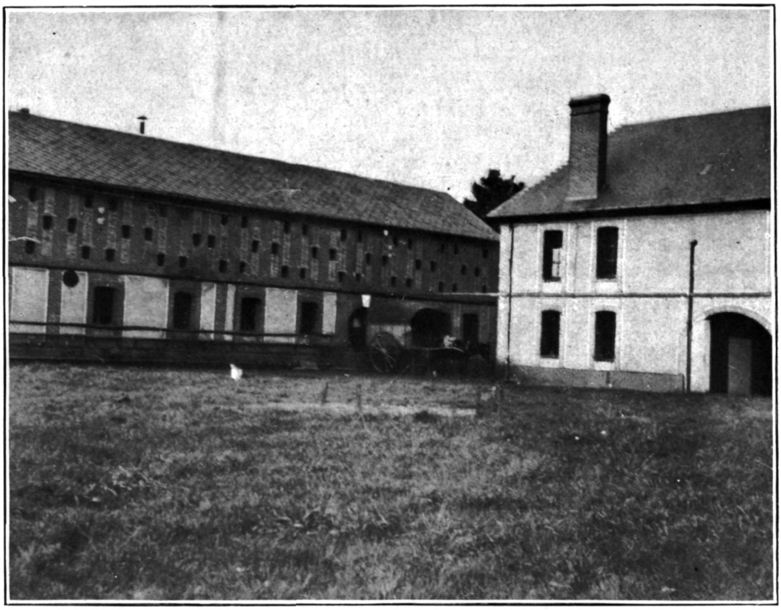
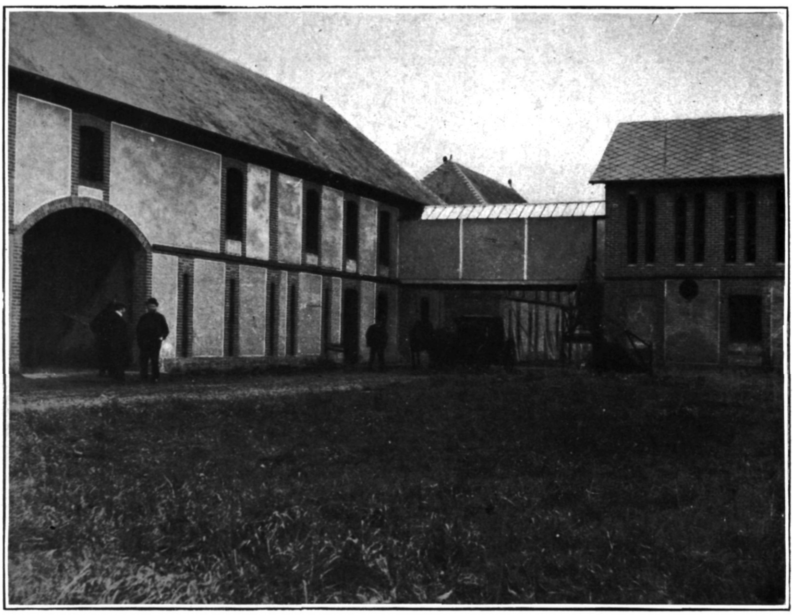


FIG. 2.—CAMEMBERT CHEESE FACTORY OF M. BRIÈRE NEAR LISIEUX FRANCE.





CAMEMBERT CHEESE FACTORY OF M. RENDU AT LISIEUX, FRANCE.

The upper picture shows a cart loaded with milk cans at the entrance of the receiving room. The square windows are seen in the second-floor rooms which are used in the first two weeks of ripening. This is a newly built factory.

(3) Hoops.[a] The Camembert cheese hoops are made of galvanized iron 4 inches in diameter and 5 inches in height, with three rows of holes, each row containing 10 to 12 holes about three-sixteenths inch in diameter. A second set of hoops about 2 inches high and large enough to set over the first set is often provided for use the second day if the cheese is not solid enough to stand.

(4) Mats are provided to cover the draining table. These are usually made of wood strips about 2 mm. in diameter held by cotton or linen strands. These mats are used in squares or in strips several feet in length. The strips of matting are often long enough to cover the entire draining table.

In preparing for cheese making the table is covered with matting and the hoops are arranged upon the mats as closely as they will stand.

Efforts are usually made to keep the cheese-making room warm. In one excellent factory the degree aimed at was 18° C. But wide variations are often found, and some factories make no provision for heating whatever.

MAKING THE CHEESE.

The milk for cheese making is heated to 24° or 25° C. (75° to 77° F.) in summer and to 30° C. (86° F.) in winter. It is then placed in tin vessels (usually) holding about 60 quarts. Enough rennet is added to curdle the milk in two hours so hard that the curd will split in front of the finger. This curd is not cut and drained before dipping. It is dipped directly into the hoops by means of a long-handled dipper of such size that five or six dipperfuls will fill the hoop (2 liters).

To allow some draining during the dipping process, one dipperful is put in each of the hoops of a series; then, beginning at the first, the process is repeated, so that the filling of each hoop requires considerable time. In fact, one can see but little difference in effect between this and the previous cutting and draining of the curd.

As soon as the hoop is filled the curd is covered with a disk of two or three layers of heavy tin or galvanized iron which fit the hoop exactly. This cover acts as a slight pressure to hasten the draining of the cheese and to keep the upper surface smooth.

The cheese stands untouched until the following morning, when the cover is removed with an instrument composed of a rubber sucking disk on the tip of a short wooden handle. The hoops are then removed, the cheese is turned by hand, and hoops are replaced. Sometimes the low hoop is substituted for the higher one after turning.

[a] The term "hoop" is less ambiguous than the word "form," very commonly used here.

SALTING.

According to some makers the cheeses are salted twice. One side and the edges are salted the next morning after making. Then after standing some hours the cheeses are turned on the other side and salted. In some localities extreme care is taken to touch the cheese as little as possible. It is carefully supported by touching only the edges, and the salt is dusted on with the free hand. In other localities the cheeses are grasped in the hand and rolled in dry salt so that the entire surface is salted at once. It may be determined by comparison of cheese salted by the various methods that the details of the operations are of slight importance. The various statements as to the things that "can not be done with a cheese" conflict so completely with the practice of others who make equally as good cheese that the selection of methods becomes merely a matter of judgment and experiment. The cheeses are nearly always salted the second day. It is also found that a very large percentage of these cheeses are too salty to the taste. This objection has been heard from Frenchmen as well as many times in America. Although the evidence supports no particular procedure, it suggests the desirability of a more careful and and more uniform manipulation.

The salt used is carefully dried and kept in shallow pans, where it is dried after using each time. Rather fine crystalline salt was found in most factories. In some cases special preparations of salt are made and advertised as intended for cheese. A packet marked "Sel Normand," recommended on the label as a preservative and vermifuge to be mixed with salt for cheese, was bought by the writer. Analysis of the sample by our chemist, Mr. Dox, shows it to be a mixture of borax and soda.

RIPENING ROOMS.

In Normandy the ripening rooms vary greatly in position. In the larger new factories they are commonly upon the second floor (premier étage), but they are often found upon the ground floor of the small factories. In the newer factories these rooms are usually ventilated by small but numerous square windows (see pl. 2), carefully covered with wire gauze to exclude insects, and provided with sash to open and close at will. In several places visited there was a distinct current of air through the room. In the smaller factories much fewer precautions are taken. Rooms built for other purposes are adapted to this, with much less satisfactory provision for control of conditions.

The character of these rooms varies from an adapted portion of a barn or part of a cellar in the dwelling house to specially built series of rooms with provision for the maintenance in each of different conditions. Where constant differences are sought, the cooler rooms are kept about 12° C. and the warmer ones about 15° C. (53° to 59° F.). In the more poorly equipped places the inside temperature will vary in much wider limits with the changes in the weather.

Such rooms must provide shelving to accommodate the total output of the factory for two to four weeks. The details of such provision may differ greatly. In most factories we found firm upright posts bearing cleats to support movable shelving. This shelving was of two general varieties. The first consisted of a grating or latticework to support a loose covering of straw, or a rattan matting made of strips three-fourths to 1 inch apart. These gratings are made large enough to carry 2 to 5 dozen cheeses. The second class was smooth boards about 10 inches wide, three-fourths of an inch thick, and exactly fitting between the posts. The shelving is arranged in any way to utilize the space to best advantage.

CHEESE RIPENING.

The cheeses are taken from the making room to the ripening room usually upon the third day. There they are placed upon the grating variety of shelf, supported by straw or matting so arranged that the cheese touches as few strands as possible. This exposes almost the entire surface to the air. These rooms are very well ventilated, because the evaporation from the surfaces of many thousands of cheeses must be carried off by fresh air. In many factories the cheeses remain in the ripening room untouched for ten to eighteen days. In other places they are turned two or three times in the first period. They should become entirely covered with the white, cottony mycelium of the Camembert Penicillium in a few days. As this mold becomes well developed and begins to change to the gray-green color indicative of ripe spores, the cheeses are removed to the smooth board shelving, upon which they must be turned every day as long as they remain in the factory. They are usually put into a separate room at this time, but there is no uniform practice on this point. When the daily turning begins the cheese is yet nearly solid and only traces of ripening are visible directly under the rind. If well covered with mold very few patches of reddish or yellowish bacteria are found at this time.

One of the best factories visited substituted two rooms for the single ripening room found in the small factory. The first room was kept at about 12° C.—perhaps a little more or less at times. The cheeses remained here until the covering of mold began to turn color, then they were removed to a room 2° or 3° C. warmer for the remainder of the ripening. Judged by the results seen, this plan was very effective. The development of the moldy rind was slightly slower than sometimes found, but very perfect. The appearance of slimy areas seemed to be delayed also, but much more than the growth of the mold. This only shows how different details of equipment and manipulation may accomplish substantially the same results. Success depends upon the fulfilment of a few important conditions, not on how these are brought about.

INOCULATION.

This covering of mold is due entirely to accidental inoculation, so far as observed. No acknowledgment of inoculation and no provision for it were made. Comparison of conditions found in several factories offers some interesting contrasts. Two large factories (4,000 to 10,000 cheeses a day) were visited in the same forenoon. In the first the cheeses were very well molded and the cultures appeared nearly pure. In the second, with a similar quantity of cheese on hand, the average cheese was poorly covered. Many of them had only a few patches of the right mold, with bacteria and other molds conspicuously common. Comparison with other notes made shows that in the first factory where the cheeses were well covered with mold the mats were not well sterilized, and the boards upon which the later ripening occurred were used twice. For the second use they were merely turned over, so that a conspicuously dirty side of each board was scattering its accumulation of spores constantly in the room. In the second factory, where the comment on the cheese was unfavorable, every utensil, every mat and board, was just as conspicuously clean. Good provision was made for steaming everything, and it was manifestly well done. Later observation in other places, large and small, showed that where the cheeses were rated as exceptionally good it was as a rule easy to find apparatus in use at least the second time without sterilizing. In other words, in conducting their work with a minimum of labor upon inherited plans unconscious inoculation was constantly practiced. Conversely, the man who introduced high-class modern methods of sterilization without conscious inoculation lost in the quality of the results obtained.

LENGTH OF RIPENING PERIOD.

The length of the ripening period as reported varies greatly. Reasons for these differences are not far to seek. Only a small proportion of the factories have adequate means of controlling the temperature of their rooms. One of the best equipped makers visited sells his cheese at 12 to 15 days old in summer, 3 weeks in autumn, and 4 weeks in winter. Another maker at no great distance reported that cheese must be at least 4 weeks old before it is sent to the market in October. But in the first factory apparatus was provided to control heat and moisture, to a large extent at least; in the other, temperature and humidity must change greatly with the changes in the weather. There is enough irregularity in the conditions found to account easily for the differences reported by the various authorities.

A cheese sent to market at 12 to 15 days old may be fully or only partly covered with mold. When cut the curd shows the beginnings of ripening just under the rind, but little if any actual softening. In that condition it is little more than so much sour curd. For the export market, cheeses in this condition are wrapped in thin paraffined paper, with or without the addition of tin foil, boxed, labeled, and crated for shipment. Although some commission houses turn the crates over from day to day, the most of these cheeses get no further attention until they reach the retailer at least. It is not remarkable, therefore, that such cheese is of very uncertain quality. The use of paraffined paper is practically universal with the makers, who believe that other forms of paper or tin foil are not satisfactory. Tin foil is finally added for the special trade which demands it, but very little is used on cheese for home consumption in France. For shipment to the general market in the larger cities of France the cheeses are packed when anywhere from 2 weeks to 4 weeks old, according to the factory and the season. For general markets they are nearly always in solid condition. Those factories which cater to a special trade ship their cheese at a much later stage of ripening. Cheeses ripened more than halfway through are rarely found in the ordinary market.

The product of the larger factory usually reaches the market directly, boxed and labeled by the maker, but many—especially of the smaller factories—sell their entire product to the middleman. A visit to one such dealer may be described. One large cold room was used for storage and shipment. The cheeses were bought from the makers unboxed. They were placed in rolls of six each and wrapped in news paper. In the storage room these rolls were kept on edge. As needed to fill orders they were unrolled and wrapped in paper or tin foil, according to the demands of the buyer. In this way an order might be filled from the product of several factories, but all would bear exactly the same label, with the name of the dealer, not the maker.

THE MARKETS.

As met in the ordinary markets of France, Camembert cheese is almost as uncertain a quantity as in America. It was found that even in the districts where the cheese is made there is very little general demand for really ripe cheese. The vast majority of the stores visited had no cheeses which were more than half ripened, and few that were even half ripe. It was very exceptional to find cheese in the older stages. To answer the questions as to the condition in which they are commonly consumed, Camembert and Brie cheeses were ordered and eaten as furnished in the ordinary restaurants and hotels in Le Havre, Paris, Caen, Lisieux, Meaux, and various cities of Germany. With very few exceptions the cheeses furnished were half ripened or less. Exactly the same conditions were found in the retail markets in both France and England. It was openly asserted that the English market would not use really ripe cheese of this type. The general presence of the cheese in such condition in the stores and eating places of the cities visited shows clearly that most of these cheeses are sold to the consumer and probably eaten before fully ripe. It is probable that many consumers ripen them at home to a more satisfactory state, but no information was obtainable on this point. Clearly from the nature of the cheese the proportion so ripened would be only a small part of the enormous amount made and sold.

The visits to special dealers and fine restaurants and hotels in Paris and other cities showed that there is also a demand for really ripe cheese. This is met by the special houses and high-class hotels. Such dealers are equipped for the complete and proper ripening of the cheese. One of the best establishments of the kind in Paris was visited under the guidance of the proprietor. This consists of a large series of cellars under one of the great markets. These cellars were far enough below the ground to insure temperature between 12° and 14° C. The air was nearly saturated, as was shown in one case by drops of moisture on the ceiling. Provision was made for ventilation to prevent the accumulation of too much moisture, however, as that causes too rapid decomposition of the cheese. The dirt floors of these rooms were practically dry. In these cellars the cheeses are taken from the boxes, unwrapped, and placed upon the shelves. Here they are turned every day and carefully watched. As fast as they ripen they are removed and sold. The best cheeses are said to ripen in those cellars when they are about 4 weeks old, although some ripen earlier and others much slower. Upon inquiry at the Pasteur Institute Dr. P. Mazé gave the addresses of three such houses in Paris, with the assurance that he had found few if any other places where fully ripe cheese was always on sale. Equally good cheese was found afterwards in some other places in Paris, and in several places in Germany, where it is constantly distributed by another great house in Paris.

Brie.

Very much less attention was given to Brie cheese than to Camembert, but many thousands were seen and studied in the market with some result. Careful questioning of the best market authorities brought the uniform answer that as a finished product the best qualities of Brie and Camembert are essentially the same cheese. This statement agrees with my personal observation, both from appearance and from flavor when eaten.

Just as the district of Calvados was first and latterly all Normandy is the home of the Camembert cheese, Brie has become the staple product of a series of districts east and northeast of the Seine. The name Brie is the name of a department, presumably the original region for the making of this sort of cheese. But the cheese is the product of a whole region rather than of any particular place or factory.

Brie cheese is produced in very large quantities. On a market day in November two special trains were required to carry to Paris the cheese brought to the market place in Meaux.

SHAPE, SIZE, AND PRICE.

Brie cheese is made in the same thickness as Camembert, 1 to 1¼ inches, but it is of much larger diameter. The sizes of the hoops vary from 8 to 16 inches, so that the cheeses weigh up to 5 or 6 pounds or even more. The large sizes require from 20 to 30 quarts of milk. In superficial appearance the descriptions already given for the general group and for Camembert will apply equally to Brie. Good Brie was listed at 2 francs (40 cents) a pound in Paris. Specially fine qualities brought 2.5 francs (50 cents) at the same time.

MAKING BRIE CHEESE.

The practice of Brie cheese making as seen in one dairy may be briefly reviewed. The cheese-making room was next to the cow stable. The milk freshly drawn was strained and enough rennet was added immediately to curdle it in one hour and a half. The curd was dipped without previous cutting into hoops 8 by 35 cm. (3 by 14 inches). These hoops were placed upon rush matting, supported in turn upon circular draining frames of wickerwork (willow). The hoops were entirely filled with curd from the morning's milk, allowed to drain all day, and refilled at night from the next milking. No artificial heat was used in the room, but the proximity of the cows in the stable raised the temperature considerably above that of the outside air. The cheese was turned the next morning and later salted in an exactly similar adjoining room, where it was allowed to stand until the third day.

From the making room and salting room the cheese was taken to the ripening rooms, where it was kept upon smooth board shelves and turned repeatedly. These ripening rooms were on the level of the ground or very slightly below. Two of them were beneath the living rooms of the family and another was a well-lighted room in the end of a near-by house. These rooms were kept about 15° C. and with fairly moist atmosphere, although the dirt floors appeared to be uniformly dry. No definite provision for controlling the temperature in these rooms was seen.

In this factory care was taken against an overdevelopment of mold. When the cheese showed a rich development of Penicillium, the owner made a broom by rolling up a mat and whipped the surface, breaking and tearing the mycelium of the mold. Upon such cheeses there was after this a richer development of reddish and yellowish slime than was commonly seen upon Camembert cheeses.

The Brie cheeses from this dairy were sold at the same stage of ripening as the Camembert cheeses in Normandy. The factory described was said to be a fair type of the cheese-making establishments of the Department of Seine et Marne. In these Brie-making districts there is said to be much cheese made this way upon the farm instead of in the large factories, as Camembert is made in Normandy.

THE ROGER METHOD.

Discussion of this Brie-making dairy necessitates a discussion of the method of ripening cheese devised by M. Georges Roger and exploited by him in that region as a trade secret. This method is claimed to involve the inoculation of the ripening rooms, mats, and utensils with one species of mold and two species of bacteria, for which organisms names are given without published descriptions. The factory visited had been so inoculated. In it the walls and ceiling had been sprayed with the spores of the mold and the mats infected with cultures of the bacteria in question. Patches of the mold could be seen upon the walls. The cheeses developed a reasonably pure culture of the pure white species of Penicillium related to the Camembert species. Except for the difference in the color of the mold, little difference could be seen in the appearance of these cheeses and those ripened in the ordinary way. The cultures here (as did Camembert cheeses previously received from Roger) appeared to contain some mixture of the Camembert mold. Ripened portions eaten appeared to differ very little from the common Brie produced by the other mold.

As the procedures in question are held to be trade secrets, rather than scientific facts to be discussed to the public, judgment of the results was sought in the market. In Les Halles, the great market of Paris, many hundreds of cheeses of both kinds were seen and examined. Careful inquiry from the largest dealers brought the uniform statement that this method produced a fair average cheese, but that the choice cheese bringing the highest prices were always those bearing the Camembert mold. M. Roger's mold, which he calls *Penicillium candidum*, appears to be the white one (No. 310) used by us in the comparative experiments reported in a previous paper.[a] The results of that work were entirely in favor of the use of the Camembert mold. A technical characterization of this species will be given in another paper.

Observation of the results and consideration of the opinions expressed by those concerned in Brie and Camembert cheese making justify the statement that, although M. Roger has improved the methods and conditions of many factories which produce a fair grade of cheese, the extravagant claims put forward for this method are not justified by the results so far secured.

Other Cheeses of the Brie-Camembert Group.

Related varieties of cheese are fairly numerous under various names, but very few of them have more than local interest or importance. Several of these varieties were carefully examined wherever found in the markets.

Coulommier was found constantly in the Paris market. In size it is between the Camembert and Brie. It is handled in crates packed in straw with paper, not put into boxes like Camembert. As seen and eaten it was a very uncertain product. The cheese from different factories varied from the appearance and flavor of Livarot to a close approximation to Camembert. The best brands were to all appearances equal to Camembert; the one distinction is that Coulommier is not salted.

Ripened Neufchâtel is seen on the markets in Paris, but is much more common in the German markets visited than in France. A Neufchâtel cheese is cylindrical in shape, about 2½ inches in length and 1¾ inches in diameter, and weighs about 3 to 4 ounces. These cheeses reach the market wrapped in paper and bring a smaller price proportionally than Brie and Camembert. The surface of the cheese is covered with a fairly good growth of mold, which appeared to be commonly of the Camembert species, but pure cultures from one such cheese brought back to America are entirely the pure white species used by Roger. The cheeses bought and examined showed partial ripening of the Camembert type, with unsatisfactory flavor and texture. The unripened portion was commonly tougher and harder than the curd of Camembert. The cheeses of this variety as seen in the markets visited were less attractive than Camembert and Brie. The better specimens eaten were simply Camembert in another form—a difference in package, not in cheese. Other specimens were of much poorer quality.

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[a] Bulletin No. 82, Bureau of Animal Industry.

A factory near Lecco, Italy, was found producing a square cheese of about the same thickness as Camembert. Some of these showed good growth of the mold and partial ripening resembling Camembert. The mold was scraped and washed away before shipment, so that it was only occasionally found on the ripe cheese. The curd of these cheeses was very different in texture from Camembert curd, so that the ripened specimens were very inferior.

In Germany some excellent Camembert is made in some regions in the west and southwest. Another cheese, under the name of Kaiserkäse, often approximates Camembert quite closely. Both of these cheeses commonly suffer from the partial use of separated milk. The German makers, in general, may be said to fail to secure the finer grades of texture and flavor that are found in the French cheeses.

Conclusions.

It may, I think, be fairly said that of this entire group of cheeses, Brie and Camembert are the only varieties worthy of serious consideration. The methods used in making these two varieties have grown up in different sections of France as the results of long experience. In detail these methods differ widely, but in the results obtained and in the underlying principles the differences almost disappear. There seems to be no reason for altering the conclusions of our previous paper, that the making and ripening of Camembert (or Brie) cheese may be successfully carried on anywhere if the methods used are based upon a study and understanding of the conditions necessary for the ripening of such cheese. The problem of ripening calls for the adaptation of the methods and equipment to the climatic conditions found in the locality. In moist, humid, foggy sections of Normandy well-ventilated upstairs rooms are used for this ripening. In Connecticut we have a much drier climate, with greater extremes of heat and cold; hence must keep the ventilation of cheese cellars much more carefully under control. On an experimental scale we find it necessary to use a dark cellar with care against extremes of temperature and special provision for maintaining the humidity of the atmosphere. It is thus difficult to secure in our environment conditions given by nature in Calvados.

With a definite understanding of the necessary conditions, and with the proper agents of ripening introduced, there is every reason to expect success wherever these principles are intelligently followed.

THE GORGONZOLA-ROQUEFORT-STILTON GROUP.

Although some may object to considering these three varieties of cheese as a single group, they have one essential character in common. The changes of the curd in ripening and the special flavor for which these cheeses are sought are attributable in the three varieties to the same species of mold. This mold has been designated in a previous paper as the "Roquefort Penicillium."

Gorgonzola is made out of cows' milk in Lombardy and ripened in special ripening buildings in cool valleys of the Alps, principally near Lecco. Roquefort is made from sheep's milk in the Department of Aveyron and to some extent beyond this area in southern France. It is ripened in cellars and caves in the sides of a single cliff in the village of Roquefort. Stilton is a cows' milk cheese, made for the most part in the midland counties of England. Roquefort and Gorgonzola are brought to America in very large quantities. Stilton is found also in the leading markets of our large cities, especially in the East. These three varieties are sold in America at prices varying from 40 to 60 cents a pound. Roquefort commands the same price in the markets of Europe, where the writer has seen it in nearly every city and town visited. It is clearly a superior article and may be taken as the standard cheese of this whole group.

Externally the cheeses of this group do not show any evidence of the nature of their ripening agents. They are comparatively hard cheeses, readily handled without close-fitting boxes in wicker baskets or crates. For the most part they are specially cleaned or covered before exporting, so that their superficial appearance gives no clue to the story of their production. Internally these cheeses differ much, but have one sharply marked character in common—every opening, every air space, natural or artificial, is lined with green mold. The cut section is thus said to be marbled with green. The odor and taste are attributable to the growth of this mold. It gives to the fully ripe cheese a piquancy which is much sought for. If eaten only partially ripened there is a bitter taste which is not attractive. This disappears, however, with the continued action of the mold.

The problem before the student of cheese ripening is largely a biological one. A certain stage of digestion of the curd brings with it the flavor sought. It is necessary, therefore, so to adapt the processes of making and ripening as to present culture conditions which will permit the necessary development of the right mold in a uniform manner without the entire decomposition of the cheese. The following brief studies of the making and ripening processes of these three varieties of cheese kept this problem constantly in view:

STILTON.

Stilton cheese is made in the midland counties of England in large quantities. Cheese making begins about April 1 and continues through the summer. Very little cheese is made after October. During the winter months the milk produced is shipped to the large cities and sold as milk, but in the summer months better returns can be derived from cheese. The largest markets where this cheese is handled are perhaps Leicester and Melton-Mowbray.

To make good Stilton cheese the milk should contain at least 3 per cent of fat; some dealers say 4 per cent is still better. The common Shorthorn cattle in the dairy sections of England give milk with 3 to 3.5 or even 4 per cent of fat. The cheese makers say that Jersey milk is too rich in fat, causing discoloration of the cheese. A Stilton cheese when ripe weighs about 14 pounds. It requires about 16 gallons of milk; that is, 9 or 10 pounds of cheese are made from 100 pounds of milk. Best Stilton retails in London at 1 shilling 4 pence (32 cents) a pound for whole cheeses and 1 shilling 6 pence (37 cents) a pound for half cheeses. No smaller pieces are cut in the best markets. In America we commonly buy Stilton the way boys trade jackknives, "sight unseen" (and with about the same result), at from 45 to 60 cents. The poorer product sells in England for all prices down to that of the cheapest hard cheeses—about 10 cents a pound.

In the making of Stilton cheese there is apparently considerable variations of practice. One dairy instructor said that the milk is treated with rennet and the curd prepared exactly as with Cheddar. The process seen in another place was briefly as follows: The milk was heated to about 90° F. It was curdled in approximately one hour. The curd was then dipped into a vessel covered with a coarse linen cloth, so that the whey could drain off through a valve in the bottom of the vessel. The mass of curd after pretty thorough draining was lifted in the cloth to another vessel and placed in a warm room, approximately 70° F., overnight to sour. In the morning the curd, which was by that time quite hard and sour, was kneaded in the hands into small lumps about one-half inch in diameter. Salt was thoroughly mixed into it, and the curd was then put into hoops. The hoops used were heavy tin, 15 or 16 inches (38 to 40 cm.) high and 7 inches (17.5 cm.) in diameter, with four transverse rows of holes about three-sixteenths of an inch in diameter to facilitate the escape of whey. The hoop was placed upon a smooth board and filled with the curd by handfuls. In filling, the curd was distributed carefully and the surface smoothed with the hands. The newly made cheese was set to drain in the same warm, dry room where the curd had stood overnight. This was done in one of the homes, where the cheese making is still sometimes carried on, by a farmer's wife who had taken the second prize for Stilton cheese in the national show and whose daughter at another time had taken first prize in that show.

The cheese so made remains in the hoops several days—one maker said nine days. It is turned each day. It must remain until the cheese is solid enough to stand fairly firm when the hoop is removed. The cheese is then carefully scraped or rubbed with a knife until the surface is smooth, then often wrapped in a cloth to assist in preserving the shape if it is still rather soft. In the earlier weeks of ripening the cheeses are turned every day and rubbed down every second day. As they become older and drier the amount of handling is very much reduced. Many dealers keep large, airy, dry cellars, where the ripening of the cheese takes place. In a large factory visited a series of rooms was used with a variation in temperature and humidity. Cheeses were taken from one to the other as their appearance and texture seemed to demand. One of these rooms was on the ground floor and continuous with the making room and remained quite moist. The second was somewhat higher and drier, while the third was on the floor above the first. For the most part no heat was supplied to such rooms, though this factory had pipes for steam heat. It must be borne in mind that the atmosphere of the regions of England where this cheese is made is very much more humid than ours, while it lacks the extreme changes in temperature we find under most American conditions.

The time required to ripen a Stilton cheese is said to be five months for the best cheeses. But there are several causes of uncertainty. Certain deleterious fermentations are very common. When these appear to a serious extent the cheese is sold and eaten much earlier and brings a much reduced price. Some cheeses refuse to mold properly, so that they do not develop the flavor of ripe cheese at all. Various schemes are used to hasten the growth of mold. The cheese may be skewered (punched with holes with an instrument resembling a skewer) or it may be "ironed" and the plug left out some time to admit fungus spores. Such a cheese becomes dry and hard without acquiring the proper flavor. Other cheeses mold too rapidly and decay quickly. It is seen that the problem of getting the proper amount and distribution of mold is still largely unsolved. Some makers are reputed to inoculate their cheese with mold, but this practice is discountenanced by most makers and instructors in cheese making.

In the ripening rooms another great source of loss is the universal presence of cheese mites. These tiny insects appear in countless numbers and eat and burrow into the rind of the cheese. So numerous are they that commonly the outer half inch of the cheese is totally destroyed. In the storerooms visited nearly every cheese was surrounded by the powdery remains of destroyed cheese, which must be repeatedly removed. No satisfactory means of combating the mites has yet been found for Stilton cheese. There is, therefore, a continuous loss, sometimes seemingly as high as 15 to 20 per cent of the product.

In addition to the plague of mites, specific bacterial troubles which attack the surface of the cheese add to the hazards of the Stilton industry.

Even a hasty survey of the present status of the Stilton industry shows an unsatisfactory condition. The percentage of low-grade cheese is too large. This, taken with a very appreciable percentage of total loss, is so great as to show much need for improvement in the methods used. But it is equally true that a really good Stilton will approximate in texture and flavor the best Roquefort, and that a small amount of even questionable Stilton finds a market in America at a price higher than Roquefort or Gorgonzola. It is therefore interesting to compare these methods with those used in producing Roquefort and Gorgonzola, in the belief that knowledge of each of these varieties may contribute something toward the improvement of methods in dealing with the problems found.

GORGONZOLA.

Gorgonzola is a cows'-milk cheese made in Lombardy. The name comes from the village of Gorgonzola, but the town produces little or no cheese at the present time. The cheese is made all over that region upon farms and in small factories, from which it is transported to the ripening cellars as soon as it is solid enough to bear handling. The buildings and cellars devoted to the ripening of this cheese are situated in valleys of the Alps, principally near Lecco.

Gorgonzola cheeses are about 30 cm. in diameter and 18 cm. thick, and weigh from 7 to 12 kilograms (15 to 20 pounds). One hundred kilograms of milk are said to produce 14 to 18 kilograms of cheese. This figure was given, but appears too large. This cheese sells at retail in Europe, where seen by the writer, at between 25 and 30 cents a pound. The usual price in America is 45 cents.

The making of a Gorgonzola cheese was seen in a factory near Milan, as follows: Freshly drawn milk is curdled in thirty minutes with rennet prepared directly from calf's stomach by the cheese maker. The curd is finely cut and the whey discarded as rapidly as it separates. In a few minutes the curd is dipped into cloths stretched over other vessels to hasten the separation of the whey. The cloths are slightly squeezed in the hands, so that at the end of thirty minutes the curd is in firm lumps of irregular size and shape. The hoop used was made of wood, 22 cm. high and 30 cm. in diameter. This was lined with a coarse linen cloth and carefully filled with the curd without pressure. A cheese so made is turned the next morning and each succeeding day for four or five days. It is then ready to remove from the hoop and to salt, the salt being rubbed over the outside. This salting process is repeated four or five times, or, according to other

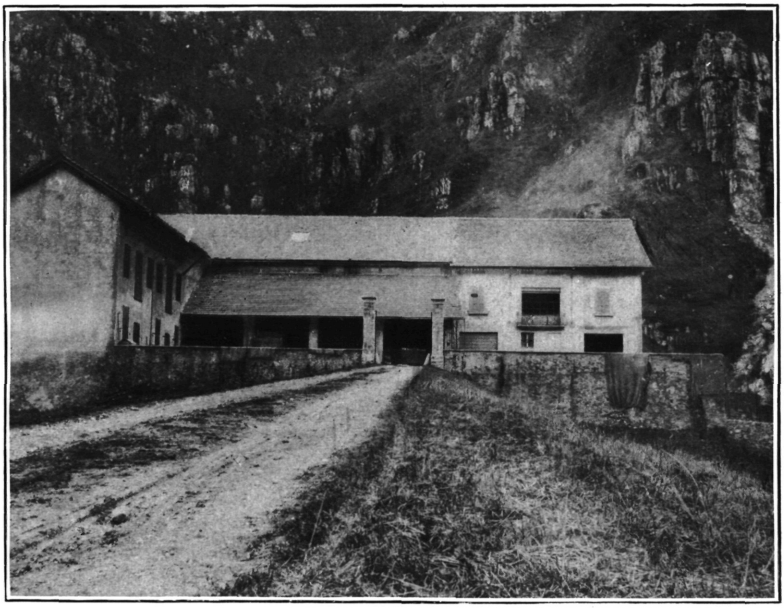

FIG. 1.—GORGONZOLA CHEESE ESTABLISHMENT OF BODEGA NEAR LECCO, ITALY.

This building stands just at the foot of the mountain. Back of it the mountain rises almost abruptly many hundreds of feet.

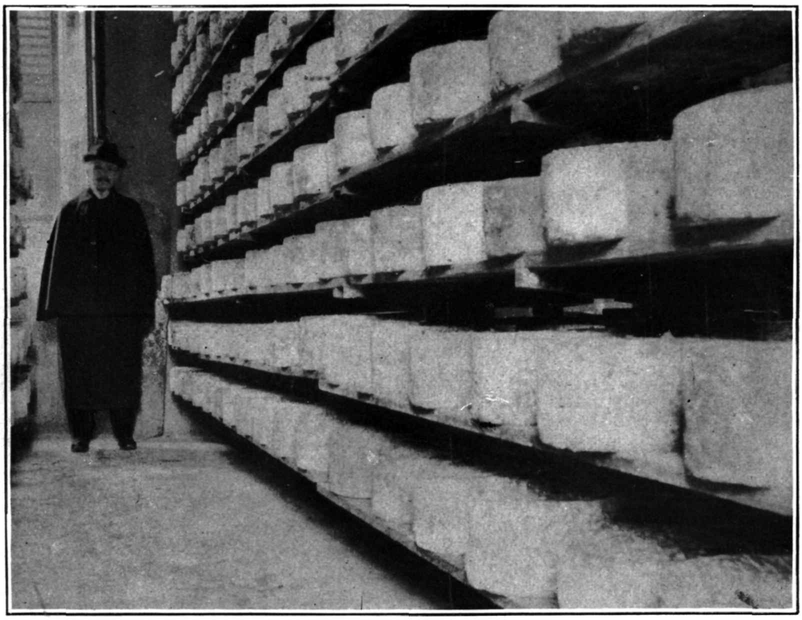

FIG. 2.—GORGONZOLA CHEESES IN RIPENING ROOM OF CORSI'S ESTABLISHMENT, LECCO, ITALY.

makers, every other day for two weeks. The practice probably varies in different factories. When the salting is complete the cheese is sold and transported to the ripening room.

The cheeses after salting are hard enough to stand considerable rough handling. In some cases they are properly crated for transportation, but very often they are simply piled into wagons upon straw, hauled to the ripening rooms, and roughly thrown out. Cheeses were often cracked and broken, besides acquiring sufficient dirt to mask their original color.

The rooms used for ripening Gorgonzola vary with the season and the stage of ripeness. For use in the warmer part of the summer one cellar was shown, half of which was filled with shelves, the other half with the winter's snow. Many tons of the snow of the preceding winter were still to be seen at the time the visit was made (November, 1905). In the cooler portions of the year the same factory provides rooms on the ground floor for finishing the ripening process, with some provision for proper heating. The fresh cheeses were found in large, airy rooms, both on the ground floor and on the floor above. The windows of these rooms were not screened, and stood open at the time, with fresh breezes blowing through the room from mountains whose summits were that day covered with snow. These rooms contained shelves as closely crowded as possible and together provided for about 40,000 cheeses. (See pl. 3, fig. 2.)

When 1 month to 6 weeks old these cheeses are mostly covered with a yellowish viscid layer largely of bacterial origin, with probably also *Oidium lactis* (judging by the smell). At this stage they are punched or skewered. The operator uses a brass instrument about 6 inches long, tapering from a sharp point to a thickness of 4 to 5 mm. at the base, where it is set in a wooden handle like a gimlet. With this tool holes are made at intervals of about 1½ inches over the whole surface of the cheese, 150 holes being made. This operation requires about two minutes for each cheese. In these earlier weeks of ripening each cheese is turned once in two days, but later the turning is reduced to once in eight days, after the surface of the cheese has become dried so that the cheese no longer sticks to the shelf. As such a cheese becomes older the surface becomes hard and dry and frequently cracks. This cracking is not objected to by the dealers, however, as it is in the case of some other cheeses. Upon entering a room filled with such cheeses a very strong ammoniacal smell was at once noticed. When tested the cheeses in this room showed an abundant presence of green mold in the holes and cavities, and gave a somewhat bitter taste which was just passing over into the taste of ripe cheese.

An examination of freshly made Gorgonzola as it reached the ripening rooms showed that the texture of the newly made cheese is frequently almost homogeneous. The masses of curd are commonly so completely blended that in section very few air spaces are found in large areas and where such air spaces are found at all they are very small. To induce uniform mold growth it is therefore necessary that holes be made evenly throughout the cheese. Only in this way can mold action affect all parts of it. Parts are often found in a market cheese where, for lack of such holes, no mold has developed. It is also found that whole areas in these cheeses are often infected with bacteria of the species found upon the surface. These bacteria produce areas of discoloration and decay, and frequently injure the flavor of the whole cheese. A study of the handling shows that these bacterial infections are due to organisms carried into the cheese by the punching process. Such observations may account for the uneven distribution of bacteria in Gorgonzola cheeses as reported by Rodella.

Gorgonzola cheeses are sold for the retail market when 3 to 4 months old. Before leaving the factory they are coated with barite held together by a mixture of lard and tallow and colored with annatto or a similar coloring matter.

It needs but a casual survey of this process to see that the hand labor used is less efficient than the methods of the Roquefort makers, and that biological principles are nearly lost sight of in attaining the desired end. However, a large measure of good results are obtained and immense quantities of cheese are produced.

ROQUEFORT.[a]

Roquefort is perhaps the most widely known of all the high-flavored cheeses. It is made in the Department of Aveyron and some of the adjoining districts of southern France. Very few factories are found outside of this region, and even these few send their cheese to the village of Roquefort for ripening. This cheese is made from sheep's milk and in enormous quantities, although the sheep give milk but six months in the year. Cheese making begins on a small scale about the middle of December, is at its best from March to June, and gradually ceases in July and August. Almost no cheese is made from September to December. The stock of cheese to supply the market for the year is accumulated in cold storage in the active months and gradually ripened to supply demands. The total amount of Roquefort cheese ripened by the firms at this village is given as 8,000,000 kilograms (16,000,000 pounds) a year.

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[a] In describing the Roquefort cheese industry the writer has utilized, in addition to his own observations, information contained in a recent work by Professor Marre, of the Department of Aveyron. This book treats the industry in considerable detail and eliminates numerous errors and misconceptions that have clung to other published descriptions.

The village of Roquefort is situated on the northeast face of a mountain or cliff 3 to 4 kilometers from the village of Tournemire (on the railroad from Paris). Here a group of natural caves, originally used for ripening cheese, have been supplemented by enormous cellars excavated in the mountain side. The extent of these cellars may be understood from the fact that one of the buildings has twelve floors, and in one place a cold-storage room in process of construction at the time of my visit was said to be calculated to hold 600,000 cheeses. The cellars are moist from the gradual dripping of the water from above. Ventilation is secured by tunnels running back into the mountain to connect with a crevice or fault leading to the mountain top some hundreds of feet above. Through this fault a continuous stream of cool air reaches the cellars, laden with moisture from passing a long distance in narrow passages between damp, rocky walls. This stream of air has a temperature of about 15° C., except in the warmer part of the summer, when it is a little higher. So abundant is this ventilation that a candle held in the open door of a cellar is usually extinguished.

This Department of France is mountainous, with large areas unfitted for cultivation. These bleak, rocky hillsides have been for centuries devoted to sheep raising. The sheep are the principal source of income to the Department. Although the returns to farm labor are exceedingly small, the aggregate values are very large. Most of the land is devoted to pastures. Flocks vary from small numbers to several hundreds. One farmer who was visited milks 200 sheep, from these he received in the past season about 15,000 liters of milk. Rating the average milking season for a sheep at six months, this is about one-half liter a day for each sheep. This milk brings as high as 30 centimes a liter (6 cents a quart), though the price has been much less at times in the past. The milking of these sheep requires six men for two hours each morning and evening. A little calculation will show that the farmer will hardly become excessively rich.

Formerly the cheeses were made on the farm by the sheep raiser and later transported to the caves for ripening. But this practice has disappeared, so that the farmer is now only a producer of milk. The milk is taken from the farm to the local factory and sold. In nearly all cases the local factory is owned and operated by one of the large firms at the village of Roquefort. Under a rigorous system of inspection uniform methods are used, and a remarkable uniformity of results is secured from the whole region. So careful is this inspection that admixture of other than sheep's milk is fairly sure to be detected and the offender punished by refusal to accept his milk afterwards, which would entail both loss and hardship in that region. The cheese made at these local factories is transported to the cellars and caves at Roquefort, where it is ripened.

The two great establishments at the village of Roquefort are the Société des Caves et des Producteurs Réunis and Louis Rigal. The former produces about 5,000,000 kilograms of cheese a year, the latter about one-third as much. There are several smaller concerns, only one of which makes any large quantity for export, the Société Nouvelle.

The large Société handles the milk from some 6,000 farmers. This milk tests 10 to 12 per cent fat in summer and 7 to 8 per cent in winter, with total solids varying from 17 to 23.6 per cent. The sheep used belong to the race Larzac. As sold from the factory Roquefort cheese brings 220 francs per 100 kilograms net, for Paris—about 25 cents a pound for the cheese. The large firms now own all the space available in the original village where future cellars can be built. Roquefort-cheese ripening is therefore practically a monopoly, where three firms control the product. All outside production is a negligible quantity.

Since there was no cheese made at the season of my visit, a review of the necessary facts may be made from the testimony of the makers and the instructors consulted.

MAKING ROQUEFORT CHEESE.

In the making of Roquefort the milk is curdled at 24° to 28° C. in one and one-half to two hours. The curd is cut with curd knives into lumps the size of a walnut. After the whey has partially separated the curd is emptied into vessels covered with cloth to hasten the draining, where it is shoveled over to equalize the cooling and draining. After the whey is removed the hoops are filled with the curd and allowed to drain with absolutely no pressure. While the curd is going into the hoops it is well sprinkled with spores from a powered bread culture of the Roquefort Penicillium. This is done with an instrument resembling a pepper box at the rate of 10 grams of bread to about 100 kilograms of cheese curd. Such a cheese is turned three times during the draining process on the same day. In from three to five days the cheeses are sufficiently hard to be handled freely. On these days the cheeses are turned three times each day and the hoops washed once a day. The cheeses may now go at once, but are commonly allowed to accumulate a few days, and are then crated and carted or shipped to Roquefort.

In the caves the cheeses are salted at least twice with a coarse hard-grained salt. In this process they are first salted on one side and then laid in piles of three for the salt to diffuse into the cheese. At the second salting the other side receives the salt. They are allowed to drain some time after salting. After the surface has dried somewhat they are run through a brushing machine which leaves a clean surface. They then go through the prickle machine. This machine has a disk set with long parallel needle-like spikes which make numerous holes through the cheese to let in the air for the growth of mold.

Roquefort cheese when a few days old is hard enough to stand handling and transportation. In the salting process the cheeses remain in piles of three without support and without change of form. In section, so far as determined, they show air spaces; that is, the pieces of curd are not completely welded together by the treatment while making. When the cheeses drain, these spaces are left as the whey runs out, and the cheese is thus from the first specially suitable for the entrance and growth of mold. It may be noted here that these large firms employ trained men and furnish them well-equipped laboratories to study the technical phases of the work.

RIPENING.

When the cheeses are ready for ripening they may be sent to the caves at once or put into refrigerators. If the cheeses are intended for the immediate market, they go at once to the caves; but if they are to be held for the season when no cheese is made, they are sent to the refrigerator. In the latter case the cheeses are wrapped closely in tin foil and carried into great storage rooms, where the refrigerating machines run constantly to maintain a temperature of about 3° or 4° C. The makers declare that a cheese may be kept in this way for five months with very little ripening. This does not entirely stop all changes, but the changes are at least very much retarded. When needed to fill the demand the cheeses are taken from the refrigerator, the tin foil is removed, and they are placed in the caves.

In the caves the cheeses stand upon edge upon the shelves. They are there exposed to a moist atmosphere at a temperature of 15° C. or near that degree. Here the development of flavor takes place. In so moist an atmosphere there is very little drying, but the cheeses become heavily coated with a yellowish or reddish slime which is probably mostly bacteria and *Oidium lactis*. So abundant is this greasy slime that everything one touches is sticky, beginning at the doorknob of the outer door. No development of other surface molds is allowed. The surface is scraped once or twice while the cheese is in the cave. A cheese coming from cold storage will show flavor in three to four weeks. It is then scraped clean, wrapped again in tin foil, and sold. The makers find that cheeses kept in cold storage for a time ripen with better flavor than those sent to the caves while fresh. It is therefore customary to send all cheese, as far as space permits, to the refrigerators, for a time at least. Whether this indicates an associative action in which the ripening attributable to the mold is supplementary to a ripening of the curd such as occurs in the cold-storage ripening of Cheddar cheese is not determined. Such action is suggested by this practice.

SOME ERRONEOUS STATEMENTS CORRECTED.

Such is a brief review of the conditions at the village of Roquefort and the processes of making and ripening of Roquefort cheese. Although it adds little to the many descriptions published and leaves out all details, it clears up a few points in which the accounts hitherto published (except that of Marre) have been totally misleading. It has been stated that the temperature of the caves for ripening is 5° to 7° C., a temperature almost refrigeration, while as a matter of fact it is 15° C. or higher. This statement has been made repeatedly and even appears in the work of an excellent French authority. Obviously every attempt to ripen such cheese upon the lines laid down in such descriptions has been necessarily a total failure, for at that temperature the mold never develops properly. The period necessary for ripening as corrected would be perhaps six to eight weeks, with the possibility of hastening it somewhat or delaying it very greatly by control of the conditions in the cellar or cave used and by refrigeration. In this connection it may be worth repeating (from the writer's previous paper [a]) that experimental cultural data indicate that a period less than six weeks is probably undesirable, since this is about the minimum time for the appearance of the flavor, or, better, the disappearance of the unpleasant flavors at first resulting from the action of the Roquefort mold. The notion that goats' milk is used to make Roquefort cheese has been quite widely disseminated by writers. The absolute demand for pure sheep's milk by the great establishments at Roquefort shows that very little goats' milk enters into the product.

PROPER USE OF THE NAME "ROQUEFORT."

The making of genuine Roquefort is confined to this restricted area in southern France. The companies concerned in its manufacture and ripening have succeeded in maintaining in the French courts their claim that Roquefort is a sheep's-milk variety of cheese which must be ripened in the village of Roquefort, in Aveyron. In

[a] Bulletin No. 82, Bureau of Animal Industry.

various parts of France imitation Roquefort cheeses are made from cows' milk. These approximate the genuine Roquefort in texture, flavor, and general appearance, but the name is not legally allowed to be used for them in France. These cheeses are sold under the name of "fromage bleu" (blue cheese), but bring a much smaller price, although they are said to be substituted for the genuine article in many cases. Unfortunately, I did not reach these factories. Out of respect for the decisions of the French courts and for our own laws as to the branding of food products, it seems desirable that we recognize the designation "Roquefort cheese" as applied only to cheese ripened at Roquefort and complying with other requirements previously mentioned. The use of that name for any other cheese whatever, no matter where or by whom made, would, according to this view, be misbranding and therefore illegal. We could, however, appropriate to our own use the suggestions as to methods derived from the practice of the makers of Roquefort, Stilton, and Gorgonzola cheeses, and in that way produce an improved cows'-milk cheese under a new or definitely modified name.

There does not appear to be any reason to believe that the production of the same cheese as Roquefort would be impossible in any region where the sheep's milk could be had and the conditions of ripening found or artificially supplied. In fact, some of the makers are seriously meditating an attempt to transplant such an industry to America. Roquefort is the only village whose name is associated with a famous variety of cheese which has retained the monopoly of the manufacture of such cheese. If such monopoly is justified, then if others should produce the same cheese a new name must be used.

There is no reason for saying, as the Roquefort people have at times attempted to do, that Gorgonzola and Stilton, as well as all other cheeses ripened by the agency of the same mold, are imitations of Róquefort. This is only another instance of the production in widely separated regions of very similar articles because the same natural conditions were complied with. In this way cheeses of the same type have arisen in several different lands under different names and in many cases are described as entirely different cheeses, while there is in realty no essential difference in their production or flavor. The conditions of ripening Roquefort and related cheeses as noted in my previous paper seem to exercise a natural selection among the numerous common molds, which gives a culture in which this species of Penicillium is overwhelmingly dominant when not in actually pure culture. The comparison in this way of related varieties points out the deficiencies of some of the methods used and offers suggestions which may be useful in improving all.

SOME GENERAL CONSIDERATIONS.

It is trite enough to say that there is no profit in a poor grade of product, but this is nowhere truer than in soft-cheese making. It is certainly true that such cheese is bought and eaten not so much for the sake of getting the largest amount of digestible food for the least amount of money as because people enjoy eating it. It belongs to that class of foods in which the first question asked refers to the flavor, the quality; the price is a secondary consideration so long as it is within reason. If the cheaper grades of cheese are actually consumed for their food value (and there is no other reason for eating some of them), as seems to be true among the poor people in certain countries, they still represent small profit if not actual loss to the producer of milk and the maker of cheese; e. g., the poorer grades of Stilton, Gorgonzola, Camembert, and Brie, which are common. This statement may not apply to certain skim-milk cheeses, which as a by-product of the butter factory are largely profit (provided one cares to eat them). It is difficult, therefore, to justify the continued production of a poor quality of cheese. The writer is tempted to add that if nine-tenths of the two hundred and fifty or more described varieties of soft cheese were most carefully forgotten, and half the remainder properly made, both producer and consumer would benefit by the change.

In reference to the groups of cheese under discussion, the product suffers from the persistence of old practices which are handed down from generation to generation without being really understood. This makes possible the current belief that there are unexplainable mysteries about the production of this article. It is often stated that cheese can be made on one farm and not on another; that the air, or the soil, or the kind of cow, or the feed, or something else, or all combined, make one factory succeed and another fail. That many factors may have to do with success or failure is clear enough, but just what value is to be attached to the individual factor is our problem. It is sufficient to say that these factors must be tested and weight given only to such influences as are really active in the processes.

The equipment necessary for making these cheeses is simple and cheap, the labor does not involve complex machinery or special methods calling for technical knowledge. Cheeses have therefore been equally successfully made in great factories and in small places where old buildings built for other purposes were adapted to this at a trifling expense. Some places used are scrupulously clean, others succeeding equally well are actually filthy. So long as the same necessary conditions are obtained, they get the same results.

If, however, the introduction of new and more scientific methods of work in some details make changes in those conditions, a factory, as we have seen before, may produce a very poor article. The question is, therefore, Shall we abandon improvement, or shall we understand the principles of our process? The failure and loss resulting from attempts to transplant these old processes to America have made necessary the proper study of these principles.

CHEESE FLAVORS IN THE TRADE.

In discussing the demands of the market the dealers in London say that the ideals of their trade have changed greatly in the past twenty years. Formerly well-ripened, high-flavored cheeses were in constant demand. Now most cheese is sold and eaten almost fresh. Low-flavored cheese is constantly demanded. Camembert, if eaten at all, is eaten unripe. Gorgonzola is preferred to Roquefort, and even Stilton finds a smaller demand than formerly. Immense quantities of fresh Canadian Cheddar are handled at small prices, and much English hard cheese is eaten in the same condition.

In France orders of cheese in the average restaurant or hotel bring out Brie, Camembert, Neufchâtel, Port du Salut, or Livarot, usually less than half-ripened through. Special orders in the best places are always filled, of course, by the finest of Camembert or Brie. Immense quantities of sour-milk cheese are consumed. Roquefort is always a well-ripened cheese. The English or American types of hard cheese are scarcely found on the French market. Swiss (Gruyère or Emmenthaler) is on sale everywhere.

In the markets of Milan Parmesan, Gouda, French Brie and Camembert, Swiss cheese, and cheese marked "Gorgonzola," but with no mold ripening, are comparatively mild cheeses. A few of these soft cheeses and Gorgonzola are the only high-flavored varieties found.

In the German market even mild cheeses are constantly offered, Swiss, Hollander (Gouda), and Edam being common. Imported Brie and Camembert are also found. The German varieties, which are numerous in every market, are very many of them strong-smelling and often strong-tasting cheeses. Roquefort is found everywhere.

Germany thus uses the hard and soft types of cheese in perhaps equal quantities. Except Swiss, France has no great amount of hard cheeses, but the evident tendency is toward the consumption of the milder brands of soft cheese. In Germany, however, a very large consumption of the high-flavored, strong-smelling cheeses is indicated by their abundance in the market.

MARKET PRICES OF VARIOUS CHEESES.

The following tables give the prices of cheese in a few of the great markets. These prices were quoted in the latter part of the year 1905. In converting the foreign prices into their equivalent in United States money the shilling is calculated at 24 cents, the franc at 20 cents, and the mark at 24 cents. The lists of the varieties of cheese offered in the market places selected were fairly representative of what is commonly found in these and other cities visited.

Prices of various cheeses in principal European markets.

LONDON.

Name of cheese.	Price in foreign money.		United States equivalent.
	s.	*d.*	
Best Stilton, whole cheeses, per pound	1	4	$0.32
Best Stilton, half cheeses, per pound	1	6	.36
English Cheddar, per pound		11	.22
Cheshire, per pound		11	.22
Especial Cheshire, per pound	1	1	.26
Gruyère (Swiss cheese), per pound	1		.24
Port du Salut, per pound	1	2	.28
Roquefort, per pound	1	4	.32
Canadian Cheddar, per pound		7½	.15
Edam, per pound		7½	.15
Gorgonzola, per pound	1		.24
Parmesan, per pound	1	4	.32
Canadian Cheddar, wholesale, 1,000 cheeses or more, 58s. per cwt. (112 pounds), per pound		6	.12
Camembert, retail, each		6½	.13
Low-grade cheeses:			
Stilton, per pound		6½	.13
Camembert, each		6½	.13
Cheddar, per pound		6–8	$0.12 to .16
Edam, per pound		6½	.13
Gouda, per pound		5	.10
Old cheese, per pound		9	.18

PARIS.

Name of cheese.	Price in foreign money.	United States equivalent.
	Francs.	
Brie, extra, per pound	2.00	$0.40
Brie, first quality, per pound	1.60	.32
Camembert, extra, each	.80	.16
Camembert, first quality, each	.70	.14
Coulommiers, each	1.30	.26
Emmenthaler, per pound	1.40	.28
Pont l'Eveque, each	.80	.16
Port du Salut, per pound	1.40	.28
Roquefort, per pound	2.00	.40

HANOVER.

Name of cheese.	Price in foreign money.	United States equivalent.
	Marks.	
Edam, uncut, per pound	0.80	$0.20
Edam, cut, per pound	.90	.22
Prima Algauer, per pound	.70	.17
Harz, 3 pieces	.20	.05
Limburger (fat), per pound	.70	.17
Romadour (special), each	.40	.10
Roquefort, per pound	2.00	$0.48 to .50
Brie (German), per pound	1.20	.28 to .30
Holland, per pound	.90	.22
Emmenthaler, per pound	1.00	.24
Tilsiter, per pound	.80	.20
Neufchâtel, each	.25	.06
Camembert (German?), half	0.30 to .50	.07 to .12

Prices of various cheeses in principal European markets—Continued.

BERLIN.

Name of cheese.	Price in foreign money.	United States equivalent.
	Marks.	
Brie (German), per pound	1.20	$0.28
Gorgonzola, per pound	1.20	.28
Roquefort, per pound[a]	1.60	.39
Camembert (French), half, each	.45	.11
Camembert (German), half, each	.25	.06
Hollander, per pound	1.00	.24
Emmenthaler, per pound	1.20	.28
Limburger, per pound	.65	.16
Edam, per pound	1.00	.24
Münster, per pound	1.00	.24
Brie (cut boxes 3 ounces), each	.35	.09
Neufchâtel, each	.25	.06
Tilsiter, per pound	.60	.15
Ziegenkäse (goats' milk)	.70	.175

[a] In one series of shops Roquefort was sold at 1.60 marks; in all others at 2 marks. Some little-known varieties of separated milk cheese are dropped from the list as of no interest.

ACKNOWLEDGMENTS.

In his studies of the soft-cheese industry of Europe the writer was shown many courtesies and given much valuable assistance and information by many persons, too numerous to mention by name, in England, France, Italy, and Germany. For all such favors he makes grateful acknowledgment.

RECORDS OF DAIRY COWS: THEIR VALUE AND IMPORTANCE IN ECONOMIC MILK PRODUCTION.[a]

By Clarence B. Lane, B. S.,
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INTRODUCTORY.

The condition of the farming industry as seen on the average farm points to the need of better business methods and more definite knowledge of the sources of profit and loss. In no department connected with the farm is there more need for absolute data than in the dairy. The records of progressive and unprogressive dairymen indicate that there is no business which shows a greater range of profit than that of dairy farming. Investigations of creamery patrons illustrate this most strikingly and show that one dairyman frequently makes double the profits of his neighbors. In an investigation of the records of 100 creamery patrons, conducted by Hoard's Dairyman, it was shown that one of them made $2.30 for every dollar invested in feed for his cows, while a neighbor made $1, and another lost 50 cents. All had the same soil and the same market. Not one in ten read any dairy literature, and thirty-eight out of the hundred kept cows at an actual loss. The difference in their profits, therefore, must be accounted for largely by the difference in the intelligence put into their business. Such a wide range of profit rarely exists in other kinds of business. Good judges believe that one-fourth of the cows in the entire country kept for milk do not pay for the cost of keeping, and nearly one-fourth more fail to yield an annual profit.

The objects in view in the preparation of this article are, first, to show dairymen the importance of keeping records complete enough to give the dairy performance of every cow in the herd, thereby making it possible to weed out the unprofitable animals; second, to induce dairymen to keep records, not only for the additional profits, but for

[a] This paper is largely an abstract of Bulletin No. 75 of this Bureau, "Records of Dairy Cows in the United States." In that bulletin were published more than 12,000 milk and butter records of herds and individual cows, including records made at the Columbian Exposition, Chicago, 1893, the Pan-American Exposition, Buffalo, 1901, and the Louisiana Purchase Exposition, St. Louis, 1904. Readers who desire a more complete compilation of such records than is given in the present paper are referred to that bulletin.

the increased interest which they give to all connected with the work and the business methods which they have a tendency to promote; and, third, to show the possibilities of production with different grades and breeds of cows under different conditions, thereby giving encouragement to the farmer and an incentive to higher standards and greater profits.

With the application of the scales and the Babcock test, combined with better care and feed, both the production and the profits of many herds could be doubled, and this with little expense.

VALUE OF DAIRY RECORDS.

Records of the performances of dairy cows form the only accurate and safe basis for judging their value. It is the constant aim of progressive dairymen to improve their herds, and such improvement must depend largely upon culling the herd and getting rid of the unprofitable animals. From the breeders' standpoint records are especially valuable in assisting in finding customers for their stock. Many buyers insist on seeing records of dairy performance before purchasing.

A record is also of great help to the feeder. If he knows exactly what a cow is doing, he can prepare the ration accordingly and often feed more economically. Again, a daily milk record enables a dairyman to detect the approach of sickness in a cow, and thus to take steps to ward it off.

Great inspiration is obtained from keeping a record, and nothing gives a dairyman more satisfaction than watching the improved returns from his herd.

Many of the State experiment stations have shown the importance of keeping careful records of the individual cows, and thus determining which are profitable and which are kept at a loss. At the Georgia station the best cow in the herd gave 7,968 pounds of milk, which produced butter worth $115.44, while the poorest cow in the same herd gave only 2,788 pounds of milk, with a butter value of only $41.63. At the Michigan station the profit on the milk from different cows varied from $6.08 to $94.05. At the New Jersey station the profits from different cows varied from 13 cents to $49.72 when milk was valued at $1 a hundred pounds. At the Connecticut (Storrs) station during the year 1903 the best cow gave a profit of $54.72 and the poorest $2.76. In this case the best cow gave a profit of nearly twice that of the average cow in the herd. At the World's Columbian Exposition, Chicago, the cow with the best individual record made two and one-third times as much butter as the poorest of the seventy-five.

While the differences between the best and poorest animals in the cases given are great, the poorest cows reported are not so poor as many of those kept by dairymen who make no accurate tests and who rarely know anything of what each animal is actually doing.

The Illinois Experiment Station, after testing a number of herds in that State, comments as follows:

Nearly every herd we have tested has proved that some of the cows produce butter enough to pay a handsome profit to the owner, while others that require the same feed, care, and time spent in milking do not make butter enough to pay for the feed they eat. * * * One man who kept twelve cows got more money for the milk of three of them than he did for that of all the other nine put together.

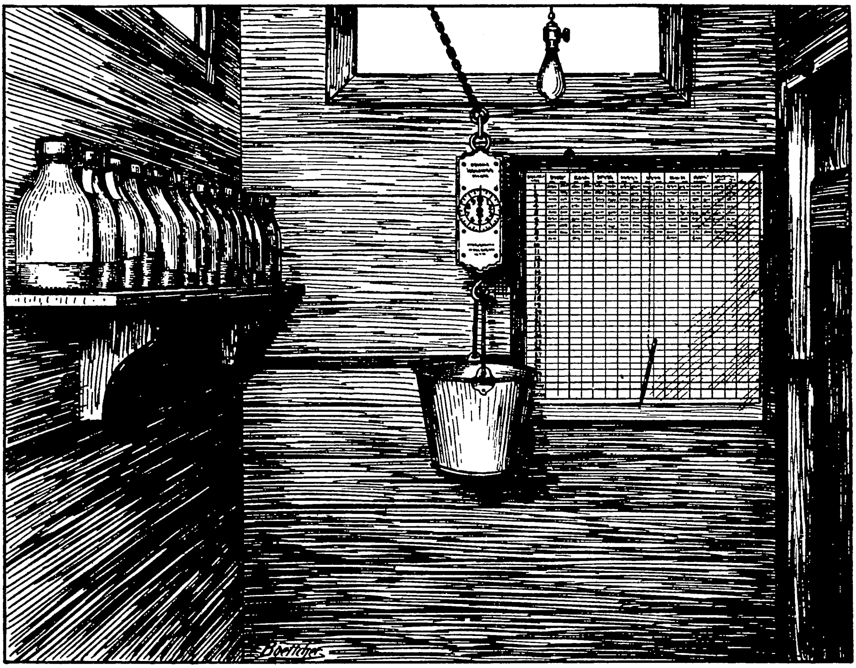


FIG. 1.—Scales, record sheet, and samples conveniently arranged.

ACCURATE RECORDS NECESSARY.

In a general way the farmers know the good milkers in their herd, and in the same general way they weed out those that are considered inferior; but only a few breeders, whether of common or purebred stock, use the scales or the fat test to supply definite knowledge. When the milk is not weighed the amount is almost sure to be overestimated. The fact that a cow gives 12 to 15 quarts of milk in a day at a certain time does not prove that she will give 5,000 pounds in a year. The cow must be fed and cared for during the entire twelve months, and the profit or loss depends on what she will produce during the entire year.

The record of the herd is a matter of the utmost importance. The highest degree of success can not be attained unless dairymen know the productive capacity of each individual cow. This is necessary as a guide to rational treatment and to insure the greatest profit. The record should include not only the dairy performance but a concise history and description of each animal. The former requires a daily record of the milk yield of every cow and a fat test of several consecutive milkings, if accurate records are to be secured. Samples for this test may be mixed and this "composite sample" tested, thus obtaining the average. The method is easily learned and practiced. With the percentage of fat taken periodically and a summary of the daily yield of milk, the dairyman has a full record of every cow in his herd. To give still more complete knowledge there should also be a record, at least approximately accurate, showing the cost of the feed consumed by each cow, so that the economy of production may be shown.

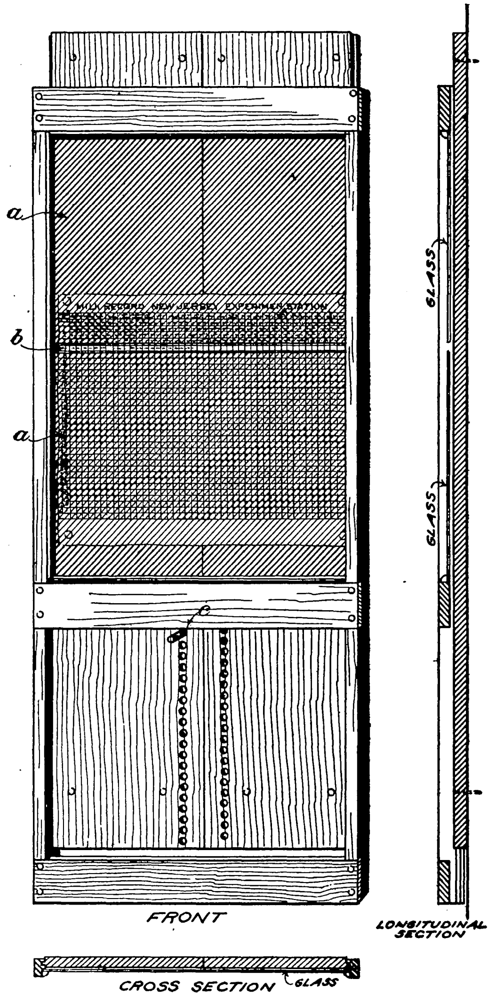


FIG. 2.—Adjustable record board used at the New Jersey Experiment Station.

THE KEEPING OF RECORDS.

Records are far more easily kept than is generally supposed, and the time and cost of keeping them for each cow is so small as to be only a trifle in comparison with their value. The length of time required to weigh and sample the milk will depend much upon the quickness of the individual doing the work. After studying the question the Illinois station found that it required on an average one minute to each cow, or two minutes a day, and that when milk is weighed and tested every seventh week, as is customary with some dairymen, about one hour and thirty-eight minutes is required yearly for each cow tested. With this amount of time expended the farmer can have a reasonably accurate dairy record of every cow in his herd. Considering the time consumed in doing this work and the small expense involved in securing record sheets, scales, and some simple form of the Babcock tester, it is surprising that more dairymen do not test their herds.

Figure 1 shows the apparatus suggested by the Illinois Experiment Station for use by dairymen in keeping records. It includes scales, record sheet, and sample bottles, all conveniently arranged so as to take as little time as possible.

The following is a sample of a farmer's milk record as kept in accordance with the suggestions of the Illinois station:

Sample of farmer's milk record for one week, from July 30, p. m., to August 6, a. m.

Number of milking.	Yield of milk.										
	Spotty No. 1.	Black No. 1.	Black No. 2.	Bottle.	Milly.	Little Lamie.	Alice.	Belle.	Sleepy Eye.	Roaney.	Pet.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	20.5	14.1	11.3	15.0	15.4	10.9	6.9	7.4	7.5	5.5	15.1
2	13.5	6.8	6.5	10.2	13.2	8.3	5.2	3.9	5.1	3.9	10.3
3	22.2	16.8	11.7	15.0	17.0	11.0	6.7	7.9	7.7	5.2	15.8
4	14.2	5.2	8.2	10.7	14.2	8.5	5.2	4.9	4.6	3.9	10.9
5	20.3	15.7	6.0	13.7	16.3	10.7	6.8	6.5	7.3	4.9	15.7
6	16.7	7.0	9.2	11.9	15.6	9.5	5.1	5.1	6.1	4.6	12.2
7	18.5	15.5	4.7	14.1	16.7	9.6	7.0	6.0	6.6	5.0	14.5
8	16.0	7.8	7.3	11.2	14.4	8.7	5.0	4.9	6.2	3.9	14.7
9	22.0	14.5	13.5	16.4	18.5	10.7	6.9	7.2	6.9	5.3	15.8
10	14.0	9.5	6.9	10.5	15.0	8.3	4.8	4.6	5.3	3.6	11.4
11	19.9	9.8	4.0	12.9	17.5	11.0	6.7	6.1	7.0	5.2	14.9
12	14.5	13.0	6.8	11.5	14.5	8.1	4.4	4.6	5.8	3.9	11.3
13	22.6	13.2	6.7	16.1	18.4	11.6	8.6	7.4	7.3	7.8	16.1
14	15.4	7.1	8.8	11.3	14.7	8.6	4.3	5.2	5.9	4.2	11.7
Total	250.3	156.0	111.6	180.5	221.4	135.5	83.6	81.7	89.3	66.9	190.4
Fat, per cent	3.2	2.8	3.2	3.5	3.2	3.4	4.6	4.0	4.6	4.4	3.0
Fat, pounds	8.00	4.36	3.57	6.31	7.08	4.60	3.84	3.26	4.10	2.94	5.71

The accompanying cut (fig. 2) represents a record board used at the New Jersey Experiment Station. A record sheet of sufficient size to include the weight of the morning and evening milk of each cow in the herd for a month is attached to this board by means of thumb tacks. Two panes of glass (*a*, *a*) are set in the frame in front of the record sheet with a space (*b*) of three-fourths of an inch between them for entering the record. The record board is so constructed that the front frame can be lowered each day to enter the new record by adjusting the pin (*c*) which holds it in place. It has the advantage of keeping the record sheet clean and in condition for permanent filing. The glass can be readily cleaned with a moist sponge.

THE BABCOCK TEST.

While full directions usually accompany the apparatus as purchased, it will not be out of place to state briefly here the principles of the test and how it is operated. The outfit (fig. 3) consists of a pipette for measuring the milk sample, an acid measure, test bottles graduated to 10 per cent, and a centrifugal machine for whirling the bottles and contents at high speed. Small machines are easily operated by hand, while large ones require power.

The important thing at the outset is to secure a fair sample of the milk to be tested. This is accomplished by thoroughly mixing the milk by repeatedly pouring it from one vessel to another. It is then in condition to sample. The sampling may be done by using a small dipper. Owing to variations in the composition of the milk from day to day and in the morning's and evening's milk of the same day, it is necessary to collect several samples if accurate results are to be secured. These may be brought together for two or three days and made into a composite sample before the test is made. A few drops of formalin or a little potassium bichromate may be used to keep the sample sweet. The composite sample thus obtained should be thoroughly

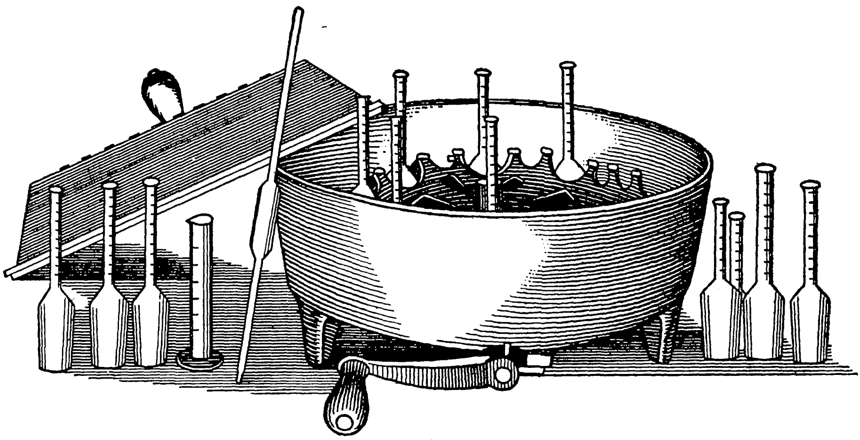


FIG. 3.—Apparatus for the Babcock test.

mixed. The pipette is then drawn nearly full of milk by placing the mouth at the end; the forefinger is then quickly placed over the top end of the pipette as it is removed from the mouth; the pipette is held on a level with the eye, while the milk is allowed to run out slowly until its surface is even with the 17.6 mark. The pipette is then inserted far enough into the test tube to allow the milk to run in without spilling. After the pipette has drained, the last drop is blown from it and the sample is ready for the acid.

The ordinary commercial sulphuric acid, having a specific gravity of about 1.82, is used in making the test. It should be used at a temperature ranging from 50° to 70° F. and always kept in a tightly stoppered bottle. Care must be taken in mixing the acid with the milk; 17.5 c. c. are measured into the acid graduate and slowly turned into the test tube in such a way that it runs down on the inside of the bottle rather than directly into the milk, to prevent burning the milk solids.

A complete mixture is effected by holding the bottle by the neck and giving it a gentle rotary motion. The action of the acid causes a rapid increase in temperature, at the same time dissolving all the nonfatty solids of the milk and making possible a rapid and complete separation of the fats.

The test bottles and contents are now placed in the centrifugal machine and whirled at the required speed, which varies with the size of the machine. The bottles assume a horizontal position, and as the fats are the lighter part of the milk they rise to the surface. With the hand machine full speed should be maintained for five or six minutes for the first whirling, after which enough hot water should be added to the contents of the bottles to float the fat within the limits of the graduated scale on the neck of the test bottle. The bottles are whirled again for two or three minutes at full speed, after which they should be placed in hot water (temperature 125° to 140° F.) to keep the fat in a clear liquid state for reading. If when managed in this way clots of curd or other matter are mingled with the fat, making the reading uncertain, the difficulty can usually be avoided by adding the hot water in two portions, filling the bottles at first only to the neck, and after whirling about one minute adding sufficient hot water to bring the fat into the graduated neck, after which the bottle should be whirled and the fat measured.

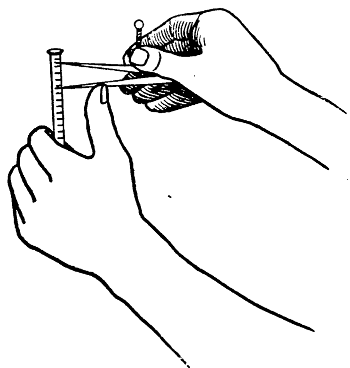


FIG. 4.—Reading the fat column in the Babcock test.

If a steam-power machine is used it will not be necessary to place the bottles in hot water.

The percentage of fat is determined by the graduated scale on the test tube. A pair of dividers or small compasses (fig. 4) can be used to good advantage in reading the results. The two points are carefully adjusted, so they exactly inclose the fat column. The lower point is then placed at the zero mark; the other point will then indicate the exact reading.

The result obtained gives the percentage of butter fat in the milk. To determine how many pounds of butter a cow is producing, multiply the pounds of milk produced by the percentage of butter fat, and multiply the result by $1\frac{1}{6}$.

Example: 24 (pounds milk) $\times$ 0.04 (per cent fat) $=$ 0.96 (pound fat) $\times 1\frac{1}{6} =$ 1.12 (pounds butter).

METHODS OF ESTIMATING RECORDS.

Several methods of estimating yearly records from a few weighings and tests have been proposed. As previously stated, however, the only absolutely accurate way to tell the amount of milk and butter fat produced by a cow is to weigh and test the milk at every milking. Cows vary so much in the amount and quality of their milk from one milking to another that entirely accurate results can not be secured by weighing and testing the milk secured at a few milkings and using the results as a basis for estimating the total production for a lactation period, or even for a month. Many dairymen, however, do not feel that they can take the time to secure daily records; nor is this necessary if it is simply desired to obtain a reasonably accurate estimate of a cow's performance at the end of the year. An approximate record is sufficient for comparing one cow with another or for determining whether a cow is up to the profit standard.

The Wisconsin Experiment Station recommends weighing and sampling the milk one day each week during the year. From these different weights and tests the amount of milk and butter fat each cow produces is estimated.

The Illinois Experiment Station suggests weighing and sampling each cow's milk for fourteen consecutive milkings every seventh week. These weights are added and multiplied by the average percentage of butter fat, the result being the number of pounds of butter fat produced. From these results the amount of milk and butter fat each cow produced the three weeks before and the three weeks following the test is estimated.

In view of the fact that the accuracy of records obtained by weighing and sampling each cow's milk at regular times during the year is often doubted, the Illinois station made a test of this method by comparing the amount of milk and butter fat sold from two farms to a creamery with the amount of milk and butter fat as determined by weighing and sampling each cow's milk every seventh week for fourteen consecutive milkings during the year. In one case there was found a difference of 2.2 per cent of butter fat and 0.0015 per cent in milk, making a difference of 4.07 pounds of butter fat and 8.09 pounds of milk to a cow; in the other case a difference of 0.038 per cent of fat and 1.98 per cent of milk, or 0.27 pound of butter fat and 120.3 pounds of milk to a cow. From these results it is seen that by carefully weighing and sampling each cow's milk every seventh week during her period of lactation records can be secured which are substantially correct.

The number of tests required during a period of lactation is illustrated further by an experiment made at the Illinois station, in which the milk of each of six cows was weighed and analyzed daily during the whole period of lactation. The daily records of the six cows give data for comparing their total production of milk and butter fat during one period of lactation, as found from the daily weights and tests of their milk, with the total amount calculated from weights and tests made at intervals of 7, 10, 15, or 30 days. The average of all results obtained with each of the six cows shows that weighing and testing the milk for a cow every seventh day gave 98 per cent of the total milk and butter fat, which, according to her daily record, was the total product. Tests made once in two weeks gave 97.6 per cent of the total milk and 98.5 per cent of the total butter fat, and tests made once a month, or only ten times during the period of lactation, gave 96.4 per cent of the total milk and 97 per cent of the total production of butter fat.

The Vermont Experiment Station made a special study to determine when a cow should be tested in order to give a correct idea of the year's production, if only one or two tests are made during the lactation period. This station recommends, when only two tests of each cow's milk are to be made during the same lactation period, that samples be taken at the intervals given below:

Cows.	First sample—weeks after calving.	Second sample—months after calving.
For spring cows	6	6½–7½
For summer cows	8	6 –7
For fall cows	8–10	5½–7

In case only one test is to be made, approximately correct results may be obtained by testing the milk in the sixth month from calving in case of spring cows, or in the third to the fifth month in case of cows which calve in the summer or fall. In all cases composite samples of the milk are to be taken for four days in the middle of the month, and the entire month's yield may be obtained with considerable accuracy, barring sickness and drying off, by multiplying the same by 7, 7½, or 7¾, according to the number of days in the month.

The Maryland station, after very exhaustive study of this question, decided that the seventh month in the lactation period would be the best to test a cow when only one test a year is to be made. But where a cow comes near the line of profit or loss a single test can not be depended upon for furnishing an accurate basis for judging her value. When two tests are to be made at different periods, this station found that the third and eighth months would be best; and when three tests are to be made, the third, sixth, and eighth months. To get the average for the year when more than one test is made, the results of the tests are added together and the sum is divided by the number of tests. The amount of milk produced in a year multiplied by the average per cent of butter fat gives the yearly yield of fat. Whether the test is made one, two, or three times a year, it is recommended that composite samples be taken for a week. This minimizes the likelihood of any unnatural condition interfering with the correctness of the test. The precaution is added that the composite samples should not be taken when there is any visible sign of anything unnatural in the condition of the animal.

RAISING THE STANDARD.

It is interesting to note that the average production of milk and butter per cow in the United States has been increasing slowly yet constantly from one decade to another. The following data show the census returns from 1850 to 1900:

Average production per cow in the United States.

Year.	Milk.	Butter.	Year.	Milk.	Butter.
	Pounds.	*Pounds.*		*Pounds.*	*Pounds.*
1850	1,436	61	1880	2,004	85
1860	1,505	64	1890	2,709	115
1870	1,772	75	1900	3,646	155

While this increase is encouraging, even the record for the year 1900 is too low to afford the dairyman much profit at the average price for milk and butter. The record indicates further that many dairymen whose herds are below the average in production must be keeping cows at a loss. Every dairyman should study the individuality of his cows, set a standard, and maintain it by promptly disposing of the animals which fail to attain it, unless he has reason to believe that an animal will make a better record in the future. When the standard is reached it should be gradually but persistently raised. This can be done by keeping a sufficient record of the quantity and quality of the milk product, knowing approximately the cost of production, and systematically weeding out the herd.

RECORDS OF DAIRY COWS.

Some typical records of dairy cows are given in the following pages. They are selected from a large number of records collected by the Dairy Division and published in Bulletin No. 75 of the Bureau of Animal Industry. In obtaining these records dairy publications, reports of breeders' associations, and the various bulletins and reports of experiment stations were freely consulted. In addition to this, 600 circulars were sent direct to dairymen asking the following questions:

1. How many cows in your herd?
2. Give approximately their average age.
3. Please state the breed of your cows.
4. What breed of bull is used in your herd?
5. Do you raise your cows or purchase them?
6. At what time in the year do your cows freshen?
7. What rations do you feed in summer?
8. What rations do you feed in winter?
9. Please state (or estimate) the cost of keeping your cows per year.
10. What is the average annual production of milk of your cows?
11. What is the average annual production of butter of your cows?
12. Please state, if possible, the average percentage of butter fat in the milk of your herd.
13. Have any of your cows extraordinary records?

Over 200 replies were received. Of these about one-fourth stated that they did not keep records; others fed whole milk to their calves for several weeks, and for this reason were unable to give complete yearly records; still others kept records of only a few cows in their herds. A large number, however, were able to furnish excellent, well-kept records, but it is believed that a large proportion of those who did not respond had no records to offer.

Records of Grade Cows.

RECORDS PROCURED DIRECT FROM DAIRYMEN.

These records are particularly valuable for the reason that the kind and cost of feed, age of cows, and other data are given in connection with them, showing some of the conditions under which they were made. The table on page 122 contains a summary of the information secured from dairymen who own grade and mixed herds. The character of the herds, the rations fed, and the milk and butter yields are shown.

Milk and butter-fat records of grade herds and herds of mixed breeding for one year, as reported by dairymen in different States.

Owner.	State.	Number of cows in herd.	Average age.	Breed.	Breed of bull.	Cost of keeping cow.	Average annual production. Milk.	Butter.	Average fat in milk.
							Lbs.	Lbs.	P. ct.
S. M. Wells & Son	Conn	42	8	Ayrshires (mainly), Guernseys, and Jerseys.	Ayrshire	$60.00	8,000	370	4.0
Geo. H. Bowker	Mass	20	5	Ayrshires (13) and grade Holsteins (7).	do	45.00	6,600	308	4.0
W. P. Edwards	Mass	6	5	Grade Ayrshires	Holstein [a]	55.00	6,450	375	5.0
Sam Jones & Son	Wis	32	7	Ayrshires (16) and scrubs (6).	Ayrshire	28.00	6,310	280	3.8
J. F. Homewood	N. C	4	4	Ayrshires and Jerseys.	do	30.00	....	150	......
C. L. Peck	Pa	24	7	Registered Ayrshires, registered Jerseys, and grades.	do	35.00	6,000	280	4.0
N. E. McKissick	Me	150	...	Ayrshires (50) and Ayrshire grades (100).	do	....	5,000	264	4.52
A. S. Worden	Pa	20	8	Devons, Holsteins, and grades.	Devon	30.00	6,223	305	4.2
A. B. Miles	N. Y	30	2½	Holsteins and grade Holsteins.	Holstein	35.00	6,000	210	3.05
H. V. Noyes	N. Y	50	5	do	do	45.00	7,701	270	3.02
F. J. Boyson	N. Y	40	7	do	do	27.35	7,000	270	3–3.6
W. W. Crittenden	Mich	5	3	Holsteins (4) and Jersey (1).	do	....	6,175	258	3.58
Ellerslie Stock Farms.	N. Y	70	7	Guernsey and Guernsey grades.	Guernsey	50.00	6,200	350	4.9
H. W. Comfort	Pa	50	6	do	do	40.00	6,000	315	4.5
G. M. Phifer	N. C	55	6	do	do	23.00	6,278	....	......
L. D. Staples	Minn	7	5	Grade Guernseys	do	35.00	5,300	265	4.3
N. I. Bowditch	Mass	107	6	Grade Guernseys, grade Jerseys, and grade Holsteins.	do	55.00	7,665	364	4.2
Banning Bros	Mich	30	8	Grade Guernseys; few grade Shorthorns.	Polled Shorthorn.	38.00	5,805	303	4.5
A. G. Lewis	N. Y	125	3	Guernseys and half-bloods.	Guernsey	78.00	6,800	367	4.63
W. H. Russell	Iowa	20	5	Guernseys and grades	do	28.00	6,000	362	5.2
W. R. Holcomb	Minn	55	6	Guernseys (37) and Holsteins (18).	Guernsey 1 Holstein 1.	43.00	5,800	315	4.66
H. McK. Twombly.	N. J	180	5½	Guernseys (35), Guernsey and Jersey grades (145).	Guernsey	61.00	6,707	360	4.6
C. W. Wilcox	Iowa	35	7	Guernsey and Guernsey grades.	do	30.00	4,700	274	5.0
Briarcliff Farms	N. Y	496	5	Jerseys and 10 per cent high-grade Jerseys.	Jerseys registered.	....	5,197	349	5.6
C. T. Rossiter	N. H	20	3	Jerseys and high-grade Jerseys.	do	50.00	5,925	380	5.5
R. S. & H. W. Davis.	Vt	46	4½	Grade Jerseys	do	42.50	4,800	270	5.0
I. B. Witmer	Ohio	8	7	Jersey and Jersey grades.	do	35.00	6,175	360	5.0
E. C. Birge	Conn	18	7	Jersey and Holstein grades.	Guernsey or Jersey.	....	5,000	245	4.2
Wm. Schulmerich	Oreg	27	5	Jerseys and grade Jerseys.	Jersey, registered.	40.00	6,730	315	4.05
J. L. Hoyle	Iowa	11	5	Grade Jerseys	do	35.00	4,738	305	5.5
L. J. Kendall	Mass	50	6	Jersey, Guernsey, and grades.	Jersey	75.00	6,450	....	......
John Lynch	Cal	50	6	Shorthorns and Shorthorn grades.	Shorthorn	30.00	6,340	....	......

[a] The words Holstein and Holstein-Friesian as used in this article are synonymous.

The information embodied in the foregoing table shows that the average number of cows in a herd was 67; average age, 6 years; average cost of keeping 1 cow one year, $41.88; average amount of milk produced annually, 6,243 pounds; average amount of butter produced annually, 306 pounds; percentage of fat in milk, 4.2.

HERDS OWNED BY CREAMERY PATRONS.

A representative of Hoard's Dairyman, detailed to make investigations concerning the patrons of creameries in various States, visited the farms, interviewed the patrons, and consulted the books of the creamery. Inquiries were made as to the number of cows kept during the year, the kind of cows and how bred, the cost of keeping the cows, the average ration, how the cows were stabled, the returns from the creamery per cow, the average number of pounds of butter per cow, the average price of butter for the year (the price to be net after taking out payment for making), the average price of milk per 100 pounds per year, and the patron's idea as to the value of skim milk.

The first investigation included 100 creamery patrons of Jefferson County, Wis., owning nearly 2,000 cows. There were but few full-blooded herds included in the number, but when the blood of one particular breed predominated in a herd it was classed as that breed. Where there was a mixture of dairy breeds and no single breed predominated they were classed "mixed dairy." The following table, arranged according to breeds and giving the average products and profits of each, is quoted from Hoard's Dairyman:

Average results for herds of 100 creamery patrons of Jefferson County, Wis.

Breed.	Number of herds.	Number of cows.	Yield of milk per cow.	Yield of butter per cow.	Returns from creamery for $1 in feed.	Net profit per cow.
			Pounds.	*Pounds.*		
Jerseys	28	466	4,798	244.7	$1.62	$17.58
Holsteins	19	450	6,081	255.0	1.54	16.99
Guernseys	11	185	5,141	252,5	1.60	17.92
Mixed dairy	19	346	4,455	208.5	1.44	12.14
Natives	11	164	4,541	203.6	1.31	8.77
Dairy Shorthorns	6	113	5,436	240.8	1.48	14.77
General-purpose Shorthorns	4	54	4,219	194.4	1.22	7.08
Brown Swiss grade on Jersey foundation.	1	12	5,236	257.8	1.35	12.43

The reason for the differences in yield and profit was found to be mainly in the kind of cows kept and the kind of feed on which they were fed. Of course there are other minor factors that contribute to success in dairying, but these two were the most prominent here.

Some of the dairymen claimed that the most profitable method was to use only such feeds as were raised on their farms and not to pay out good money for concentrated feeds. Others were of the opinion that it paid a good profit to buy feeds so as to make a balanced ration where the proper feeding stuffs were not raised on the farm. To test the matter the 100 patrons were divided into two classes. One class bought feed such as cotton-seed meal, oil meal, gluten feed, brewers' grains, malt sprouts, and wheat bran. The other class all fed corn and oats, which were the only grain feed their cows had. In all cases the cows were charged with the market value of all the feed they consumed; that is, the purchased feed at the price paid for it and the feed raised on the farm at the cash price at which it could have been sold. Forty-six patrons bought feed and received for butter from the creamery $1.57 for each dollar's worth of feed the cows ate. The other 54 patrons bought no feed and received $1.45 for each dollar's worth of feed consumed. Thus those who purchased feeds made 12 per cent more on the value of all the feed their cows ate than did the others. And it must be borne in mind that many of those who did buy feed and are counted in this class purchased only a little, in some cases but 1 or 2 tons of bran during the winter, not enough to have much effect in balancing a ration.

It is true that some who had cows of the best dairy type and gave them the best of care and attention realized good returns from their cows without buying feeds. The fact, however, remains that the patrons who secured the best records and received the greatest profits fed a fairly well balanced ration, and in order to do that they had to buy feeds rich in protein. It would be an ideal condition if the farmer could raise all the protein feed necessary to make his cows do their best. This is occasionally accomplished by raising such crops as clover, field peas, cowpeas, and soy beans. Until, however, crops are raised containing more protein than those ordinarily grown by the farmer it will be necessary to buy protein feeds if the best results are to be secured.

Some of the patrons made the mistake of having all their cows "come fresh" in the spring, thus producing the most milk when the price was low. After passing through the season of heat and flies the cows were nearly dry, and the best attempts had but little effect in bringing back the flow of milk during the winter. Many did not read dairy papers or make any effort to study out the principles of the dairy business, and as a rule these secured the lowest profit. It was noted that good dairymen, as well as poor ones, seemed to be in clusters. Here is shown the influence of a few progressive dairymen who for years studied their business and became intelligent in regard to it. Their neighbors followed their example. On the other hand, the example of those who did not read and study dairy methods was followed and they were all ignorant together, and as the result of their ignorance they received very little if any profit from their dairy cows.

In another creamery-patron investigation in three counties in New York it was pointed out that patrons received an average profit of 65 cents per cow. The cost of keeping a cow averaged a little over $35 a head. Other things being equal, the silo men got the greatest profit from the expenditure for feed. The grade of cow kept, the skill shown in selecting feeds, and the care and intelligent attention to the needs of the cow were large factors in determining the results. In many cases better and cheaper rations were needed as well as better cows to turn the ration into milk. It was shown that the silo and the alfalfa crop would assist materially in reducing the cost of feeds and that dairy cows producing 5,000 pounds of milk a year were within the reach of every painstaking dairyman.

An investigation in two other counties in New York revealed the fact that a fair ration for a cow in that section of the country costs $35 a year; that the average net returns for butter were not over 17 cents a pound, and the average price for milk was not over 90 cents per 100 pounds. At these prices the cow that did not make 200 pounds of butter a year, or nearly 4,000 pounds of milk, did not pay for her keeping. Dairymen who practiced the primitive methods of thirty, forty, and fifty years ago and failed to adapt their methods to the demands of a progressive age lost money. The reason they did not progress was because they did not avail themselves of the education in dairying and agriculture so cheaply offered to them by the dairy and agricultural papers, farmers' institutes, farmers' reading courses, experiment stations, agricultural colleges, etc.

A study was also made of fifty herds in Pennsylvania. The representative of Hoard's Dairyman who made these investigations stated that only about one-half of the dairymen visited read any kind of agricultural papers or seemed to be availing themselves of the means of education offered them. As a consequence of this lack of knowledge losses and leaks were found which robbed the dairyman of all the profits in his business. One great waste was in not having cows that responded to good care and feed. In some instances a very good ration was fed to a herd with little or no profit, while other herds that were fed almost the same ration returned a good profit. A lack of knowledge of the principles of breeding was also reported. Less than 10 per cent were keeping purebred sires descended from dams having good dairy records. Another waste was in the feeding of unbalanced rations. Sometimes the carbohydrates were far in excess of what the cow could utilize in milk production and the excess was wasted. For instance, some were feeding as high as 3 bushels of ensilage per cow daily. Too often the cornstalks were fed to the cattle dry and uncut, only a part being eaten. Little attempt was made to grow any protein soiling crop—such as alfalfa or oats and peas—to supplement the pasture. About 75 per cent of the barns were reported not sufficiently warm. This also caused a waste of food nutrients. Not more than 10 per cent of the stables were provided with any system of ventilation other than windows, holes in the floor over the stable, and hay chutes. In addition to pure air, sunshine was also lacking in most cases. Too often the manure which should have enriched the soil and nourished the crops was wasted. One encouraging feature was that more than one-third of the dairymen had silos, and others were preparing to build them. They were finding that they could not profitably make winter milk without a cheap, succulent feed. A few dairymen were progressive and prosperous and making good profits, while some of their immediate neighbors were not. One patron received $70 per cow from his whole dairy and $1.79 for each dollar invested in feed. Not far from him was another patron who received only $15 per cow and 50 cents for each dollar invested in feed.

In an investigation of one hundred dairy herds in Iowa it was noted that thirty-eight herds of the number gave less than a dollar's worth of butter for a dollar in feed, and one gave less than half a dollar's worth. Sixty-two herds paid a dollar or over, while four herds paid over $2 for $1 in feed. Most of the herds were fed liberally, and of some it might be said that they were heavily fed on grain. Only five herds were fed anything except the grain and forage raised on the farm, which consisted of corn in the majority of cases. A few used feeds richer in protein, and these secured better returns. Two or three fed a well-balanced ration and were well paid for it. One dairyman fed gluten feed, bran, and silage—a well-balanced, succulent ration—to high-grade dairy cows and realized $2.30 in butter for each dollar's worth of feed. The cash received for butter was $59.85, or a net profit of $33.85 per cow. Another fed bran and silage with exceptionally good results. Still another fed bran and clover hay, which made a fairly good ration for a herd of full-blood dairy cows, and secured 325 pounds of butter per cow in return.

Investigations were made by Hoard's Dairyman in several other States, but it will not be necessary to include the results here. Enough data have been presented to show what hundreds of dairymen are actually doing.

INVESTIGATIONS OF DAIRY HERDS BY EXPERIMENT STATIONS.

For over a year the department of dairy husbandry of the Illinois Experiment Station conducted field work among the dairymen of the State. A number of them were persuaded to weigh and sample the milk a sufficient number of times during the year to make it possible to estimate the performance of each cow with some degree of accuracy. These records brought the farmers face to face with facts that existed upon their own farms, and showed that some herds were kept at a good profit, some at a small profit, and others at an actual loss.

The following tables show the results of investigations with the herds referred to:

Comparison of the average yearly performance of all the cows in each of the herds tested.

Herd.	Yield of milk.	Fat in milk.	Yield of butter.	Net profit or loss.	Cost of 100 pounds of milk.	Cost of 1 pound of fat.
	Pounds.	*Per cent.*	*Pounds.*		*Cents.*	*Cents.*
Herd A	3,361	3.55	139	—$4.54	92.5	25.8
Herd B	5,360	3.52	220	12.12	57.0	16.1
Herd C	4,942	3.90	224	16.22	55.5	14.2
Herd D	5,911	4.45	306	26.64	54.9	12.3
Herd E	6,474	4.19	317	35.80	43.8	10.4
Herd F	5,846	3.32	227	18.58	42.9	12.9
Herd G	4,865	3.95	224	....	....	....
Herd H	3,852	4.02	180	....	....	....

In estimating in the above table the profit or loss on a cow it was counted that the calf paid for her keep while dry and the skim milk paid for the labor.

Comparison of the results from the six most profitable cows in herd D with the results from five other herds.

Herd.	Number of cows in herd.	Total yield of milk.	Total yield of butter.	Total profit.	Total loss.
		Pounds.	*Pounds.*		
Herd D	6	50,669	2,644	$296.97	....
Herd A	28	94,126	3,890	....	$127.12
Herd B	20	107,217	4,409	242.41	....
Herd C	17	84,014	3,823	275.90	....
Herd E	7	45,322	2,220	250.63	....
Herd F	14	81,845	3,178	260.15	....

This table shows clearly that a few good cows will yield a greater profit than large herds of unselected animals. It was found in herd D that 15 of the best cows gave a profit of $651.94, while the other 32 cows gave a profit of only $600.24, or the 15 cows gave the owner $51.70 more profit than the 32 other cows.

The following table shows the average yield of milk and butter fat per cow, with gross cash returns for the same, in fifty-eight Arizona herds as reported by the Arizona State Experiment Station:

Average results with fifty-eight Arizona herds.

No. of herd.	Number of cows.	Average yield of milk.	Average yield of butter fat.	Average cash return.	No. of herd.	Number of cows.	Average yield of milk.	Average yield of butter fat.	Average cash return.
		Pounds.	*Pounds.*				*Pounds.*	*Pounds.*	
1	21	7,409	274.00	$54.80	30	25	4,865	191.15	$38.23
2	8	7,587	269.20	53.84	31	9	5,240	189.30	37.86
3	43	5,936	247.00	49.40	32	19	4,795	188.00	37.60
4	48	6,676	236.60	49.32	33	11	5,167	187.90	37.58
5	23	5,659	243.00	48.60	34	54	5,150	185.20	37.04
6	4	6,019	238.15	47.63	35	19	4,302	183.60	36.72
7	9	3,447	233.85	46.77	36	9	5,312	183.60	36.72
8	21	4,438	234.00	46.00	37	7	5,229	179.25	35.85
9	12	6,176	222.00	44.40	38	5	4,833	178.55	35.71
10	31	6,442	219.10	43.82	39	6	4,667	177.35	35.47
11	24	6,048	214.40	43.00	40	8	4,632	176.30	35.28
12	16	5,672	214.85	42.97	41	9	5,095	169.05	33.81
13	23	4,972	214.00	42.80	42	9	4,655	161.10	32.22
14	29	5,863	214.00	42.80	43	11	4,292	158.20	31.64
15	9	5,255	213.85	42.77	44	7	4,154	154.70	30.94
16	25	5,778	210.00	42.00	45	12	4,282	150.40	30.08
17	12	5,559	208.15	41.63	46	7	4,187	145.20	29.04
18	55	5,681	205.15	41.03	47	6	4,411	144.25	28.85
19	15	5,944	204.60	40.92	48	12	4,248	127.55	25.51
20	11	5,607	202.50	40.50	49	3	2,973	125.80	25.16
21	15	Cream.	201.00	40.20	50	10	4,085	125.75	25.15
22	6	5,942	200.45	40.09	51	11	3,520	124.25	24.85
23	43	5,505	200.00	40.00	52	6	3,735	113.00	22.60
24	4	4,774	200.00	40.00	53	4	3,075	109.10	21.82
25	10	4,819	199.50	39.90	54	5	3,059	102.50	20.50
26	17	4,658	199.50	39.90	55	20	3,297	101.65	20.33
27	6	5,886	198.10	39.62	56	5	2,585	99.80	19.96
28	44	5,232	197.50	39.50	57	5	2,642	87.15	17.43
29	9	5,462	192.25	38.45	58	11	2,019	66.40	13.28

Of the fifty-eight herds reported, the last sixteen (Nos. 43–58) failed to pay what was estimated to be the cost of keeping ($32). The difference between the returns from the average cow of the poorest herd and the average cow of the best herd is the difference between a loss of $18.72 and a profit of $22.80.

RECORDS OF DAIRY HERDS AT EXPERIMENT STATIONS.

The records presented here are of special interest and value for the reason that they have been kept with the greatest care and accuracy, and show the possibilities of production with grade herds under most favorable conditions of feeding and management, while at the same time many of the cows making up the herds were purchased of dealers in the vicinity of the station at moderate prices and were, therefore, no better than could be secured by any dairyman. The experiment stations have demonstrated very clearly that the dairyman must get above average conditions to attain success, and that he must use business methods and avail himself of the latest and best knowledge of the subject.

The following table comprises the data for the dairy herds at eighteen agricultural colleges and experiment stations:

Average yearly records of grade herds at agricultural colleges and experiment stations.

State.	Number of cows.	Average age.	Breed.	Breed of bull.	Cost of keeping cow.	Average annual production.		Average fat.
						Milk.	Butter.	
		Yrs.				*Lbs.*	*Lbs.*	*P. ct.*
Pennsylvania	27	.....	Grade Guernseys (24) and Guernseys (3).	Guernsey	$45.00	5,436	320.0	5.1
Arizona	6	4	Natives	Jersey	32.00	5,340	325.0	5.22
Michigan	20	5	Holsteins, Shorthorns, Jerseys, Brown Swiss.	Holstein, Shorthorn, Jersey, Brown Swiss.	41.00	7,444	344.0	3.96
New Jersey	28	.....	Grade Jerseys, grade Guernseys, grade Ayrshires, grade Holsteins.	1 Guernsey, 1 Ayrshire.	45.00	6,528	335.0	4.41
New York (Cornell).	19	4½	Largely grade Jerseys and grade Holsteins.	1 Holstein, 1 Jersey.	45.25	7,327	322.0	3.76
Tennessee	30	.....	Three-fourths herd Jerseys, rest grades.	Jersey	{35.00- 40.00}	5,40	320.0	5.1
Utah	18	.....	Natives, grade Devons, grade Jerseys.	.....do	21.33	5,713	276.5	4.15
Wisconsin	21	7	Pure breds and grades of Jerseys, Guernseys, Holsteins, Shorthorns, Red Polled.	Jersey, Guernsey, Holstein, Shorthorn, Red Polled.	38.00	7,309	369.0	4.19
North Carolina.	7	8	Grade and registered Holsteins and Jerseys.	Jersey	40.00	5,673	324.0	4.9
Indiana	14	.....	Jerseys and Holsteins	Jersey and Holstein.	{32.00- 43.00}	6,211	304.0	4.2
Oregon	10	4½	Registered and grade Jerseys, Ayrshires, and Holsteins.	Registered Jersey.	30.00	4,962	258.0	4.47
Nebraska	....	.....	Jerseys, Holsteins and grades, Shorthorns.	Jersey, Shorthorn, Holstein.	25.00	5,902	320.0	4.65
Alabama	7	6	5 Jerseys, 1 Holstein (1901).	....	24.00	4,136	231.0	4.79
Kansas	49	5	Jerseys, Holsteins, Ayrshires, Red Polled, Shorthorns, Guernseys, and scrubs.	Jersey, Holstein, Ayrshire, Red Polled, Shorthorn.	32.00	6,288	293.0	3.99
Vermont	41	8	Ayrshires and grade Jerseys.	Jersey	51.00	5,558	329.0	5.07
Connecticut	20	.....	Registered and grade Jerseys, Guernseys, Ayrshires, and Shorthorns.	.....do	53.46	5,498	326.0	5.08
Missouri	30	9	Jerseys, 6 Holsteins	Jersey and Holstein.	28.00	6,000	350.0	5.1
Minnesota	23	.....	Pure bred and grade Jerseys, Guernseys, Holsteins, and Shorthorns.	....	37.82	6,408	351.0	4.7

The information embodied in the foregoing table shows that the average number of cows to a herd was 22; average age, 6 years; average cost of keeping 1 cow one year, $36.94; average amount of milk produced annually, 5,951 pounds; average amount of butter produced annually, 316 pounds; percentage of fat in milk, 4.5.

The first of the accompanying charts (fig. 5) shows graphically the average production of milk, butter fat, and solids not fat given by each cow in the herd at the Utah Agricultural College, and brings out prominently the great variation in production for the different cows in the herd.

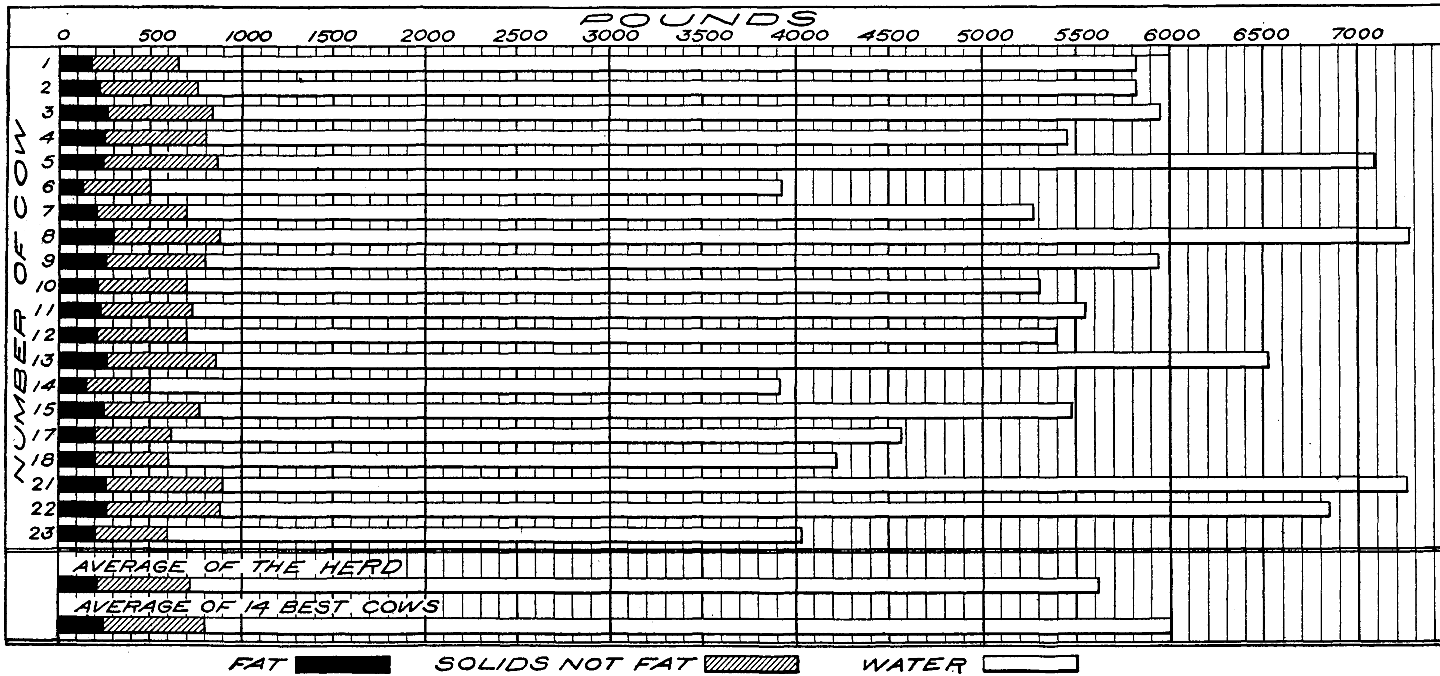


FIG. 5.—Chart showing milk, butter fat, and solids not fat yielded by cows of Utah Experiment Station herd.

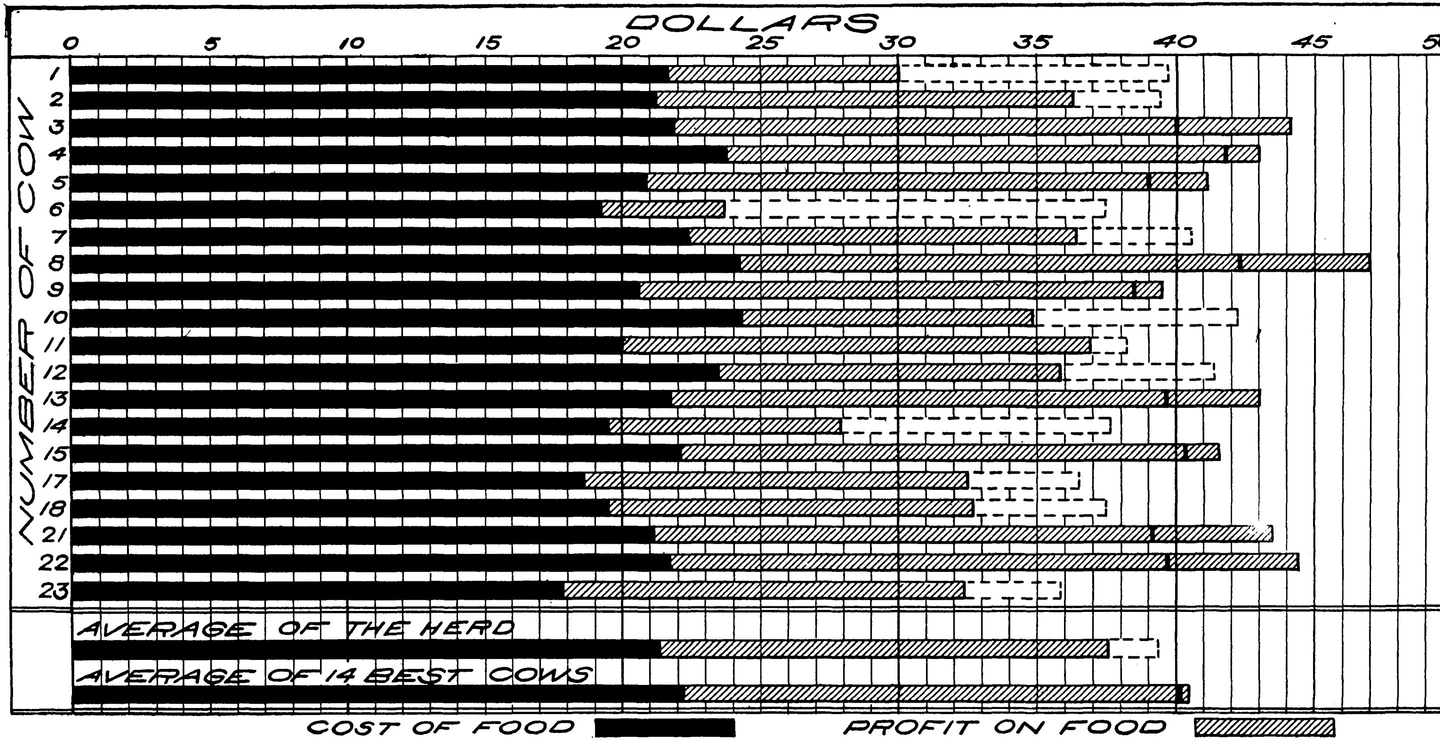


FIG. 6.—Chart showing yearly returns per cow of Utah Experiment Station herd on the basis of 16 cents a pound of butter fat. The dotted extensions show how much more the cow should have returned to pay $18 a year for labor. Ten out of the 20 cows gave returns sufficient to pay cost of food, $18 for labor, and a profit in addition, the amount of which is indicated by the extensions beyond the short heavy perpendicular lines.

The second chart (fig. 6) shows the average yearly returns from the cows figured on the basis of butter fat at 16 cents per pound, and brings out prominently the great variation in profit from the different cows.

RECORDS OF SINGLE GRADE COWS.

While records of dairy cows for a full year are valuable, records for series of years are still better. Dairy cows have their off years, and this must be considered when cows having poor records are being dropped from the herd. If this fact is not borne in mind there is danger of selling the best cows. Attention is called to a cow, Sweet Briar, of the Minnesota Experiment Station, that produced for ten years an average of 358.07 pounds of butter a year, while in 1898 she produced only 206.06 pounds of butter, in 1899 she made 306.53 pounds, and in 1901, 370.53 pounds. If the merits of Sweet Briar had been wholly based on the work she did in 1898 she would possibly have been dropped from the herd. The great value of scales and the Babcock test lies in their continued use in the dairy herd. It sometimes happens that promising heifers do very poorly the first year. In such cases the heifer's individuality, together with her breeding, should be considered before disposing of her. A good cow, however, seldom has two off years in succession.

A few examples of records of single grade cows for series of years in experiment station herds are given herewith and are worthy of careful study. They show the possibilities in production where cows are well fed and managed, and that grade cows may return a liberal profit for seven, eight, and even nine years.

Records of grade cows for series of years at the University of Wisconsin Agricultural Experiment Station.

Name of cow.	Breed.	Year.	Weight of cow.	Days in milk.	Yield of milk.	Fat in milk.	Yield of butter fat.	Value of products.	Cost of feed.	Profit.
			Lbs.		*Lbs.*	*Per ct.*	*Lbs.*			
Maud	Grade Shorthorn	1898	1,176	338	6,997.5	4.29	300	$78.39	$40.50	$37.89
		1899	1,118	336	7,960.2	4.17	332	86.94	40.72	46.22
		1900	1,132	304	8,695.4	3.99	347	91.02	43.15	47.87
		1901	1,164	334	10,782.1	3.76	405	107.33	42.80	64.53
		1902	1,175	291	9,694.0	3.80	368	97.43	33.98	46.45
Average			1,153	320	8,825.4	3.97	350	92.22	40.23	52.00
Bessie	Grade Guernsey	1898	868	294	6,651.1	4.81	320	82.58	37.48	45.10
		1899	847	306	6,565.1	4.74	311	80.47	44.11	36.36
		1900	894	329	7,977.7	4.44	354	92.17	38.69	53.48
		1901	987	327	7,021.3	4.68	329	85.21	35.22	49.99
		1902	922	371	7,333.0	4.28	314	85.55	34.04	51.51
Average			903	325	7,109.6	4.53	322	65.19	37..90	47.29

Records of grade cow for series of years at the Cornell University Agricultural Experiment Station, New York.

Name of cow.	Breed.	Age.	Date of calving.	Number of lactation.	Weeks in lactation.	Total yield of milk.	Fat in milk.	Total butter fat.
		Yrs.				*Lbs.*	*Per ct.*	*Lbs.*
Ruby	¾ Holstein	3	Sept., 1891	2	53	9,174.50	3.49	320.23
		4	Nov., 1892	3	57	9,968.25	3.44	342.84
		5	Feb., 1894	4	40	11,086.00	3.49	386.50
		6	Jan., 1895	5	38	10,781.50	3.42	369.01
		7	Dec., 1895	6	48	13,574.00	3.17	430.15
		8	Dec., 1896	7	64	16,089.50	3.24	521.32
Average						11,778.95	3.35	395.01

Records of grade cows for series of years at the Utah Agricultural Experiment Station.

No. of cow.	Breed.	Year.	Age.	In milk.	Milk yield.	Butter fat in milk.	Yield of butter fat.	Total cost of food.
				Days.	*Pounds.*	*Per cent.*	*Pounds.*	
6	Grade Devon	1894-95	7	329	4,196	3.72	156.0	$20.07
		1895-96	8	316	3,699	3.87	143.0	19.53
		1896-97	9	347	3,899	3.79	147.7	18.37
		1897-98	10	169	2,886	3.49	100.8	9.90
	Average			290	3,670	3.73	136.9	16.97
9	Grade Devon	1894-95	5	365	6,367	4.27	271.9	19.71
		1895-96	6	335	6,176	4.18	258.3	22.79
		1896-97	7	305	5,308	4.72	250.3	23.10
		1897-98	8	345	5,974	4.48	267.5	20.89
		1898-99	9	261	4,135	4.49	185.8	16.71
	Average			322	5,592	4.41	246.7	20.64

Records of grade cow for series of years at the New Jersey Agricultural Experiment Station.

Name of cow.	Breed.	Year.	Yield of milk.	Fat in milk.	Yield of butter fat.
			Pounds.	*Per cent.*	*Pounds.*
Model	Grade Jersey	1897	8,302.9	4.0	332.0
		1898	7,424.4	4.1	304.4
		1899	6,695.3	4.1	274.5
		1900	7,694.9	4.3	328.7
		1901	8,351.7	4.2	348.7
		1902	7,982.5	4.5	361.3
		1903	6,685.1	4.1	275.7
Average			7,591.0	4.18	317.9

Records of grade cow for series of years at the Vermont Agricultural Experiment Station.

Name of cow.	Breed.	Year.	Age.	Days in milk.	Yield of milk.	Fat in milk.	Total solids in milk.	Yield of butter fat.	Total cost of food.	Proceeds from butter.	Value of fertilizing ingredients.
			Yrs.		*Lbs.*	*P. ct.*	*Per ct.*	*Lbs.*			
Golden Rod	Grade Jersey	1894-95	3	365	5,327	6.67	16.40	355.3	$54.30	$97.41	......
		1895-96	4	308	5,399	6.21	15.80	335.1	46.62	89.92	$23.70
		1896-97	5	326	5,886	6.27	15.85	368.8	49.09	104.34	22.65
		1897-98	6	292	5,372	5.96	15.40	320.1	48.74	96.20	25.00
		1898-99	7	298	5,379	6.19	15.59	333.0	47.99	101.02	23.80
		1899-1900	8	286	4,556	6.75	16.60	307.5	54.93	97.74	29.43
		1900-1901	9	306	4,901	6.28	16.09	307.8	54.46	98.78	33.31
		1901-2	10	323	4,482	6.45	16.31	289.3	52.32	93.64	30.40
		1902-3	11	329	4,413	6.71	16.90	296.3	61.21	103.70	37.11
Average (9 years).				315	5,090	6.36	......	323.7	52.18	98.08	......

The milk and butter-fat records of single grade cows for short periods are also of interest in showing the possibilities in dairy production, but must be coupled with more extended tests if true dairy capacity is to be determined. A few illustrations are presented below.

Milk and butter-fat records of single grade cows for short periods.

Owner.	State.	Name of cow.	Breed.	Time.	Total yield milk.	Fat in milk.	Yield of butter fat.
				Days.	*Lbs.*	*P. ct.*	*Lbs.*
J. L. Kendall	Massachusetts.	Guernsey Maid.	Grade Guernsey	1	37.86	5.65	2.14
New Jersey Experiment Station.	New Jersey	No. 4	do	7	316.0	4.5	14.28
J. H. Bennett	New York		Grade Holstein	1	73.0		
New Jersey Experiment Station.	New Jersey	Queen	do	7	381.8	3.9	14.88
Do	do	do	do	30	1,582.5	3.43	54.28
N. I. Bowditch	Massachusetts.		Grade Jersey	1	57.0		
Hatch Experiment Station.	do	Pearl	do	7	247.2	7.4	18.3
Experiment Station	Pennsylvania		do	28	1,097.9	5.8	63.7
New Jersey Experiment Station.	New Jersey	No. 5	Grade Shorthorn	7	356.6	4.5	15.88

Records of Purebred Cows.

The keeping of accurate records is perhaps of more importance to the owner and breeder of purebred stock than to dairymen who have nothing but grade and native cows in their herds. With the breeder of purebred stock the products of the dairy are often a secondary matter, his principal business being to breed and sell the animals. If he can present creditable records of the cows and heifers which he has for sale, as well as those of their ancestors for some years before, naturally these will assist in advertising and selling his stock. It was the aim of the writer to collect records of purebred cows of various breeds under a variety of conditions of soil and climate, and it is believed that the results obtained are of some value, not only to the dairyman, but to the breeder as well.

RECORDS OF PUREBRED HERDS FOR ONE YEAR.

In the following table are summarized data relating to a large number of purebred herds as secured direct from dairymen. This includes some information in addition to milk and butter records, and should give some light to those seeking dairy knowledge.

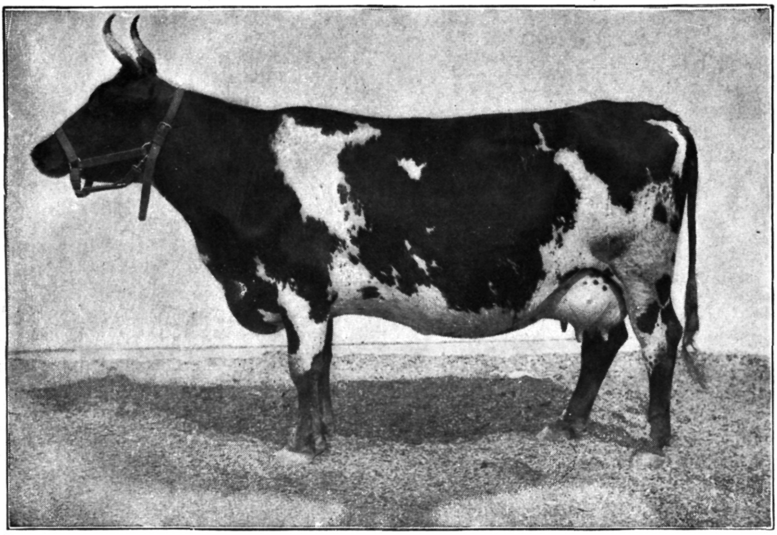


FIG. 1.—PUREBRED AYRSHIRE COW DURWOOD 12680.

Official record, 10,701 lbs. milk, 433.7 lbs. butter fat, in 1 year.

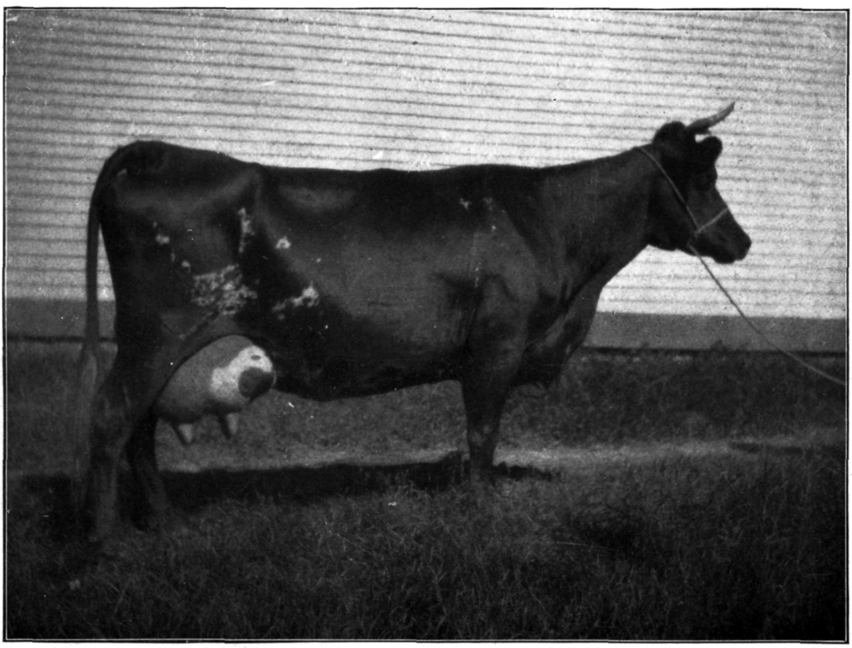


FIG. 2.—PUREBRED AYRSHIRE COW MISS OLLIE 12039.

Best year's record, 9,924 lbs. milk, 440.6 lbs. butter fat, 4.44 average per cent of fat; best month's record, 77.2 lbs. butter fat; best week's record, 364.2 lbs. milk, 15.3 lbs. butter fat, 4.2 average per cent of fat; best day's record, 56 lbs. milk, 2.57 lbs. butter fat, 4.59 average per cent of fat. Average for 6 years, 8,168 lbs. milk, 355.4 lbs. butter fat, 4.35 average per cent of fat.

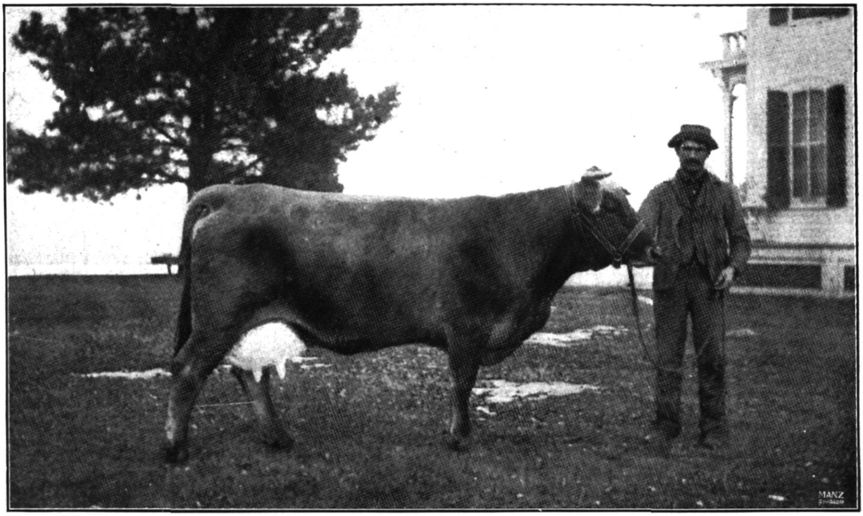


Fig. 1.—Purebred Brown Swiss Cow Kaiserin 850.

Best year's record, 10,295 lbs. milk, 400 lbs. butter fat, 3.89 per cent fat. Weight 1,460 lbs.

Fig. 2.—Grade Red Polled Cow Lady.

Record for the year ended October 14, 1903, 13,403.7 lbs. milk, 549.1 lbs. butter fat, equal to 640.6 lbs. butter. The net profit returned by her for this period was $88.49. She was placed on an official test by the Illinois Experiment Station on January 9, 1904. Thirteen days after calving and during the following 7 days she produced 406.1 lbs. milk, 17.566 lbs. fat. The best day's record for fat was 2.69 lbs.

Milk and butter records of purebred herds for one year, as reported by dairymen in various States.

Owner.	State.	Number of cows.	Average age.	Breed.	Cost of keeping cow.	Average annual production. Milk.	Average annual production. Butter.	Average fat in milk.
			Yrs.			*Lbs.*	*Lbs.*	*P. ct.*
John P. Buckley	Me	25	6	Ayrshire	$60.00	6,500	280	3.8
W. P. Schauck	N. Y.	35	4	do	47.00			4.2
Geo. C. Clark	N. H.	15	4½	do	35.00	6,480	300	
Geo. H. Yeaton	N. H.	18	7	do	70.00	7,100	301	3.6
L. S. Drew	Vt	22	8	do	40.00	6,000	300	
E. B. Sherman	R. I	75	5	do				3.0
C. A. Abell	Vt	13	4	do	35.00			3.9
E. A. Holt	N. H.	20	7	do				
Melrose Farm	Va	32	7	do	50.00	5,545	243	3.76
L. D. Stowell	N. Y.	40	5	do	35.00	7,000	300	
E. J. Fletcher	N. H	25	4	do	40.00	7,000		4.9
J. F. Butterfield	Pa	15	4⅓	do	30.60		250	4.25
E. F. Pember	Me	30	6	do	40.00	6,000	300	4.25
W. V. Probasco	N. J.	15	7	do	43.00	7,377	347	4.2
C. M. Winslow	Vt	30	5	do	50.00	7,183	320	3.82
C. H. Hayes & Son	N. H.		6½	do	30.00	6,000	259	3.7
Hull Bros	Ohio	10	5	Brown Swiss		6,681		
M. W. Oliver	Pa	10	8	Devon	26.00	5,100	250	4.3
L. V. McWhorter & Sons.	Wash	9	5	North Devon	16.00	a 1,849		
J. W. Swab	Ohio	37	5	Dutch belted	32.00	5,840		3.6
Howard P. Tuttle	Conn	18		Guernsey	59.00	4,598		5.54
L. V. Axtel	Ohio	35	5	do	40.00	7,000	375	5.0—
J. G. Hickcox	Wis	15	5	do		7,000	350	
J. C. Chambers	Mich	25	6	do	30.00	8,000–10,000		5.0
Chas. Solveson	Wis.	25	6	do	35.00	6,400	370	5.0
Ezra Michener	Pa	20	6	do	50.00	7,000	390	5.0
E. P. Turner	Me	18	6	do		4,610	275	5.0
B. Clark & Son	Wis	19	5	do	40.00–45.00	6,000	325	5.0
A. E. Pelton	Iowa	14	6	do	24.75		300	4.0
F. B. Fargo	Wis	45	4½	Holstein	45.00–50.00	6,000–10,000	225–375	
Isaac Dalrymple	N. Y.	30	5	do		8,000		
McKay Bros	Iowa	30		do		8,500	335	3.4
State Hospital	Vt	45	7	do	35.00	7,600		
J. H. D. Whitcomb	Mass	60	6	do	50.00–75.00	10,000–12,000		3.9
W. H. Grenell	N. Y.	40	4	do	35.00		275.	3.8
Nick Grimm	Wis	22	6	do	30.00	8,000		3.5–3.8
W. O. Jackson & Sons	Ind	31	3	do	30.00		430	3.5
J. H. Coolidge & Sons	Ill	25	5	do	30.00–35.00	8,500–9,000		3.6
W. C. Hind	N. Y.	70	5	do		10,000	375	
W. M. Benninger	Pa	16	5	do	50.00	10,000	450	4.0
E. E. Randall	Wis	35	4	do	35.00	14,000		3.7
Knapp & Pierce	Ohio	30	4	do	30.00	10,000		3.8
C. D. Holt & Son	Wis	35	5	do		4,500	200	
I. L. Curtis	Wis	15	5	do	30.00		350	3.6
W. B. Smith & Son	Ohio	90	5	do	55.00	9,850		
A. B. Chase	N. Y.	28	6	do	51.00	7,500	328	
A. A. Cortelyou	N. J.	110		do	60.00	7,000–12,000		3.7
The Stevens Bros.-Hastings Co.	N. Y.	150		do	45.00–50.00	8,000–12,000		
Gardner & Misner	N. Y.	25	5	do	50.00	9,304	370	3.4
W. R. Gates	Wis	14	5	do	35.00	8,000	300	3.5
J. B. Irwin	Minn	20	4	do	50.00	10,000	400	3.45
J. H. Mead	Vt	14	6	do	72.00	14,000		
S. Mather & Sons	N. Y.	32	5	do	40.00	8,326	355	3.66
F. W. Allis	Wis	40	4½	do		7,507	263	
W. H. Jones	Wis	30	5	do	27.00	10,000	430	3.7
Gillett & Son	Wis	20	4½	do	40.00–50.00	11,515		3.6
C. F. Stone	Kans	15	6	do	22.00	10,500		
E. J. Burrell	N. Y.	150	7	do	38.00	6,500		
Thos. Fassitt & Sons	Md	23	7	do	30.00–35.00	6,000–10,000		3.5–3.8
F. G. Johnston	Ohio	16	5	do	50.00	8,000	345	3.7
Don J. Wood	N. Y.	33		do		7,664		
A. J. Daugherity	Ill	100	5	do	50.00	12,000	500	3.4–4.0
Eastern Mich. Asylum	Mich	59		do	50.00	9,768		
Pierce Land and Stock Co.	Cal	150	5	do	30.00	10,000	430	3.7
A. W. Brown	N. Y.	36	4	do		8,128	332	3.5
Wm. B. Goodrich	Iowa	15	5½	Jersey	35.00	6,570	398	5.2
G. H. Sweet	N. Y.	22	7	do	68.00	6,550	405	5.3
R. W. Ellis	Me	24	5	do	30.00	5,000	300	5.25
David Roberts	N. J.	70	6	do	50.00	5,650		5.5
W. R. Spann	Tex	60	6	do	32.50		389	5.0
Biltmore Farms	N. C.	130	8	do		5,365	383	

a Average of 5 cows for four months (not counted in general average).

Milk and butter records of purebred herds for one year, as reported by dairymen in various States—Continued.

Owner.	State.	Number of cows.	Average age.	Breed.	Cost of keeping cow.	Average annual production.		Average fat in milk.
						Milk.	Butter.	
			Yrs.			*Lbs.*	*Lbs.*	*P. ct.*
The Billings Farm	Vt	26	.....	Jersey	$48.00	6,325	402	5.45
E. R. Hicks	Wis	40	6	do	50.00	7,280	467	5.5
Reform School	Pa	21	5	do	....	5,037	289	4.9
G. V. Saffarrans	Mo	20	6	do	25.00	....	400	5.2
Windemere Herd	Me	25	6	do	50.00	4,800-6,000	300-350	5.4
W. L. Bradbury	Va	10	6½	do	35.00	5,548	353	5.45
G. V. Woollen	Ind	20	5	do	40.00	5,000	....	5.0
Joseph Mailliard	Cal	250	7	do	45.00	4,800	300	....
T. F. Marston	Mich	70	6	do	45.00	6,000	385	5.5
J. K. Honeywell	Nebr	30	6	do	34.00	5,994	319	....
F. L. Davis	Vt	20	4	do	46.50	6,000	340-365	....
H. C. Young	Nebr	34	5	do	35.00	5,000	290	5.0
Austin Leonard & Son	Pa	19	6	do	40.00	5,160	300	5.0
S. H. Joiner	Wis	12	8	do	35.00	6,000	364	5.2
D. H. Olds	Ohio	100	5	....	35.00	5,000	....	5.0
W. J. Hussey	Ohio	35	5	Jersey	35.00	4,000	240	5.3
M. A. McDonald	Ind	50	3	do	35.00	....	350	5.0
D. A. Jordan	Ind	25	6	do	32.00	5,000	275	5.0
John F. White	N. Y.	250	6	do	50.00	6,500	395	5.2
W. Gettys	Tenn	50	6	do	45.00	....	300	5.0
J. A. Middleton	Ky	27	4	do	60.00	4,523	....	5.0+
E. B. Cooper	Mo	30	6	do	....	3,000	....	5.0
A. F. Peirce	N. H.	25	5	do	50.00	6,000	380	5.44
M. M. Offutt	Tex	10	4	do	40.00	6,000-7,000	350-400	5.0
O. B. Yates	N. Y.	8	5	do	....	5,620	341	5.2
M. H. Olin	N. Y.	59	6	do	37.00	....	383	5.4
F. G. Craft	Ind	20	5	do	30.00	4,750	295	5.4
C. LeB. Homer	Pa	29	4	do	....	7,500	....	5.0
A. O. Auten	Ill	60	7	do	48.50	....	300	5.04
N. H. Robinson	Wis	24	7	do	34.50	7,176	470	5.77
C. O. McAhron	Mo	7	7	do	30.00	4,790	....	5.5
A. M. Stevens	Wash	13	5	do	....	6,765	469	....
L. P. Bailey	Ohio	40	....	do	40.50	5,200	....	5.35
H. R. Ihrie	Miss	35	3	do	36.00	4,000	350	....
A. H. Cooley	N. Y.	40	7	do	....	8,000	....	5.2
W. & I. Mekeel	N. Y.	26	5	do	40.00	5,153	332	5.5
F. H. Scribner	Wis	21	7	do	35.00	7,665	....	5.6
F. E. Dawley	N. Y.	40	6	do	36.00	7,060	408	5.1
Estate of A. Chisholm	Cal	18	6	do	30.00	5,500	400	....
J. W. Martin	Wis	48	6	Red Polled	35.00	6,000	300	4.4
P. G. Henderson	Iowa	22	10	do	30.00	5,713	270	4.1
Frank Hartline	Ohio	9	5	do	....	7,000-10,000	355	....
Calvin Lovett	Mich	28	7	Shorthorn	20.00	7,000	300	....
J. K. Innes	N. Y.	60	7	do	42.00	6,800	299	....

The annual cost of feeding a cow ranged, with 95 dairymen reporting, from $16 to $75, the average being $40.36. The average of the milk yield reported by 99 dairymen was 7,093.1 pounds, and the average butter yield reported by 78 dairymen was 341.2 pounds. It should be remembered that most of these dairymen practiced up-to-date methods, were careful feeders as well as breeders, and kept careful records of their work. These records present a great contrast to those reported under creamery-patron investigations.

RECORDS OF PUREBRED HERDS FOR SERIES OF YEARS.

These records, one of which has been continuous for twenty-five years, show the possibilities of maintaining a herd at a high standard of production, this being done largely by raising the best heifer calves from the best cows. Owing to lack of space, only one record of each breed can be presented here for illustration.

Milk and butter-fat records of purebred herds for series of years.

Owner.	Breed	Number of cows in herd.	Year.	Average milk yield.	Average fat in milk.	Average yield of butter fat.
				Pounds.	*Per cent.*	*Pounds.*
C. M. Winslow, Vermont	Ayrshire	10	1880	6,035		
		11	1881	6,176		
		9	1882	6,672		
		15	1883	6,168		
		16	1884	6,814		
		11	1885	7,025		
		16	1886	6,238		
		16	1887	5,782		
		16	1888	6,356		
		15	1889	5,836		
		17	1890	5,480		
		14	1891	5,971		
		12	1892	6,249	4.23	264.3
		10	1893	6,233	4.04	251.7
		19	1894	6,455	4.01	258.8
		17	1895	6,765		
		16	1896	7,289	4.0	291.5
		15	1897	7,228		
		19	1898	6,956		
		17	1899	6,180		
		22	1900	7,189	3.74	268.9
		15	1901	6,711	3.83	257.2
		11	1902	6,600	3.87	255.4
		20	1903	6,305	3.64	229.5
		15	1904	7,183	3.71	266.5
Average				6,476		260.4
E. M. Barton, Illinois	Brown Swiss	16	1896	6,812	4.09	278.6
		20	1897	6,503	3.64	236.7
		16	1898	7,813	3.94	307.8
		22	1899	6,785	3.95	268.0
Average				6,978	3.91	272.8
Levi P. Morton, New York	Guernsey	62	1892	6,119.8		
		83	1896	5,240.0	5.08	266.2
		35	1898	7 689.0	5.73	440.6
		5	1899	7,561.6	5.24	386.4
Average				6,652.6		364.4
S. Mather & Sons, New York	Holstein	36	1898	7,607.1	3.61	274.9
		30	1899	8,381.0	3.43	287.6
		31	1900	7,968.7	3.47	276.7
		35	1901	8,166.6	3.41	278.3
		33	1902	7,790.0	3.41	265.9
Average				7,982.7	3.47	276.7
A. E. Stevens, Washington	Jersey	12	1894-5	6,499.6	4.81	312.6
		11	1895-6	6,110.0	5.26	321.4
		12	1896-7	6,323.7	5.58	352.8
		12	1897-8	5,964.5	5.60	334.0
Average				6,224.4	5.30	320.2

RECORDS OF SINGLE PUREBRED COWS FOR ONE YEAR.

The value of accurate yearly records of the dairy performance of purebred cows can hardly be overestimated. These records are indispensable in determining the profit of a cow and her value from the breeder's standpoint. The data included in the following table will serve to answer the question frequently asked: "How much product of milk and butter can be expected from cows of the different breeds?" Naturally, with cows representing different families, kept under various conditions of soil and climate and treated very differently as to feed and management, there is a wide variation in the yield.

Milk and butter-fat records of single purebred cows for one year.

Breed.	Name of cow.	Age.	Milk yield.	Fat in milk.	Yield of butter fat.
		Years.	*Pounds.*	*Per cent.*	*Pounds.*
Ayrshire	Acelista	10	11,277	3.46	390.00
	Rena Myrtle		12,172	3.85	468.60
	Acelista		10,034	3.65	366.20
	Rose Deross 10347		10,645	4.61	490.30
	Lady Fox 9669		12,299	4.35	534.90
	Lukolela 12357		12,187	3.82	465.40
	Meewee 11130		11,252	4.32	486.00
	Xoa 11469		10,155	4.01	407.10
	Miss Olga 13984		10,096	4.17	420.90
	Princess Aldine 7815	10	14,200		
Brown Swiss	Bettschard's Laubi 717	11	10,750	3.92	421.60
	Julia B. 681		8,380	3.72	312.20
	Kaiserin 850		10,295	3.89	400.00
	Gelten 712		10,741	3.80	408.10
	College Becky 1859		10,156	3.85	391.10
Devon	Vesta	9	4,038		
	Lisa	7	4,652		
	Zoe	7	4,097		
		5	6,013		
	Lady Alice		9,038	4.28	388.30
Guernsey	Yeksa Sunbeam 15439	9½	14,921	5.74	857.15
	Imp. Pretoria 14443	4¾	11,529	5.30	595.35
	Portia of Maplehurst 10071	4	11,623	5.29	602.37
	Vestella of Belle Vernon 12500	3¾	10,064	5.53	550.21
	Dolly Bloom 12770	3½	12,675	5.01	623.94
	Sister Sue of Mossgiel 17480	2½	10,622	5.53	582.37
	Imp. Itchen Daisy 3d 15630	2	9,959	5.39	533.83
Holstein	Aaggie 2d	5¾	20,763		
	Princess of Wayne	12	29,009		
	Clothilde	6½	26,052		
	Clothilde 2d	4⅔	23,603		
	Boutje	7½	21,679		
	Pietertje 2d	9¾	30,318		
	Belle Sarcastic 23039		23,190	3.11	721.68
	Houwtje D. 12005		19,025	3.47	660.20
	Johanna 5th Clothilde	6	16,452	3.83	630.02
	Lilith Pauline De Kol 43434	5	19,061	3.24	617.36
	Beryl Wayne 32496	7	17,166	3.50	600.77
Jersey	Oneida 2d		10,171	5.53	562.71
	Merry Maiden		10,488	5.61	588.51
	Sophona		9,060	6.05	548.47
	Oonan 11th	4⅝	9,138	5.46	498.07
	Tonona 9th	2⅛	8,034	5.63	452.43
	Oonan 25th	3 5/12	8,274	5.38	445.38
	Tonona 12th	2	7,990	5.33	425.96
	Sophie 10th	6 1/12	8,683	5.51	478.62
	Oneida		12,735	4.37	556.10
	Kathletta's Fancy		11,784	4.94	581.79
	Miss Helen Brice		10,980	5.02	550.79
	Ida of Glendale	6	13,475	4.71	634.38
	Edith's Faith	10	8,254	7.03	579.91
	Dots Lily		9,460	6.10	577.00
Red Polled	Nera N-5 3505		12,204	3.85	469.80
	Duchess of Wis 5		11,015	3.90	429.58
	Ruby Twin	1	10,239	5.18	530.40
	Mayflower 2d		10,458	4.47	468.00
	Susie		11,023	6.83	422.60
Shorthorn	Mamie Clay 2d		10,315		
	Maud		10,100	4.15	419.00
	Lady Knightly 15th		9,711	3.59	348.60
	Pansy of Stanton 35th		10,055	3.89	391.10
	College Moore		8,450	4.13	349.20
	Reward of Nora's Duke		9,327	4.13	385.10

It is of interest to note the uniformly good records of certain families of cows—for example, the Johanna family of Holsteins, given below. The old adage "like produces like" is demonstrated here. Dairymen who have unusually good cows should make the most of them in building up a herd of large producers, and should consider carefully their value when tempting offers are made. Many a dairyman's success in building up a good herd is due to one or two extraordinary cows which were his foundation stock.

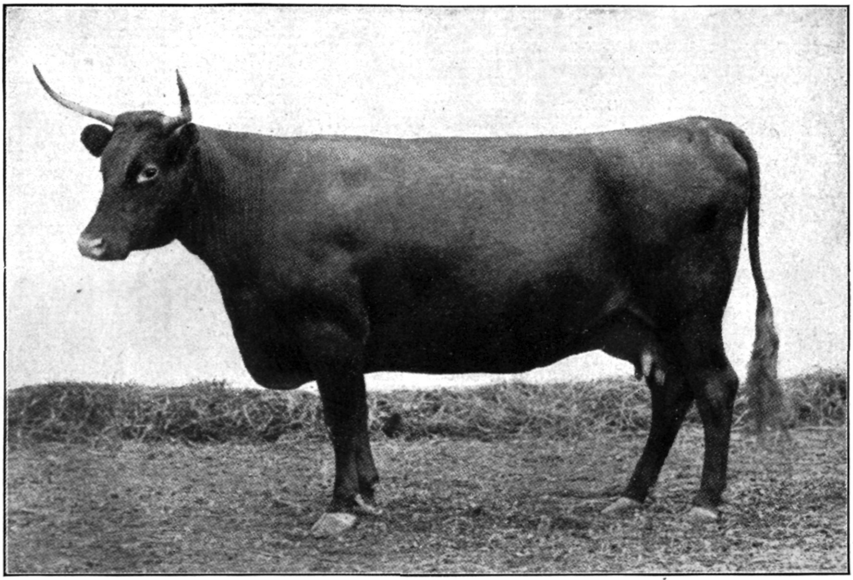


FIG. 1.—PUREBRED DEVON COW PRETTY PET 10579.

First prize and sweepstakes three-year-old at the Pan-American Exposition, Buffalo, 1901.

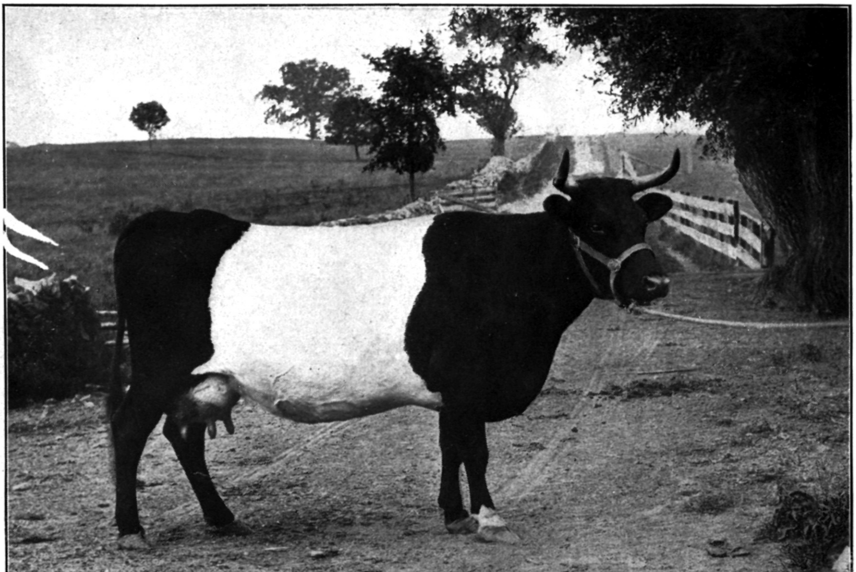


FIG. 2.—PUREBRED DUTCH BELTED COW LADY CLARENCE 2D 545.

Record, 8,670 lbs. milk in 1 year.

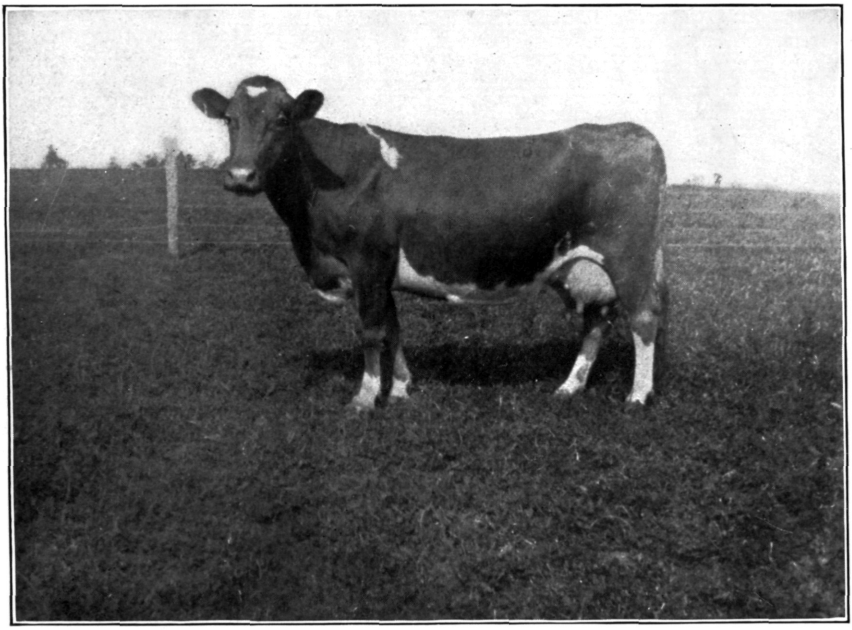


FIG. 1.—PUREBRED GUERNSEY COW YEKSA SUNBEAM 15439, ADV. R. 331.

Official year's record, 14,920 lbs. milk, containing 857.15 lbs. butter fat, equal to 1,000 lbs. butter.

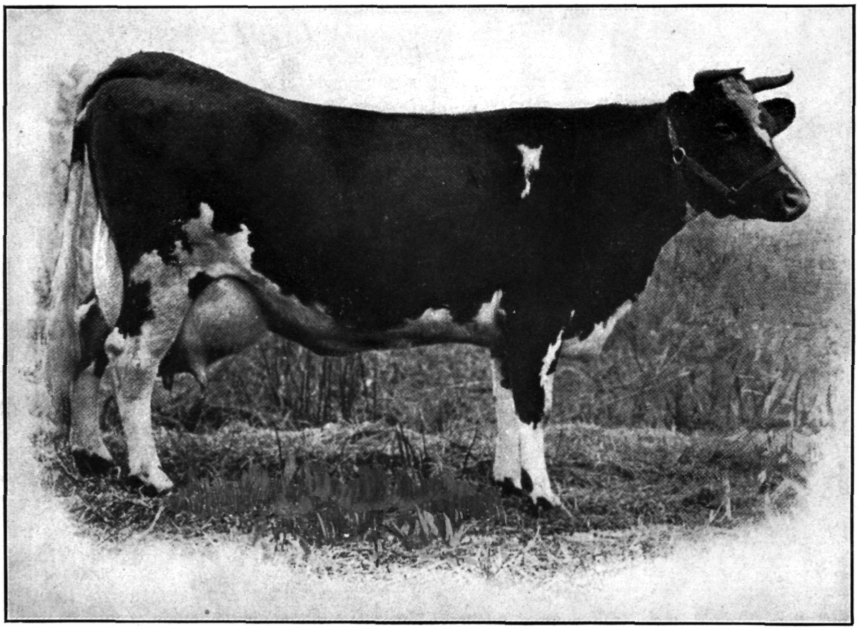


FIG. 2.—PUREBRED GUERNSEY COW AURICULA 2D 12209.

Best year's record, 13,411.6 lbs. milk, 605.5 lbs. butter fat, 4.51 per cent butter fat. Average yield of milk for 5 years, 11,281.3 lbs.

Milk and butter-fat records of single purebred Holstein cows of the Johanna family for one year.

Owner.	Name of cow.	Age.	Time in milk.	Milk yield.	Average fat in milk.	Butter fat yield.
		Yrs.	*Mos.*	*Lbs.*	*Per ct.*	*Lbs.*
Gillett & Son, Wisconsin	Johanna Rue	8	12	20,340.4	3.46	704.00
	Johanna Rue 2d	6	12	18,288.9	3.62	662.70
	Johanna 5th Clothilde	6	12	16,452.1	3.83	630.02
	Johanna De Kol	4	10	13,760.4	3.73	513.30
	Johanna Aaggie	4	11	16,102.1	3.81	613.00
	Johanna De Kol 2d	2	10½	11,944.4	3.67	438.40
	Johanna de Pauline	2	10½	11,058.7	3.74	413.60
	Duchess Clothilde	5	12	16,499.8	3.40	560.90
	Colantha 4th	3	11⅓	14,951.5	3.86	577.20
	Johanna 4th	10	12	14,946.5	3.50	523.12
	Johanna 5th	4	12	16,186.3	......	......
	Johanna May	6	10	12,176.7	......	......
	Johanna Clothilde	4	11½	13,467.0	4.08	549.50
	Johanna Rue 3d	3	12	15,416.4	3.61	556.50
	Johanna Rue 4th	2	10½	11,285.6	3.49	394.00
	Johanna De Kol 3d	2	12	10,675.1	3.59	383.40
	Johanna Ruth	2	12	12,178.0	3.95	481.00
	Johanna de Colantha	2	12	12,787.0	3.88	496.10
	Johanna Colantha	4	12	13,428.8	3.82	512.90
	Colantha 4th's Johanna	4	12	19,309.3	3.59	693.20

RECORDS OF SINGLE PUREBRED COWS FOR SERIES OF YEARS.

These records give examples of persistency in milk production and show that a cow's period of usefulness may extend over eight or ten years and even longer.

Milk and butter-fat records of single purebred cows for series of years.

Owner.	Breed.	Name of cow.	Age.	Year.	Time in milk.	Yield of milk.	Fat in milk.	Yield of butter fat.
			Yrs.		*Days.*	*Lbs.*	*P. ct.*	*Lbs.*
L. S. Drew, Vermont.	Ayrshire	Sheba 11931	2	1894	130	2,324.00	4.35	101.10
		....do	3	1895	360	5,809.00	5.00	290.50
		....do	4	1896	300	6,121.00	5.14	314.60
		....do	5	1897	247	7,117.00	4.43	315.30
		....do	6	1898	290	6,973.00	4.11	286.60
		....do	7	1899	304	9,043.00	4.11	371.70
		....do	8	1900	304	7,812.00	4.15	324.20
		....do	9	1901	291	7,733.00	4.02	310.90
		....do	10	1902	289	6,025.00	3.27	197.10
		....do	11	1903	272	5,477.00	3.93	215.10
		....do	12	1904	254	5,440.00	3.95	215.10
		Average	......	......	......	6,352.00	4.21	267.50
	....do	Nancy B. 9581	7	1894–95	345	7,831.00	3.90	305.50
		....do	8	1895–96	293	6,068.00	4.06	246.60
		....do	9	1896–97	356	8,782.00	4.06	356.80
		....do	10	1897–98	268	7,662.00	3.80	291.00
		....do	11	1898–99	333	8,344.00	4.00	333.80
		....do	12	1899 1900	317	7,776.00	3.75	291.60
		....do	13	1900 1901	339	9,161.00	3.74	342.30
		....do	14	1901–2	288	5,692.00	3.71	211.10
		....do	15	1902–3	317	5,610.00	3.81	213.80
		Average	......	......	......	7,436.00	3.87	288.10
C. M. Winslow, Vermont.	....do	Acelista	6	1900	......	9,354.00	3.58	335.20
		....do	7	1901	......	9,330.00	3.76	350.60
		....do	8	1902	......	9,090.00	3.64	330.80
		....do	9	1903	......	9,843.00	3.38	332.60
		....do	10	1904	......	11,268.00	3.53	397.80
		Average	......	......	......	9,777.00	3.57	349.40

Milk and butter-fat records of single purebred cows for series of years—Continued.

Owner.	Breed.	Name of cow.	Age.	Year.	Time in milk.	Yield of milk.	Fat in milk.	Yield of butter fat.
			Yrs.		*Days.*	*Lbs.*	*P. ct.*	*Lbs.*
E. M. Barton, Illinois.	Brown Swiss	Flawyl	7	1896	......	9,067.00	4.10	371.30
		.....do	8	1897	......	6,936.00	3.77	261.60
		.....do	9	1898	......	9,207.00	3.72	342.70
		Average				8,403.30	3.87	325.20
	.....do	Bettschard's Laubi	9	1896	......	7,114.00	4.21	299.80
		.....do	10	1897	......	6,605.00	3.94	260.20
		.....do	11	1898	......	10,750.00	3.92	421.60
		Average				8,156.30	4.01	327.20
E. W. Strawbridge, New Jersey.	Guernsey	Auricula 2d			......	8,194.00	......	....
		.....do	4	1901–2	......	10,070.00	......	....
		.....do	5	1902–3	......	12,077.00	......	....
		.....do	6	1903–4	......	12,654.20	4.40	555.60
		.....do	7	1904–5	......	13,411.60	4.51	605.50
		Average				11,281.20	......	....
C. L. Hill, Wisconsin.	.....do	Lady Bishop	5	1896	......	5,555.30	5.11	284.00
		.....do	6	1897	......	6,346.20	5.40	342.50
		.....do	7	1898	......	6,823.20	5.43	370.80
		.....do	8	1899	......	7,064.00	5.85	413.20
		.....do	9	1900	......	6,157.10	5.28	325.10
		Average				6,389.20	5.43	347.10
New Jersey Experiment Station.	Holstein	Hilda	.....	1898	......	6,588.10	4.20	273.74
		.....do	.....	1900	......	7,172.40	3.80	270.25
		.....do	.....	1901	......	10,119.20	3.80	387.83
		.....do	.....	1902	......	9,782.00	3.75	366.37
		.....do	.....	1903	......	8,511.30	3.50	298.81
		Average				8,434.60	3.78	319.40
Wisconsin Experiment Station.	.....do	Alma	.....	1899	......	9,102.60	3.22	292.93
		.....do	.....	1900	......	10,811.40	3.34	360.57
		.....do	.....	1901	......	10,732.20	3.15	432.98
		.....do	.....	1902	......	10,195.00	3.08	313.66
		Average				10,960.30	3.19	350.03
Minnesota Experiment Station.	Jersey	Champion's Sweet Brier 3d.	.....	1892	......	7,057.00	5.10	359.90
		.....do	.....	1893	......	7,094.00	5.00	354.70
		.....do	.....	1894	......	4,744.00	4.90	232.50
		.....do	.....	1895	......	8,426.00	4.98	419.60
		.....do	.....	1896	......	6,364.00	5.00	318.20
		.....do	.....	1897	......	7,594.00	5.35	406.20
		Average				6,879.80	5.07	348.50
Vermont Experiment Station.	.....do	Minta Bella 85578	4	1895–96	285	4,726.00	6.25	295.30
		.....do	5	1896–97	365	5,751.00	6.70	385.50
		.....do	6	1897–98	325	6,036.00	5.54	334.20
		.....do	7	1898–99	363	4,953.00	6.60	326.70
		.....do	8	1899–1900	344	6,860.00	5.72	392.20
		.....do	9	1900–1901	309	6,162.00	5.62	346.40
		.....do	10	1901–2	314	5,468.00	5.58	304.90
		.....do	11	1902–3	321	6,200.00	5.66	351.00
		Average				5,769.50	5.93	342.00
George H. Sweet, New York.	.....do	Pride's Olga 4th 96870.	4	1897–98	284	9,509.60	......	....
		.....do	5	1898–99	290	10,698.70	......	....
		.....do	6	1899–1900	330	11,888.30	......	....
		.....do	7	1900–1901	223	6,677.90	......	....
		.....do	8	1901–2	248	9,791.00	......	....

Milk and butter-fat records of single purebred cows for series of years—Continued.

Owner.	Breed.	Name of cow.	Age.	Year.	Time in milk.	Yield of milk.	Fat in milk.	Yield of butter fat.
			Yrs.		*Days.*	*Lbs.*	*P. ct.*	*Lbs.*
George H. Sweet, New York.	Jersey	Pride's Olga 4th 96870.	9	1902-3		10,185.30		
		.....do	10	1903-4		9,759.10		
		.....do	11	1904-5	223	8,095.70		
		Average				9,575.70		
J. K. Innes, New York.	Shorthorn	Jennie Lee		1902-3	336	8,153.90		
		.....do		1903-4	304	8,758.60		
		.....do		1904	115	4,610.30		
		Average				7,174.27		
Utah Experiment Station.	.....do	No. 1	4	1894-95	334	5,159.00	3.04	156.70
		.....do	5	1895-96	280	4,501.00	3.06	137.70
		.....do	6	1896-97	322	7,228.00	3.35	242.30
		.....do	7	1897-98	291	6,309.00	3.14	198.00
		.....do	8	1898-99	214	5,870.00	3.35	196.70
		Average				5,813.40	3.20	186.28

SOME REMARKABLE LONG-PERIOD RECORDS.

A purebred Ayrshire cow, Crocus No. 3400, owned in Portsmouth, N. H., made an average milk record for twelve years of 7,082 pounds and for fifteen years of a little over 6,000 pounds. She lived until 17 years of age, and her total milk product amounted to over 45 tons, or 5,000 Boston cans of 8½ quarts each.

Another purebred Ayrshire cow, Annie Bert, owned at Hickory Hill Farm, New Hampshire, gave in twelve years 90,389 pounds (over 45 tons) of milk and 3,906 pounds of butter.

A proprietor of a dairy farm in New York makes the following statement regarding the dairy performance of a Jersey cow in his herd, Pride's Olga 4th:

The total number of days she has milked since she dropped her first calf has been 2,257, and the total amount of milk given in that time has been 76,605.64 pounds, which means an average of 33.94 pounds of milk per day.

A New Jersey dairyman gives the following statement regarding the dairy performance of a purebred Holstein cow owned by him:

Quite a remarkable cow in our herd is Susie De Kol, a registered Holstein-Friesian cow, and possibly one of the strongest bred in the De Kol lines of any cow living at the present time. She has given birth to ten calves—seven heifers and three bulls—all of which are living. She came to Bloomingdale after her second calf, and has been in milk here seven years, and during that time she has given 81,284 pounds of milk, or 40 tons and 1,284 pounds, equal to about 36,475 quarts, which at an average price of 3 cents per quart would give $1,093.25. She has been officially tested three times. In 1899 she gave 19.84 pounds butter in seven days; in 1900 she gave 24.31 pounds butter; in 1901 she gave 474.48 pounds milk and 25.3 pounds butter, her milk averaging 4.26 per cent fat during the test. She has five daughters and several granddaughters that have advanced registry records.

The University of Missouri reports that a registered Jersey cow, Hope of Ramapo, at that institution, brought $1,341.72 into the school treasury during seventeen years through the sale of her butter, milk, and calves. Her record for this period is 78,585 pounds of milk, 4,147 pounds of butter, and 15 calves.

Such records as the above show the possibilities of production from a good cow. Many farmers who keep a cow a year to raise a $15 or $20 calf think they have done well, but such profits do not compare with those of the dairyman.

RECORDS OF PUREBRED COWS FOR SHORT PERIODS.

The records of purebred cows for short periods presented in the accompanying table will serve to show the possibilities of production when animals are carefully bred and fed and managed with the view of securing maximum yields.

Milk and butter-fat records of purebred cows for short periods.

Breed.	Name of cow.	Age.	Time.	Yield of milk.	Fat in milk.	Yield of butter fat.
		Years.	*Days.*	*Pounds.*	*Per cent.*	*Pounds.*
Ayrshire	Miss Ollie		1	54.96	4.70	2.58
	Mary 2d		1	70.00		
	Miss Olga 13984	4	7	333.50	4.30	14.34
	Lukolela 12357	6	7	428.50	3.80	16.28
	Annie Bert 9670		7	333.20	4.20	13.99
Brown Swiss	Brienzi 168		3	245.10	3.81	9.33
	Bettschard's Laubi	12	1	56.80	4.27	2.43
	do	12	7	361.00	3.92	14.15
Devon	Songstress 2d	6	1	51.00	4.00	2.04
	Lady Alice		7	347.00	4.00	13.88
Guernsey	Queen Deette 9794	4½	7	413.10		16.22
	Imp. Princess Rhea 15479	7½	7	349.10		16.06
	Mentor Maid 13261	4	7	299.90		16.02
	Cecchina 11694	4	7	300.40		13.52
Holstein	Pietertje 2d 3273	9¾	1	112.40		
	Princess of Wayne	11⅝	1	113.10		
	Gelsche 173	7	1	100.00		
	Rosa Bonheur 5th 11227		1	106.00	2.89	3.06
	Aaggie Cornicopia Pauline 48426	2½	1	86.00		
	Lilith Pauline De Kol 43434	4	1	100.85		
Jersey	Emma's Pearl		1	53.50		
	Effie of Jefferson		1	56.00		
	Pride's Olga 4th		1	65.30		
	Countess Matilda	6⅔	7	270.20	6.28	16.96
	Figgis 76106	11	7	293.40	5.49	16.10
	Bluster's Pip	6⅔	7	307.40	5.21	16.02
	Betsona's Khedive le Gros	10⅝	7	282.00	5.50	15.51
Red Polled	Chloe	8	7	201.70		8.41
	Glee 4927		1	34.34	4.71	1.62
	Popsey 3d	6	1	57.40	3.77	2.16
	Average of 7 cows		1	37.92		1.55
	Lady of Tittleshall		1	40.84	4.43	1.81
Shorthorn	College Moore		7	258.50	4.51	11.66
	Kitty Clay 4th		30	1,592.90	3.34	53.31
	Kitty Clay 3d		30	1,230.60	3.49	43.03
	Reward of Nora's Duke		30	1,145.50	3.97	45.51

RECORDS OF TWO NOTED DAIRY COWS.

The purebred Holstein cow Shadybrook Gerben (pl. 8, fig. 1) was the leader for all breeds at the St. Louis dairy contest (1904) in total production of milk and butter fat. She was but twelve days in milk when the test began. During the one hundred and twenty days she

FIG. 1.—PUREBRED HOLSTEIN COW SHADYBROOK GERBEN 43753.

Leading Holstein cow in World's Fair dairy demonstration, St. Louis, 1904. Record for 120 days, 8,101.7 lbs. milk, 282.601 lbs. butter fat, 3.5 per cent butter fat.

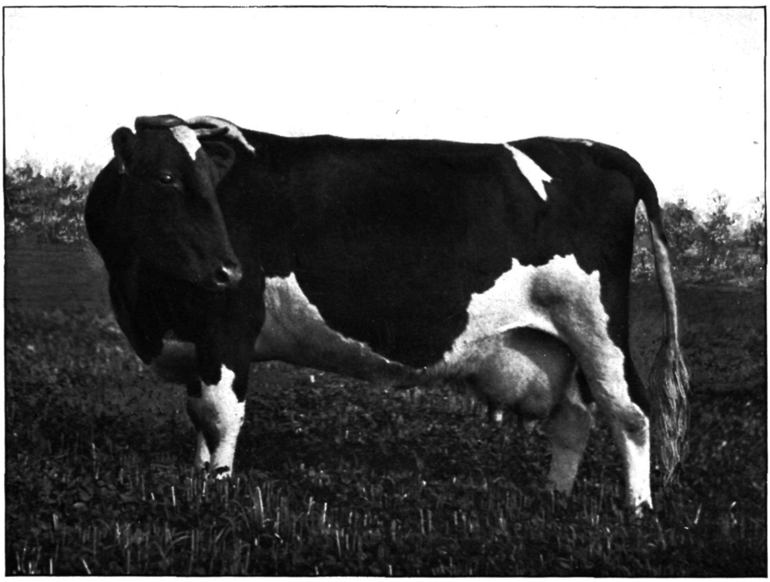


FIG. 2.—PUREBRED HOLSTEIN-FRIESIAN COW SADIE VALE CONCORDIA 32259.

Records, 694.3 lbs. milk, 24.51 lbs. butter fat in 7 days; 2,752.6 lbs. milk, 98.94 lbs. butter fat in 30 days; 5,093.6 lbs. milk, 176.42 lbs. butter fat in 60 days.

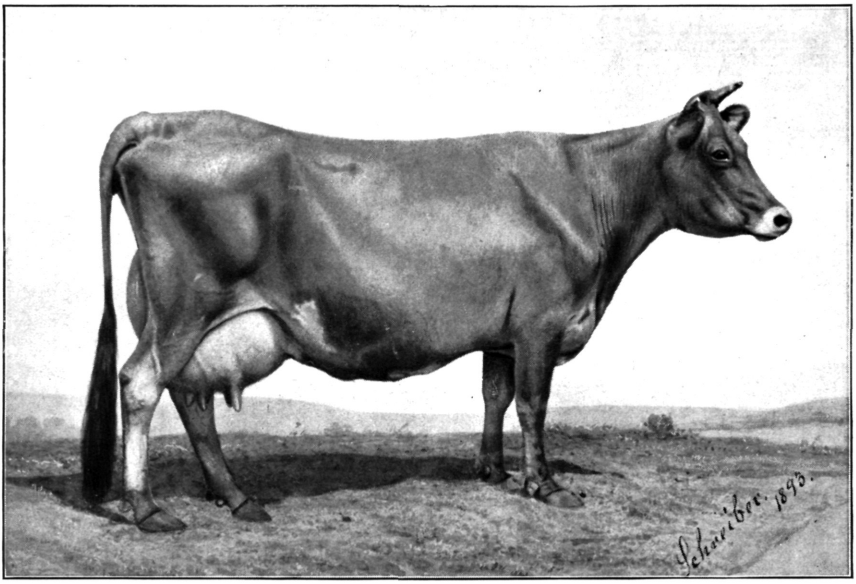


FIG. 1.—PUREBRED JERSEY COW BROWN BESSIE 74997.

Champion butter cow at World's Fair, Chicago, 1893. Record for 90 days, 3,634 lbs. milk, 216.64 lbs. butter.

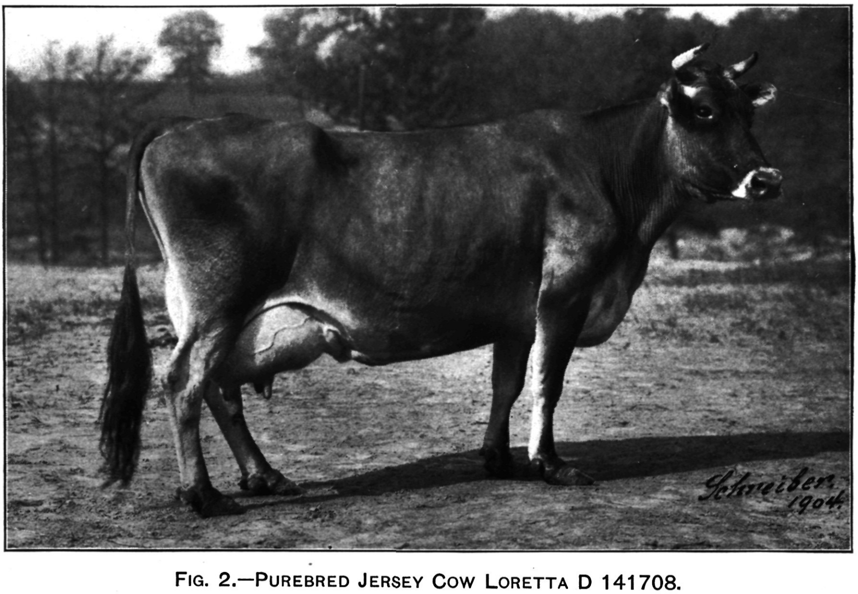


FIG. 2.—PUREBRED JERSEY COW LORETTA D 141708.

Champion cow in classes A and B, World's Fair dairy demonstration, St. Louis, 1904. Record for 120 days, 5,802.7 lbs. milk, 4.8 per cent fat, 330.03 lbs. estimated butter.

produced 8,101.7 pounds of milk, containing 282.601 pounds of fat and 620.534 pounds of solids not fat. The estimated butter yield was 330.361 pounds. The percentage of fat in the milk of Shadybrook Gerben was 3.48 and of solids not fat 7.65; the percentage of total solids 11.13. Her grain ration averaged 22.1 pounds a day, and the hay and other coarse feed 64.22 pounds a day. The average cost of her feed per day was 30.47 cents. Her milk yield averaged 67.5 pounds a day for the whole period of the test, she having started with a yield of 80 pounds a day. Her fat yield averaged 2.355 pounds a day, and her butter yield 2.753 pounds. It required 24.52 pounds of her milk to make 1 pound of butter. The cost of feed in 1 pound of butter was 11.07 cents.

The purebred Jersey cow Loretta D. (pl. 9, fig. 2) is a cow of exceedingly strong constitution and weighs 998 pounds. She is owned by the W. S. Ladd estate, Oregon. She was the leader in the dairy-cow demonstration at the Louisiana Purchase Exposition for demonstrating the economic production of milk and butter fat. At the beginning of the test she was 7 years and 8 months old, and had been seventy-one days in milk. During the one hundred and twenty days of the test she produced 5,802.7 pounds of milk, containing 280.161 pounds of butter fat and 522.895 pounds of solids not fat. The fat was officially estimated to equal 330.03 pounds of butter. From the date of her freshening to the end of the St. Louis test, April 10 to October 13, 1904 (one hundred and eighty-one days), she produced 9,214.7 pounds of milk, containing 416.64 pounds of fat, or a daily average of 49.3 pounds of milk, 2.23 pounds of fat, and 2.62 pounds of butter. The milk of this cow during the St. Louis test contained on the average 4.82 per cent of fat and 9.01 per cent of other solids, making the per cent of total solids 13.83. She was fed an average of 17.49 pounds of grain and 36.93 pounds of hay and silage per day at a cost of 26.65 cents a day. It required 17.58 pounds of her milk to make an estimated pound of butter. She averaged in butter value 68.75 cents a day and in net profit for production of butter 42.09 cents per day. She averaged in milk value 83.11 cents per day and in net profit for production of milk 56.45 cents per day. In March, 1902, when 5 years and 5 months old, she was put on a fat test for one year, during which she produced 9,241.1 pounds of milk, containing 516 pounds fat, verified by a representative of the Wisconsin Experiment Station. She has an official seven-day record of 17.24 pounds of butter fat.

CONCLUSIONS.

The discussions presented in the preceding pages may be briefly summarized as follows:

The scales and the Babcock test are essential requisites for every true dairyman.

One dairyman's cows may produce twice the yield and return double the profit of those of another with the same soil and the same market, simply because he uses greater intelligence in his business.

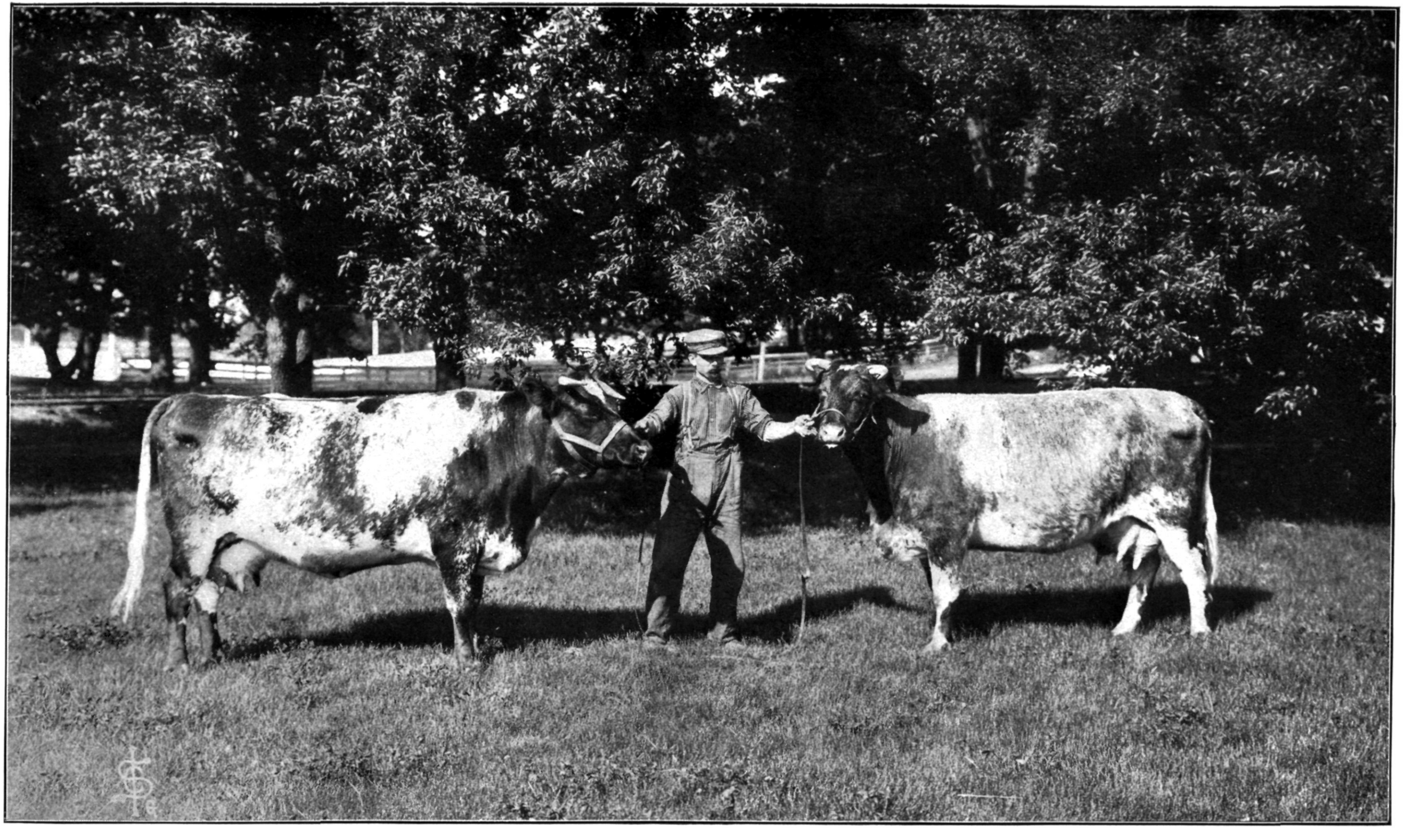
Records are valuable because they assist dairymen to distinguish the good from the poor cows, assist the feeder in preparing rations economically, give warning of the approach of sickness, and give inspiration to those who watch carefully for improvement.

Accurate and continuous records are necessary for best results. Examples show the impracticability of trying to determine the profitable cows by mere guesswork. One dairyman found the cow he had picked out for best to be fifth on his merit list when actual records were taken.

It is desirable that records of dairy animals include not only the dairy performance, but a concise history and description of each animal, and a record, at least of approximate accuracy, of the cost of the feed of every cow, so that the economy of production may be determined.

The time and expense required in keeping records is small compared with their value. In some instances one minute to a cow at each milking, or two minutes a day, has been found sufficient to record the weight of the milk and take the sample. On this basis, when milk is weighed and tested every seventh week, as is customary with some dairymen, only about one hour and thirty-eight minutes would be required yearly for each cow tested. With this amount of time expended a reasonably accurate record can be secured of every cow in the herd.

While daily records are best, various investigators have recommended methods of estimating the yearly production from a few weighings and tests, a number of which have proved practical and reasonably accurate. For example: The Wisconsin station recommends weighing and sampling the milk one day each week during the year; the Illinois station suggests weighing and sampling each cow's milk for fourteen consecutive milkings every seventh week; the Vermont station recommends that when only two tests of each cow's milk are to be made during the same lactation period in case of fall-fresh cows, the first test should be made eight to ten weeks after calving and the second test five and one-half to seven months; the Maryland station decides, after an exhaustive study of this question, that the seventh month in the lactation period would be the



PUREBRED SHORTHORN COWS IMP. ROSEMARY AND IMP. NONPAREIL.

Showing good types of dairy Shorthorns.

best to test the cow when only one test a year is made; when combinations of two tests are to be made at different periods, this station found that the third and eighth months would be best, and for a combination of tests during three months, the third, sixth, and eighth.

The average production of the dairy cows in the country is hardly up to the profit line. The average yield per cow in the year 1900 was reported to be 3,646 pounds of milk and 155 pounds of butter. Every dairyman should determine upon a standard for his herd which will yield him a good profit and work up to it by keeping a record of the quantity and quality of the milk product and the cost of production, and by systematically weeding out the herd. Examples are numerous where dairymen are doing this successfully.

The answers to 600 circulars sent to dairymen indicated that only a very small proportion made any attempt to keep records of their cows. Of the 200 replies received, 25 per cent stated that they did not keep records, and it is believed that a large proportion of the 400 who did not respond had no records to offer. A still smaller proportion was able to give the cost of keeping their cows.

Reports from dairymen as to the kind of cows kept indicated that where they selected a special breed they were more careful in the breeding and management of their cows and secured larger yields and greater profits than where there was a mixture and no single breed predominated.

Dairymen who were careful to supply an abundance of nutrients to their cows, even though they had to buy concentrated feeding stuffs to balance the ration, received the greatest profit for money expended for feed. Occasionally a farmer who raised such crops as clover, alfalfa, field peas, and cowpeas was able to balance his ration without the purchase of protein feeds.

Too often the carbohydrates in the rations were far in excess of what the cow could utilize in milk production, and this resulted in waste. In some cases cornstalks were fed to the stock dry and uncut, only a part being eaten. Where protein crops were grown to supplement the pasture, an increased milk yield and greater profit were secured. It was also shown that the silo assisted materially in reducing the cost of feed.

In some instances low records were due in part to the barns not being sufficiently warm, this resulting in a waste of nutrients. Too often dairymen provided no system of ventilation other than windows, holes in the floor over the stables, and hay chutes. Sunshine as well as pure air was frequently lacking. These conditions all have their influence upon milk production.

Good dairymen as well as poor ones seem to be in clusters. The influence of a few progressive dairymen who study their business and become intelligent in regard to it is shown in some communities. In others the example of those who do not read and study dairy methods is followed, and they are all ignorant together, and as a result they receive very little, if any, profit from their cows.

One reason for low records and lack of progress is that many dairymen do not avail themselves of the education in dairying and agriculture so cheaply offered to them by the dairy and agricultural papers, farmers' institutes, farmers' reading courses, experiment stations, agricultural colleges, etc. It has been clearly demonstrated that dairymen must get above average methods and average conditions to attain success, and must use business methods and avail themselves of the latest and best knowledge.

Cows producing good records are not confined to any one breed or locality or section of the country. The individuality of the cow and the care and treatment she receives have more influence than natural conditions or peculiar characteristics of the soil.

A cow's dairy performance can not be fairly judged from her record for a single year. Dairy cows have their "off years," and this must be considered when cows having poor records are being dropped from the herd. If this fact is not borne in mind, there is danger of selling the best cows.

Cows producing 5,000 pounds of milk and 200 pounds of butter annually are within the reach of every painstaking dairyman. A lower yield than this in most sections of the country leaves little or no margin for profit. It should be the constant aim of the dairyman to raise his standard.

Many dairymen make the mistake of keeping more cows than they can properly shelter and feed. It is more profitable to begin with a few well cared for than with a large number poorly fed and poorly sheltered. As a rule dairymen have cows enough in number, but their yield is too low. To increase the profit the product must be increased.

The fundamental steps to be taken in improving dairy herds may be stated as follows:

1. Take advantage of variation. While the tendency of nearly all cows raised is to become average cows, a number fall below and a few reach a yield of 500, 600, or even 700 pounds of butter.

2. Those above the average should be carefully selected and bred with care and judgment.

3. While the test must be used to detect variation and make selections, it is needed particularly to test the progeny, to determine whether the good qualities of the parent have been perpetuated, and to see if any improvement in the offspring has been made.

4. Feed, care, and management are of the highest importance. Having been carefully selected and having stood the test, the cows must be well fed and cared for if their good qualities are to be retained and improved.

GOVERNMENT ENCOURAGEMENT OF IMPORTED BREEDS OF HORSES.

By George M. Rommel, B. S. A.,
Animal Husbandman, Bureau of Animal Industry.

In the discussion of this subject the writer will consider what has been the Government's policy in the past, what is its policy at the present time, and what may be its policy in future, always keeping in mind the effect of these policies on the horse-breeding industry. As the tariff laws in this respect have been drawn to apply to all classes of domestic animals, the encouragement of the importation of horses for breeding purposes is only a part of the whole, although the horse-importing business has come to be the most important. It will be necessary to consider the subject first as it applies to all classes of animals.

THE HISTORIC POLICY.

The historic policy of the United States Government regarding the importation of domestic animals has been that when such animals were imported for breeding purposes no duty was to be imposed by the customs officers. One of the earliest tariff acts on the statute books is that of February 27, 1793, which provided "that the several laws of the United States, imposing duties on goods, wares, and merchandise imported into the United States, so far as they may be deemed to impose a duty on horses, cattle, sheep, swine, or other useful beasts imported into the United States, for breed, shall be repealed." With one exception every tariff law enacted since that date has placed breeding animals on the free list. That exception was the act of May 16, 1866, which placed a duty of 20 per cent ad valorem on all animals imported. It was superseded by the act of July 14, 1870, which removed the duty on "animals specially imported for breeding purposes from beyond the seas, * * * upon proof thereof satisfactory to the Secretary of the Treasury."

Up to the act of 1866 no restrictions seem to have been placed on the use of this privilege, and the act of 1870 is the first one which specifically provides that satisfactory proof should be submitted that the animals for which the duty-free privilege was claimed were actually imported for breeding purposes. These restrictions were necessary to protect American breeders and to prevent frauds upon the customs, which were obviously possible under the old laws. They have been broadened considerably, as will be pointed out later.

This is our historic policy, that domestic animals of all kinds—not only horses, but cattle, sheep, hogs, and similar animals of the farm—when of superior merit and imported with the idea of improving the domestic stock, should be charged no duty, but their importation encouraged. Europe began the improvement of the breeds of live stock long before the New World. Here pioneers started out with the same kind of animals that they had in the old homes on the other side of the Atlantic (and it is not unreasonable to suppose that they were good ones of their sort), but these pioneer farmers were too much occupied with their struggles with the forest, the Indians, and politics to devote a great deal of attention to the improvement of their breeds of live stock. When they finally wished to do this, they found Europe far ahead of them and naturally saw that great strides could be made by the use of the best animals from European breeders. The idea seems to have been that this improved blood would be used to give our farmers a more superior grade of breeding stock than could be obtained from native sources, and that liberal provisions of the tariff would enable our breeders to establish these improved breeds at the lowest possible expense.

THE PRESENT POLICY.

The reader has seen how the first restriction as to the purpose for which breeding animals were imported was imposed by the tariff act of 1870. This remained unchanged for twenty years until the passage of the McKinley Act on October 1, 1890, when the first restrictions were imposed as to the character of these animals. This law provided that—

> Any animal imported specially for breeding purposes shall be admitted free: *Provided*, That no such animal shall be admitted free unless purebred, of a recognized breed, and duly registered in the book of record established for that breed: *And provided further*, That certificate of such record and of the pedigree of such animal shall be produced and submitted to the customs officer, duly authenticated by the proper custodian of such book of record, together with the affidavit of the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree. The Secretary of the Treasury may prescribe such additional regulations as may be necessary for the strict enforcement of this provision.

This remained unchanged for over twelve years, having in the meantime been reenacted in the Dingley law of July 24, 1897.

In December, 1902, the Board of General Appraisers ruled that this provision applied only to animals intended for the immediate use of the importer and not for sale, and an additional act was passed on March 3, 1903, providing that the duty-free privilege could be obtained whether the animals imported for breeding purposes "were intended to be so used by the importer or for sale for such purpose." This act also amended the phraseology of the preceding ones by changing "book of record" to "books of record," and stipulated that the privilege of free entry in these cases would be extended only to citizens of the United States. Under the provisions of these laws the Treasury Department has issued the necessary supplementary regulations from time to time. All importers are familiar with them and it is unnecessary to discuss them here.

The connection of the Department of Agriculture with this work dates from the passage of the annual appropriation act on March 3, 1893, which provided "that the Secretary of Agriculture shall determine and certify to the Secretary of the Treasury what are recognized breeds and purebred animals" under the provisions of the McKinley Act, then in force. This provision was included in each annual appropriation act for the Department until the passage of the Dingley Act on July 24, 1897, when it was included in the clause regarding the importation of animals for breeding purposes.

The powers of the Secretary of Agriculture under these provisions apply to all points which may come up, touching not only what books of record shall be recognized, but the validity, authenticity, and sufficiency of pedigrees, and what constitutes a pedigree; and these powers have been sustained in the courts.

The Department certifies not only books of record doing business across the seas, but also those in the United States, the latter being certified to provide for the importation of animals from Canada, as no Canadian books are certified.

Until 1904 the Department promulgated no specific regulations for this work. For about a year the certification and supervision of books of record and pedigree record associations had been part of the work of the Animal Husbandry Office of the Bureau of Animal Industry, and on October 14, 1904, Bureau of Animal Industry Order No. 130 was published. Up to this time the requirements for certification had been broad, and they still are, but a tendency to take advantage of them had begun to manifest itself among American associations, and it seemed necessary to take steps to exercise a closer supervision, so that the Department would have accurate means of knowing what associations were doing a live and legitimate business and were entitled to certification. This policy is carried out by liberal interpretations of the laws on broad lines, without discrimination as to breed or sex.

Bureau of Animal Industry Order No. 130 makes provision for the application of new associations for certification, and requires each certified association to make an annual report to the Department and publish a volume of its book of record at least once in four years. All certified American associations must hold their books open to inspection by the Department, if such inspection is deemed necessary. Foreign associations are required to keep their books of record on file. In its dealings with the latter the Department is guided by the advice of certified associations in the United States, American representatives abroad, and its own inspection of the books of record.

By the end of the year 1905 fourteen amendments to this order[a] had been issued, dealing with the granting, withdrawal, or amendment of certification.

The writer has gone into this rather tedious discussion of Government regulations to show the steps that have been taken to prevent fraud against the customs and to protect the interests of American breeders. The policy of the Government at the present time is to encourage the importation of animals of the highest class, whose value will more than compensate for their competition with the product of American breeders, the object being the adaptation of foreign breeds to our special conditions, or the establishment of American breeds by fusing the imported and native blood, the ultimate end being practical independence of foreign breeders. That this policy is sound does not seem open to question. America has the facilities of soil, climate, feed, and pasture to supply her own demands for breeding stock of all kinds. The quality of her wool, meat, and horses is unrivaled in the world's market. If the high standard of these products is admitted the possibility of producing breeding stock of equal value must also be admitted.

If we are to hold our own in the world's competition we must maintain and even raise our standard. This means that the breeding stock which supplies our flocks, herds, and studs must be specially suited to our conditions, and, therefore, must be distinctly American. The door should always be open to let in the best blood lines and new

[a] Since this article was written Order No. 130 and its amendments have been superseded by Order No. 136 under date of June 20, 1906. This order contains all the essentials of Bureau of Animal Industry Order No. 130, but in addition has one radically different feature. As a general rule, under its provisions the certification of American books is made the basis for the acceptance of pedigrees of animals imported for breeding purposes. American secretaries are now made responsible for the pedigrees of animals imported and registered in their books to obtain the duty-free privilege. With a few minor exceptions only an American certificate will entitle an imported animal to free entry. The number of associations certified by Bureau of Animal Industry Order No. 136 is shown in the following table:

Animals.	American.	Foreign.	Animals.	American.	Foreign.
Cattle	14	24	Dogs	1	4
Horses	19	20	Cats	2	1
Asses	1	0			
Sheep	20	13	Total	69	64
Hogs	12	2			

and desirable species, breeds, and families, but every introduction of this kind must be made with great care and intelligence, especially when we shall have succeeded in developing types peculiarly our own.

NUMBER OF CATTLE, HORSES, SHEEP, AND SWINE IMPORTED FOR BREEDING PURPOSES.

To obtain a satisfactory understanding of this subject it is necessary to study the figures showing the number of animals imported for breeding purposes. The earliest year that such animals were separately enumerated was 1883, and the earliest year that the country of origin was shown was 1884. The following table gives the figures from 1884 for each year and for five-year periods.

Imports of cattle, horses, sheep, and swine into the United States for breeding purposes from 1883 to 1905, inclusive.

Period (years ending June 30).	Cattle.			Horses.		
	Number.	Value.	Average value.	Number.	Value.	Average value.
1883	21,650	$1,133,805	$52.37	5,594	$1,653,334	$295.56
1884	40,823	2,291,227	56.13	16,713	2,056,343	123.04
1885	26,336	1,168,496	44.37	17,425	1,805,219	103.60
1886	24,894	671,680	26.98	20,880	2,162,331	103.56
1887	14,194	401,169	28.26	15,090	2,252,374	140.26
Five years (1883-1887)	127,897	5,666,377	43.52	75,702	9,929,601	131.17
Average per year	25,579	1,133,275	....	15,140	1,985,920	....
1888	6,768	204,399	30.20	9,665	2,670,656	276.32
1889	4,340	149,373	34.42	10,417	2,681,264	257.39
1890	3,925	76,276	19.43	10,402	2,881,658	277.03
1891	2,584	49,384	19.11	4,990	1,922,672	385.31
1892	108	25,463	235.77	2,260	1,214,963	537.59
Five years (1888-1892)	17,725	504,895	22.84	37,734	11,371,213	301.35
Average per year	3,545	100,979	....	7,547	2,274,245	....
1893	157	20,369	129.74	1,363	939,507	689.29
1894	15	2,448	163.17	438	759,973	1,735.10
1895	181	30,069	166.13	319	370,775	1,162.30
1896	72	9,433	131.01	270	165,505	612.97
1897	169	23,878	141.29	94	69,260	736.81
Five years (1893-1897)	594	86,197	145.11	2,484	2,305,020	927.95
Average per year	119	17,239	....	497	461,004	....
1898	544	73,439	135.00	140	120,002	857.16
1899	622	96,102	154.50	377	262,792	697.06
1900	795	199,660	251.14	701	318,221	453.95
1901	1,226	272,664	222.38	1,376	655,290	476.23
1902	1,905	373,955	196.30	2,396	1,233,074	514.64
Five years (1898-1902)	5,092	1,015,820	199.49	4,990	2,589,379	518.91
Average per year	1,018	203,164	....	998	517,876	....
1903	1,493	229,075	153.43	2,356	1,153,958	489.80
1904	688	87,194	126.74	2,116	1,043,533	493.16
1905	442	70,600	159.73	2,271	1,122,107	494.10

Imports of cattle, horses, sheep, and swine into the United States for breeding purposes from 1883 to 1905, inclusive—Continued.

Period (years ending June 30).	Sheep.			Swine.		
	Number.	Value.	Average value.	Number.	Value.	Average value.
1883	5,733	$121,480	$21.19	222	$5,096	$22.96
1884	4,260	73,778	17.32	283	8,481	29.97
1885	5,492	37,257	6.78	342	7,199	21.05
1886	32,107	56,936	1.77	243	6,241	25.68
1887	28,535	56,348	1.98	160	2,298	14.36
Five years (1883-1887)	76,127	345,799	4.54	1,250	29,315	23.45
Average per year	15,225	69,160		250	5,863	
1888	18,865	80,901	4.29	307	3,363	10.95
1889	5,928	69,924	11.80	298	5,007	16.80
1890	16,295	118,308	7.26	239	5,194	21.73
1891	9,384	124,778	13.30	49	1,823	37.20
1892	4,270	110,840	25.96	18	351	19.50
Five years (1888-1892)	54,742	504,751	9.22	911	15,738	17.28
Average per year	10,948	100,950		182	3,148	
1893	4,932	111,197	22.55	19	630	33.16
1894	2,620	64,447	24.60	44	1,533	34.84
1895	1,962	30,885	15.74	76	3,578	47.08
1896	4,251	43,027	10.12	68	2,840	41.76
1897	2,382	32,640	13.70	85	2,932	34.49
Five years (1893-1897)	16,147	282,196	17.48	292	11,513	39.43
Average per year	3,229	56,439		58	2,303	
1898	2,018	32,909	16.31	80	1,030	12.88
1899	2,399	47,670	19.87	94	2,823	30.03
1900	2,381	48,034	20.17	42	1,002	23.86
1901	2,039	49,366	24.21	178	6,249	35.11
1902	2,042	46,674	22.85	149	2,764	18.55
Five years (1898-1902)	10,879	224,653	20.61	543	13,868	25.54
Average per year	2,176	44,931		109	2,774	
1903	1,734	37,950	21.89	315	7,818	24.82
1904	1,251	23,298	18.62	191	8,392	43.94
1905	2,201	45,319	20.59	109	4,582	42.04

A little study of this table shows that the importing business is not nearly so extensive as it was twenty years ago. The importations of cattle especially have decreased greatly and are still declining. Sheep importations show a smaller proportional decrease, but during the last three years have increased considerably, and horse importations have increased from less than 100 in 1897 to an annual average of over 2,000 during the years 1902–1905, although they are not yet nearly so large as they were in the early eighties. Importations of hogs for breeding purposes more nearly approach in numbers the trade of that time, but they comprise only a small proportion of the trade. The largest number of horses come from France, with British North America second and the United Kingdom third. The largest number of cattle and sheep come from British North America, with the United Kingdom second. Swine importations have not been reported by countries, but Canada probably furnishes most of them.

THE STALLION TRADE.

Although the figures do not show it, the great majority of the horses imported for breeding purposes from across the seas are drafters.

This trade from Europe, although bringing us the best horses imported, is the one that American breeders have most cause to fear.

For at least thirty years we have been importing draft horses from Europe in large numbers, but the first notable importation dates back to the coming of old Louis Napoleon in 1851. Theoretically, the same conditions hold here as for the importation of other classes of stock, but, practically speaking, instead of being developed, so as to establish the breeds rapidly in the United States, the business has become a stallion trade, handled by men who rarely breed, own, or import a female.

Confirmation of these statements can be found in the following table, compiled from the reports to the Department of secretaries of certified American studbooks for breeds originated in Europe, showing the number of American registered animals of each sex on December 31, 1905:

Number of horses registered in American studbooks on December 31, 1905.

Studbook.	Number registered.	
	Male.	Female.
LIGHT BREEDS.		
Cleveland Bay	1,236	502
Coach Register, French	130	4
Coach, German	1,656	246
Coach, German (Oldenburg)	260	23
Hackney	810	1,595
Total	4,092	2,370
DRAFT BREEDS.		
Draft, Belgian	2,056	266
Draft, French	9,000	5,000
Percheron Register	928	102
Percheron Studbook	1,640	1,460
Shire	6,062	2,148
Suffolk	159	88
Total	19,845	9,064
Total, all breeds	23,937	11,434

The Clydesdale and Thoroughbred studbooks do not separate the sexes. The position of the Hackney breeders, as shown by these figures, is noteworthy. Registrations of Shetland ponies at the same time were—males, 2,300; females, 3,500. They show a similarly logical condition, but are not included in the above table for obvious reasons. For further details on this subject the reader is referred to the reports of secretaries of certified studbooks on page 296 of this volume.

The writer is fully aware that this rapidly developed trade really dates back but eight years, that it is due largely to the present tremendous local demand for draft horses for business purposes, and that the work that was accomplished before the financial depression of 1893–1897 was almost destroyed by the stampede of farmers at that time to get rid of their mares; but the present system is an anomaly. The country must have drafters, and to get them we can not always rely on foreign-bred stallions. We must have mares. We must breed our own stallions.

Undoubtedly the draft-horse business confronted a peculiar situation when it began to revive in 1897. An emergency was to be met and met quickly. A supply of breeding stallions had to be obtained and a trade developed. But, candidly, has this trade been developed along the right lines? If we sold our draft mares during the depression, would not the logical proceeding have been to import more mares than stallions, so as to establish a supply of stallions of our own breeding?

The following table shows the number of horses imported from France, the United Kingdom, Belgium, and Germany since the year the trade reached its lowest ebb—1897:

Horses imported into the United States for breeding purposes, from France, the United Kingdom, Belgium, and Germany, for the years 1897 to 1904, inclusive.[a]

Year.	France.	United Kingdom.	Belgium.	Germany.
1897:				
Number	....	16	....	19
Value	....	$20,754.00	....	$6,260.00
Average value	....	$1,297.12	....	$329.47
1898:				
Number	28	35	....	14
Value	$15,054.00	$59,540.00	....	$12,138.00
Average value	$537.64	$1,701.14	....	$867.00
1899:				
Number	118	143	7	29
Value	$62,635.00	$155,275.00	$1,862.00	$19,433.00
Average value	$530.81	$1,085.87	$266.00	$670.10
1900:				
Number	349	176	32	41
Value	$149,914.00	$118,930.00	$14,306.00	$16,481.00
Average value	$429.55	$675.74	$447.06	$401.98
1901:				
Number	492	499	90	121
Value	$280,321.00	$268,257.00	$39,034.00	$49,612.00
Average value	$569.76	$537.59	$433.71	$410.02
1902:				
Number	1,206	592	163	137
Value	$592,451.00	$422,394.00	$76,789.00	$53,269.00
Average value	$491.25	$713.50	$471.10	$388.82
1903:				
Number	1,142	594	122	232
Value	$545,089.00	$338,663.00	$62,517.00	$96,152.00
Average value	$477.31	$570.14	$512.43	$414.45
1904:				
Number	919	479	308	281
Value	$446,128.00	$305,692.00	$141,222.00	$102,446.00
Average value	$485.45	$638.19	$458.51	$364.57

[a] This table shows all horses imported free of duty, and may include a few which have entered free under other provisions than those covering animals imported for breeding purposes. This number is, however, too small to be of importance in the case of the countries of origin here given.

Here are about 2,000 horses, probably three-fourths of them stallions, coming to us annually from four countries. Compared with that for cattle and sheep, this trade bears a much more important relation to the horse industry of the country than the figures indicate, on account of the fact that horses are fewer in number and the number of registered and purebred horses is particularly smaller.

How long this trade will continue and where it will end is worthy of consideration. The farms of France have been drawn upon until the breeders there are becoming anxious for the permanence of their studs, and importers are turning to Belgium, as these figures and our stock shows bear witness. In the European breeding establishment the importer has found a goose which lays a golden egg. Is he not systematically killing it?

INEQUALITIES IN REGISTRATION METHODS.

The large preponderance of stallions in this trade is not the only serious condition. The studbooks of the United States are generally closed to horses whose sires and dams are not registered in the studbooks of America or those of Europe. If the standards of registration were the same in both cases no one could complain. It would be a straight case of competition, with open chances to all. The European studbook societies, however, especially those on the Continent, do not regard pedigree of the same importance as we do here. The individuality of a horse, rather than his breeding, decides whether he shall be registered, this usually being passed upon by a board of inspectors. This inspection system has much in it that is commendable, and our studbooks might adopt modifications of it to advantage. If horses must pass a rigid inspection before being admitted to registry, the result on the breed will be the same as the result on an army of a rigid physical examination of recruits. The practical workings of the system, however, make possible the registration of horses concerning whose breeding there is little accurate information, and it is easy to see the disadvantage under which an American breeder works when he tries to sell his horses in competition with them. The Government provides a certain amount of protection against these horses by requiring the pedigree certificates of imported animals to show not less than two generations of descent from registered ancestors, but it is only within the past two years that the importation of horses has been stopped whose pedigrees were short on the dam's side in the second generation. The second dam showed what appeared to be a bona fide registration and the certificate passed the customs officers without detection, but reference to the studbook showed that the data were taken from the registration of the first dam and that nothing was really known of the maternal descent beyond this point, except the name and owner of the second dam and, occasionally, her sire. The evasion was explained to the Treasury Department and its continuance is impossible. In other words, up to two years ago two-top crosses were coming in duty free and being sold in competition with home-bred stock, which never has been eligible on less than a five-top cross, and now a horse with a three-top cross can enter without restriction.

The fact that a three-top cross can enter our ports free seems to indicate at first sight—to be perfectly candid and frank—that the Government is not doing its duty toward American breeders, but if the Government were to revise the regulations so that the conditions would be more nearly equal, and were to require more than two generations of registered ancestors or require certified foreign studbooks to close their books to "woods-bred" stock, importations would stop at once. Importers are agreed that in many cases the present regulations act as a positive hardship toward them. They are frequently compelled to pass by some of the best horses presented for sale because their pedigrees are short in the second generation, yet these horses are of outstanding merit and good judges say that they could often be imported to advantage. It may be that the European system of registration is more efficient than ours, but at all events there is a condition here which can not be passed by lightly. We are not yet able to dispense with importations, but a more equitable adjustment would seem to be desirable if practicable.[a]

SPECULATION IN HORSE IMPORTATIONS.

The presence of the speculator in the horse-importing business is a condition that is worthy of the most serious consideration. Excepting his predilection toward stallions, I have no criticism to make against the honest importer who buys the best horses obtainable and conscientiously strives to give good value. He deserves praise for his energy, good business methods, and farsightedness; but the man is beneath contempt who is in the business solely for the money he can get out of it, who buys without regard to individual merit, soundness, or pedigree, and sells his horses by the methods of the confidence man or the agent for fruit trees and lightning rods. It is reassuring that only a small number of the horsemen of the country are in this class, but it is a matter of regret that some of them are not only importers, but pose as breeders as well. That they are able to do business at all is due to their shrewdness and consummate nerve, the credulity of the public, and the difficulty of convicting men in the courts of fraudulent pedigree manipulation.

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[a] Owing to the change in the regulations as set forth in Bureau of Animal Industry Order No. 136 and Circular No. 70 of the Division of Customs of the Treasury Department, the two-generation pedigree is no longer required, and the remarks in the two foregoing paragraphs are to a certain extent obsolete. However, the Department requires that the secretary of a book registering imported animals, to obtain the duty-free privilege for such animals, shall submit the pedigrees of such animals to inspection by its authorized representative, and the registration of animals not strictly purebred, or when registered in a foreign book which is not certified, will render an association so registering them liable to withdrawal of certification when such registry is used to obtain the duty-free privilege.

These men generally use the "company" system of selling horses as the most convenient means to dispose of their stock. The company system is an institution and is pretty well fixed. Practically all draft horse handlers use it, but a great many do so not from choice but from compulsion. The wiles of the agent and his plausible arguments are well known. A common plan is for an agent to go into a community and get a leading farmer to assist him in the organization of a company for the consideration of a share of stock. The shares are represented by negotiable notes, which are discounted at the bank when the company is finally organized, and the bank collects. The price paid for the horse must include, besides the profit to the owner, the expenses and commission of the agent and the discount on the notes. At its best the system is expensive. A purchase direct from the firm would cost one-fourth to one-half less than that paid under the company plan. Generally speaking, however, the system gives almost unlimited opportunities for fraud, for this reason: Under the law a firm is responsible for the acts of its agents only when he acts within the limits of his authority. Therefore, an unscrupulous agent for an unscrupulous stallion owner can promise and represent almost anything to bring about a sale, and if fraud is perpetrated the purchaser has no recourse. The agent is a migratory being and hard to catch, while the employer puts on a sanctimonious air and retires behind the excuse that his agent "exceeded his authority." Most of these agents are loyal, and loyalty is a term capable of a very wide range of definition. Their profits depend upon their ability to make sales, and the results of the system are not really surprising. Even an honest firm may have dishonest agents, and in their desire to extend business they may condone the actions of an agent if he is a hustler and loyal, and in the event of an agent exceeding his authority the employer's temptation to avoid his moral obligation is certainly great.

It is gratifying to note that many horsemen condemn this system without mercy, even though they may use it. As long as horses must be sold, and competition is keen and the buyers will not seek the sellers, the system will probably prevail. It is one of the regrettable features of the speculative side of the horse business, and the only chance for its end lies in the hope that the public will become educated to its costliness and its possibilities for fraud.

This subject can not be passed without mention of the possibilities of the studbook associations to eliminate dishonesty from the horse business of the country. These organizations constitute the backbone of the industry. As a rule they have honest boards of directors and honest officers and are managed competently. They possess a power greater even than that of the law to check the machinations of dishonest importers and breeders. By ostracizing men who continually persist in crooked work, and by the adoption of improved methods of studbook publication, they can put the business on the highest plane.

Space will not permit an elaborate discussion of this phase of the subject, but among the features whose adoption would be desirable are the publication of a studbook volume annually, rules requiring the report of all deaths and transfers, and the publication in the studbooks of the progeny record of mares and stallions. Some of these features have already been tried without success, but they have much of merit and should not be discarded lightly.

SUGGESTIONS REGARDING FUTURE GOVERNMENT POLICY.

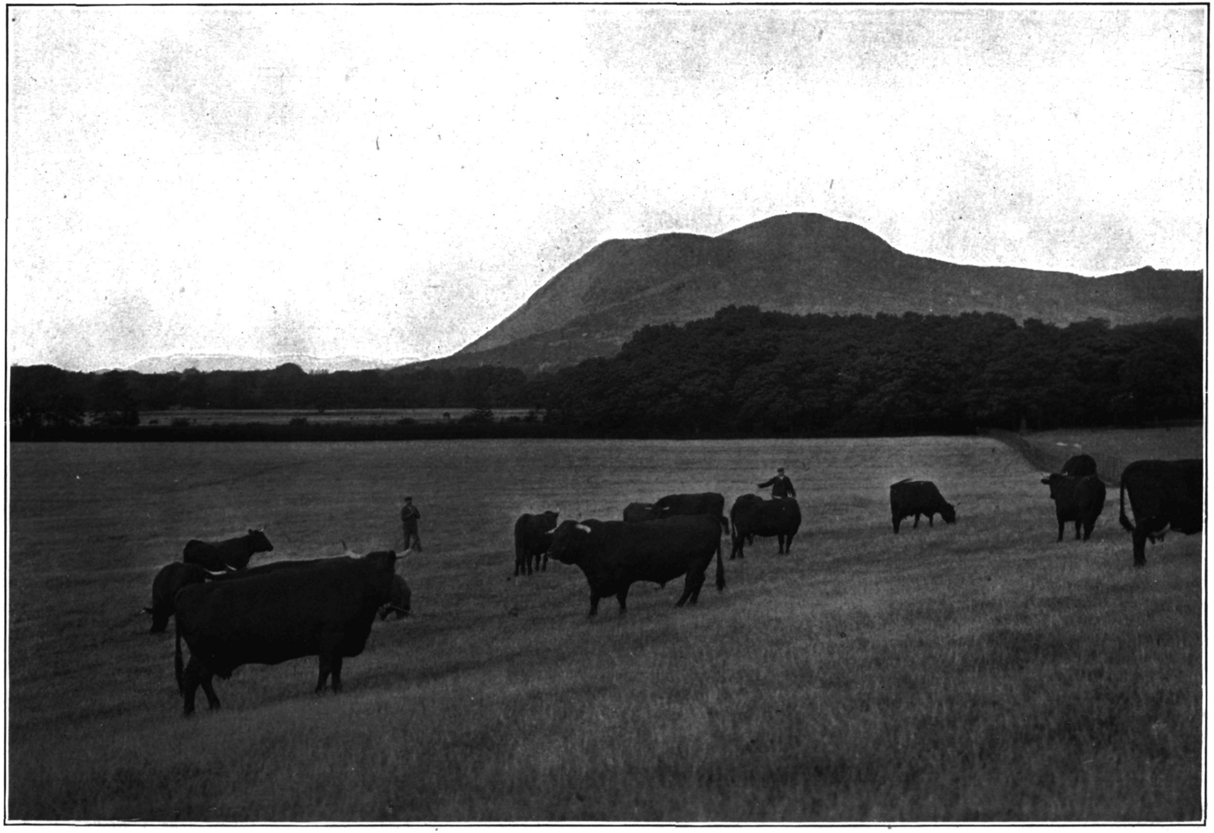
In conclusion, let us consider briefly how far the present policy of the Government regarding the importation of horses for breeding purposes is responsible for these conditions, and whether there is any possibility that changes in this policy may tend to remedy them. There seems little reason to believe that we shall ever depart from the idea that the object of our policy should be the establishment of the breeds as soon as possible on our soil or their adaptation to our conditions. Many breeders, however, believe that the present tariff laws act as a positive discrimination against American-bred stock, and this sentiment has found voice in a more or less tangible desire for the withdrawal of the duty-free privilege. Some breeders urge that if the regular duty were imposed more care would be exercised in buying and only the best could be imported. This idea was expressed officially by the American Shorthorn Breeders' Association when it imposed a registration fee of $100 on all animals imported from foreign countries except Canada. The rule met with violent opposition at the time of its passage, but its operation has shown that it is a wise rule and its repeal is unlikely.

The complete withdrawal of the duty-free privilege, without the present restrictions regarding pedigree and registration, would be undesirable, for the reason that short-bred animals recorded in European books of record would not be kept out. As it is at present, the importer does not bring in such animals, the duty preventing him, although he could do so if he wished by paying the duty, and thus avoiding the scrutiny of his pedigree certificates.

A more reasonable plan, which has much of merit, is that a duty be placed on males, the importation of females of approved pedigree being permitted without duty. This would give a very desirable impetus to the importation of mares. If this plan were adopted, it would seem desirable to require the importer to state whether his animals were intended for breeding purposes and to have the present pedigree restrictions apply to breeding males as well as females.

A further restriction that has been suggested is to have all mares and stallions offered for importation inspected by veterinarians for unsoundness and refused admission if found unsound. There is little doubt that many unsound horses are imported, but the Government has no authority to reject them, the law requiring sanitary inspection only.

That there is a necessity for the establishment of the breeds of horses in this country, especially drafters, no one can doubt, and its possibility seems equally evident. It requires more than skill at a horse trade; it demands knowledge of pedigrees, heredity, and faith in one's self and in horseflesh. The problems that confront the horsemen of the country must be solved, and one can not doubt that they will be. Sentiment must play a minor part. We must buy the best where we can find it, use it intelligently, and await results. A splendid opportunity exists here for the constructive breeder, the man who will apply ability, perseverance, and courage to the problem.



A PORTION OF THE HERD OF WELSH BLACK CATTLE AT THE UNIVERSITY COLLEGE OF NORTH WALES EXPERIMENTAL FARM.

The bull, Mafeking 181, in the middle ground, is 9 years old and has sired a large number of winners.

WELSH BLACK CATTLE.

By John Roberts,
Of the Editorial Office, Bureau of Animal Industry.

INTRODUCTION.

The Welsh breed of cattle is considered a very valuable one in Great Britain. The cows are good milkers, but the breed is chiefly famous for its feeding qualities and the admitted excellence of the carcass, the latter being a prime favorite with English butchers. If we grant that the modern beef animal should be considered mainly from the point of view of economy in production, the above characteristics of the Welsh breed seem to entitle it to consideration.

Youatt, writing of Welsh cattle seventy years ago, said:

> Great Britain does not afford a more useful animal. * * * They combine to a considerable degree, and as far, perhaps, as they can be combined, the two opposite qualities of being very fair milkers with a propensity to fatten. The meat is generally beautifully marbled. It is equal to that of the Scotch cattle, and some epicures prefer it. They thrive in every situation. They will live where others starve, and they will rapidly outstrip most others when they have plenty of good pasture. * * * Great numbers of them are brought to the London market. They stand their journey well and find a ready sale, for they rarely disappoint the butcher, but on the contrary prove better than appearance and touch indicate.

The above description seems to apply equally well to the present day. At any rate, large quantities of Welsh cattle are annually purchased by English graziers to fatten for the great British markets. Writing on this subject twenty years ago, Col. Henry Platt, a very noted breeder of these cattle, refers to the increasingly large number annually sold for this purpose from his district (North Wales) as follows:

> It is now estimated that 50,000 are sent across the border annually. At the end of summer and beginning of autumn these cattle find their way, fat, to the London markets, where they hold their own against Scotch polls or any other breeds and command the highest prices.

The Welsh breed is a very old one, and in this respect, as well as others, resembles the Highland breed of Scotland. Like the latter, they are exceedingly hardy and thrifty. Wales is a mountainous country and in winter is often very bleak and stormy, yet in some parts the bulk of the cattle remain out of doors all the year and maintain their condition in a remarkable way.

Another authority, Prof. Thomas Winter, professor of agriculture at the University College of North Wales, referring to the manner in which these cattle had until recently been neglected by breeders, says:

If we trace the history of most breeds of cattle we come across the names of breeders who have effected great improvements in the cattle of their districts. The Welsh breed has never had its improvers, and for two centuries at least most of the best breeding stock has been allowed to leave Wales for the English pastures to be fattened for the great markets. It is only within recent years that any considerable number of Welsh agriculturists have paid special attention to the breeding of cattle. Fortunately, Welsh cattle are so inherently good that after centuries of neglect they still have no superiors for all-round purposes in the British Isles.

About thirty years ago an organized effort was made by a number of the prominent breeders to improve the breed, and a herdbook was established. Since then much has been accomplished to rectify the former mismanagement and produce a uniform animal of the best beef type.

The writer saw numerous specimens of these cattle in their native environment while on a visit to Europe last year. They are useful looking animals, though their conformation shows something of a lack of symmetry as compared with the more fashionable beef types. A quarter of a century ago the common failing of the breed was a high rump. Modern improvement, therefore, as viewed by the most intelligent breeders, has consisted chiefly in improving the symmetry without losing the original valuable characteristics. The breed has no doubt made rapid improvement in recent years, and our stockmen may judge from the information in the following pages whether this is of such a character as to warrant the use of the cattle in this country.

Attention is specially called to the chapter on "Carcass competitions and the block test." The carcass competitions at the London Smithfield show furnish a remarkable testimonial to the quality of Welsh beef. It will be seen that the Welsh and Scotch score heavily over the English breeds, and this result is the more striking when it is remembered that the entries of the former are comparatively few. The showing of the Welsh breed at the latest Smithfield slaughter test (December, 1905) was surpassingly good. Out of a total entry of four all received prizes, as follows: First, in steers under 2 years; first and fourth, in steers under three years, and fourth in the heifer class.

ORIGIN AND HISTORY.

There seems to be some difference of opinion as to the exact origin of Welsh Black cattle. However, as it is beside the purpose of this article to go extensively into the historical side of the question, it will suffice to give a few of the main points. Cæsar, 55 B. C. (De Bello Gallico, Liber VII), states that he found a great number of cattle on the island. Colonel Platt, after a search through the antiquarian lore on this subject, concludes that the cattle mentioned by Cæsar were small, black animals, descended from the *Bos longifrons* in contradistinction to the cattle of the eastern part of Great Britain, which were descended from the *Bos urus*, the theory being that the former were domesticated in Britain prior to the Roman conquest, while the *Bos urus* type came over later with the Teutons and other tribes of Northern Europe, who drove the Celts, along with their oxen (*longifrons*) into the mountains and inaccessible parts of the western portion of the country (Wales). Youatt suggests that it is probable also, because of the fact that Wales was never entirely subdued by the early invaders of Britain, nor, indeed, by the early Norman kings of the island, that for many centuries there was little admixture with any other British cattle and that the breed would be likely to maintain many of its ancient characteristics into modern times.

Owing, no doubt, to various local influences and the restricted travel of early days, there have been several distinct breeds of Welsh Black cattle. Wallace, in 1889, divides them into two main divisions, namely, (1) the South Wales Pembroke (or Castle Martin) black, and (2) the North Wales, or Anglesea, black, to which are added the subsidiary Glamorgan breed and the old Castle Martin white. There was also a strain called the Montgomery. The authorities assert that the first two are no doubt the purest and oldest and that such breeds as the Glamorgan and Montgomery have practically been crossed out of existence.

Low characterizes the Pembroke (South Wales) as the best of the mountain breeds, they being somewhat larger in size than the West Highland breed of Scotland. The district of Castle Martin became famous for producing the best specimens of these cattle, hence this name was given to them. The Anglesea (North Wales) are described as similar in essential characteristics to the Castle Martins but of somewhat larger and coarser frame, owing to the more level nature of the country in which they are reared.

A herdbook was established for Welsh Black cattle in 1874. Later, in 1883, owing to differences having arisen between the northern and southern breeders, separate herdbooks were issued by these two divisions until 1905. In the latter year the parties made up their differences and started afresh with Volume I of a combined herdbook, which was duly issued in the year named. Volume II is to be issued in 1907. The current volume contains the names of 175 members and the entries of 211 bulls and 698 cows and heifers.

DESCRIPTION.

Good specimens of the Welsh breed are well proportioned, free-moving animals. Youatt, in discussing the breed, says they were favorites with Bakewell, "who considered them nearer to perfection in some points than any other breed, except his own improved breed." Youatt was of opinion also that the South Wales cattle more nearly resembled the North Devon in conformation, while those of North Wales had more of the squareness of the Shorthorn.

A well-known authority on the breed, writing for the first volume of the North Wales Herdbook, published in 1883, briefly describes the most prominent points of the cattle, as follows:

(1) *The bull.*—Select your bull coal black, if possible. He must stand on short legs, and those naturally square, like a table. He must have a broad, straight back, also broad across his shoulders, with a strong masculine neck; thin tail, lying closely between his rumps; small, round bones, but deep, well-filled thighs to the hocks. His ribs should be well sprung (not flat), shoulder points must not project, bosom low and projecting forward between forelegs, wide apart; his head should be short, forehead broad across from one eye to the other; he must have good thick hair, soft to the touch. Do not use a bull with curly hair; also avoid an animal with bristly hair.

(2) *The cow.*—Select your breeding cow as black as possible; she should stand as square as possible on her legs, like a table; the legs short, with a broad, level back, thick neck for constitution, ribs well sprung like an umbrella when opened, tail thin at top, fitting closely between her rumps; thighs well filled, coming low down to her hocks; bosom should project forward, and your cow should stand wide between her forelegs.

Another authority wrote for the same volume as follows:

In selecting a bull of the Welsh breed, the first of the many considerations ought to be the indications by which it may be possible to form an opinion as to his constitution. This all-important point the breeder should be very careful that the animal is possessed of. The color ought to be black, the head not too large, but handsome and neatly set on; the muzzle fine, nostrils wide, the horns low and well spread, moderately strong, of rich yellow color, with black points; the eyes should be mild, large, and expressive, the throat clean, the neck a fair length, rising from the head to the shoulder top and surmounted by a moderate crest, which adds to the masculine appearance—a point so desirable in a bull. The neck should pass neatly and evenly into the body, with full neck vein that should show no undue prominence on the shoulder top; an upright shoulder in cattle is generally accompanied by a light waist—an important defect. The crops should be full and level, with no falling off behind, the ribs well sprung, springing out barrel-like and neatly joined to the crops and loins; the loins broad and strong, the hook bones not too wide, narrower than in the average Shorthorn; the quarters long, even, and rounded, with no hollow from the hooks to the tail. The tail should come neatly out of the body, and not higher at the root than the line of the back; a high tail, head, and rump are characteristic of the breed, but these defects are being gradually removed by the more scientific breeders. On both sides of the tail the quarters should turn away in a rounded manner, swelling out downward and passing into thick, deep thighs; the twist should be full, and the hind legs set well apart and not detached from the body until the level of the flank is reached; the flanks full and soft; the bottom line should be as even as the top and side lines; the bones of the legs fine, flat, and clean. The skin ought to be fairly thick, soft, and pliable over the ribs, yielding to the least pressure and springing back toward the fingers.

These are a few of the principal points which a good Welsh bull ought to possess. Many of the foregoing remarks apply to the Welsh cow, which in general character differs considerably from the bull. Her head ought to be much finer, the horns narrower, their pitch more upright, the neck thinner and cleaner, with no crest; the shoulder top sharper, the bone altogether finer, the skin not quite so thick, the udder large, and the milk vessels large and well defined.

CHARACTERISTICS, FEEDING, AND MANAGEMENT.

Robert Wallace, in Farm Live Stock of Great Britain, published in 1889, advocates the use of the Welsh breed, as well as the Highland, because of their wealth of constitution and feeding qualities.

William Housman, in his report on cattle exhibited at Windsor, England, in 1889 (this being the semicentennial anniversary of the Royal Agricultural Society of England show), mentions the fact that special classes for Welsh cattle at the English "Royal" were first instituted in 1853. For the first twelve years of these shows the only breeds of cattle having special classes were the Shorthorn, Hereford, and Devon. In the course of his remarks Mr. Housman says:

> Welsh cattle have unquestionably vast capabilities of both milk and beef production, and their rude health is an important recommendation. Where hardy, active cattle are required—cattle which can live roughly yet answer to keep and care, grow beef of the first quality and, under favoring conditions, great in quantity—the Welsh breed should claim a trial, and they would doubtless prove ready to adapt themselves to districts and countries to which hitherto they have been strangers.

The most economical way of preparing Welsh cattle for the market is by grazing them. This is undoubtedly their strong point, though it is claimed they are good stall feeders also. Some of the principal grazing districts in England have for many generations received the bulk of their feeders from Wales. Indeed, the demand became so strong that it threatened to be the undoing of the breed because it encouraged the wasteful and short-sighted policy adopted by so many of the breeders of selling off the pick of their herds to the graziers and retaining only the weeds to breed from. The more progressive breeders, headed by the late Mr. R. H. Harvey, of Slade Hall, Carmarthen, became alive to the necessity of checking this ruinous practice and brought about the reform movement which resulted in establishing the herdbook, thus giving the necessary impetus to breeding from pedigree.

WELSH COWS AS DAIRY COWS.

It has before been hinted that Welsh cows are good dairy performers when required for that purpose, but they are of course inferior to the strictly dairy breeds. It goes without saying, also, that when an animal is raised exclusively for beef the pail will necessarily suffer, but cows of this breed will soon put on flesh after their dairy career has ended.

There are no milking trials in connection with Welsh shows, so that the dairy properties of the breed are not as well known as they deserve to be. The following are a few examples of dairy performances which have been casually encountered:

Colonel Platt, in his pamphlet published in 1885, quotes the Rev. W. Davies, from the latter's book on the Agricultural and Domestic Economy of North Wales, which appeared in 1810. This book contains the record of a Welsh cow that gave, from May 1 to October 30, 4,026 quarts of milk, which produced 358 pounds of butter, or nearly 2 pounds a day, the milk averaging 22 quarts a day for 183 days.

Professor Winter mentions a Welsh cow, the Duchess of Carnarvonshire, that won a championship a few years ago at the London dairy show. He also mentions a Welsh cow that was awarded first prize in similar trials at the Tring show in August, 1905, in a class of twenty-eight competitors, nearly all of which were Jerseys.

The only herd record that is available is that of the one at the farm of the University of North Wales, near Bangor, North Wales, which the writer visited last summer. The exact figures were not procured, but a general idea of the profitableness of this herd is given in Professor Winter's own words, as follows:

In the college herd of 25 cows, of average capacity from the point of view of the dairy, the milk and butter sold from each cow for the last three years has produced on the average £20 ($100) per year. In addition to this, with one or two exceptions all the cows have reared calves.

It is only fair to state, however, that the marketing conditions which apply to this herd are unusually favorable, inasmuch as the situation of the farm enables the products of the dairy to be sold at city prices direct to the consumer, and the cost of handling would be much lower than the average in this country.

PRESENT-DAY METHODS OF MANAGEMENT.

Information along this line has been procured by means of personal statements from a few prominent breeders in different sections of both North and South Wales. The methods of managing the herd just mentioned on the experimental farm of the University College of North Wales, are told below by Prof. Thomas Winter, professor of agriculture at the university named, who resides on the farm and supervises the entire work done:

The herd of Welsh Black cattle belonging to the University College of North Wales is kept at the college farm, Madryn, near Bangor. It consists of about 25 cows and their offspring. All calves are reared; a few of the males are kept for bulls, but the majority are castrated. Those that are intended for show purposes suckle their dams, the rest are fed on new milk for about three weeks, after which separated milk and boiled linseed are gradually substituted, until at 5 or 6 weeks old the new milk has been entirely replaced. All calves, except those on their dams, are fed from the bucket until they are at least 4 months old. The feed usually consists of separated milk and boiled linseed; but oatmeal and, to a certain extent, wheat flour are also used.

As soon as the calves will eat they are given small quantities of crushed oats and linseed cake, with a little sweet hay, and during the autumn and winter a few sliced swedes (rutabagas). The quantities of these are gradually increased, so that by the time the calf is 6 months old it is receiving about a pound of concentrated food per day. All calves 6 months old or over are turned out to grass about the middle of May. The concentrated food is continued for a time, but if grass is plentiful no concentrated food is given after the first fortnight. Shelters from the heat are always provided where possible.

About the middle of August the calves are brought in in the evenings, but continue to run out during the day until the end of October and often throughout the winter when the weather is favorable. From October onward they are given hay and a small quantity of crushed oats and linseed cake, and as soon as the grass begins to fail pulped roots and chaffed hay and straw in addition, the quantities of prepared foods being gradually increased as the winter advances.

During their second summer the young stock get nothing except what they pull from the pastures. If the weather is favorable and there is plenty of grass they are kept out until December, when they are brought in at nights and given a feed of pulped roots and chaffed hay and straw night and morning, with long straw in their racks.

The bullocks are fed off for the butcher at from 2 to 2½ years old. Heifers are put to the bull so as to calve at from 2½ to 3 years old.

The cows run out all the year round, but are housed at nights from November to April. During the winter they receive a moderate supply of roots and long hay. Those in milk get on the average about 4 pounds of concentrated food (the bulk of which is cotton cake) daily throughout the year. Some of the milk is sold and the rest is made into butter.

The above herd has a long record of prize winners, and several of its present members are shown in the illustrations accompanying this article, including the group shown on plate 11.

Following is the testimony of a breeder of a number of prize-winning "Blacks:"

I have found young steers of the Welsh breed give as satisfactory increase in weight for food consumed as in the case of Shorthorn steers of same age. The latter come out a week or two sooner, but show no more profit when sold by live weight, as is my custom. They are fair dairy cattle and keep up their milk for a long time after calving.

For experiment I tried two or three Shorthorn heifers and cows at first with my Blacks and with like treatment the Welsh kept in good condition while the Shorthorns fell off a good deal. My land is exposed and lies 300 feet above the sea. The result of the carcass competition at Smithfield this year should satisfy breeders of Welsh Blacks of the great merit of the breed as a beef producer. The animals always kill and weigh better than they look. As I only keep about 12 or 14 cows I have not many to choose from. I have had 5 pairs of twin calves in the past four years and have not lost a calf.

Mr. I. W. Griffiths, the owner of the well-known Penally Court herd, of South Wales, furnishes the following statement. The herd in question is famous for the milking properties of the cows and has many cups and special prizes to its credit.

Treatment.—The treatment of my herd at present varies very much; first, because of having a large milk round, for which I find it a great boon to have sufficient machinery to utilize everything grown on the farm for feeding the stock. By pulping roots with hay, chaff, etc., with the addition of some artificial feedstuffs, I find I get the most economical feeding.

Breeding.—I find it more profitable to suckle the calves I rear, either on their dams or on foster mothers. By so doing I have been the most successful exhibitor in South Wales of late years, and I attribute my success to the calves getting access to their dams more frequently than by hand. I am not an advocate of inbreeding, but with a large herd you have advantages of breeding from a few different strains. Like produces like, but I still maintain that a little fresh blood by very careful selection is desirable now and again. It is proverbial of Welsh breeders to sell the sires to the butcher before seeing results, thereby retarding the breed to a great extent. I have seen this often and often in my experience.

Milking capacity.—By very judicious selection the Welsh cattle milk very well indeed, and undoubtedly compare favorably with other breeds. My herd are all outlyers. I find their constitutions better, their milking properties increased, and attribute it to free access to water, etc. The milk also is more wholesome and less contaminated than when the cattle are housed. They are guaranteed to stand the tuberculin test.

The pastures of Wales are very deficient for feeding, therefore the cattle are mostly sent to the midland counties of England. The best bred ones are in very great demand.

Another well-known herd of Welsh Black cattle with a large prize record is the one at Blaenwernddu, Whitland, South Wales. Concerning the management of this herd the owner, Mr. John Scourfield, says:

Breeding.—The females in this herd are kept for breeding purposes only and are hardly ever exhibited, being kept in the most natural condition, as it has been found that the breeding qualities of heifers are interfered with by overfeeding and pampering for show purposes. The calving season usually commences about the first week in October and generally all the calves required for rearing are dropped by the end of January. Those coming after this date are mostly sold for rearing to purchasers by means of advertising in the local papers, for which there is a good demand.

The calves are allowed to suck their dams for about three weeks, the bull calves for a month; they are then weaned and fed with fresh and skim milk in equal quantities for the next week; then the skim milk gradually replaces the fresh until it is withdrawn altogether. Then the calves are supplied with some dry food in addition, so as to keep them going—such as crushed oats, linseed cake, also mangolds. In May the heifer calves are turned out to grass, having access to some open sheds for shelter from the sun in the hot weather. They are given a little dry food again once a day. The bull calves are mostly all kept indoors, as they do less damage to themselves. They are turned out for a little exercise in the yard every day, but not to the field.

Feeding.—The cows are fed with a view to producing the greatest quantity of butter after the calves are weaned. Their food consists of some meadow hay (and straw during the winter nights), and about 4 pounds each every day of barley, or maize meal and bran, with about 3 pounds each in addition of undecorticated cotton cake until turned out to grass, then the meal is dropped and the cake continued for a short time, as it is found that it is effective in checking the effects of the succulent herbage in the spring of the year. The cows are hardly ever more than two months dry during the whole year, so that in this respect they can hold their own with most of the breeds.

I believe that the Blacks are destined to take an important position among the foremost breeds of cattle in the near future on account of their hardiness and all-round qualities.

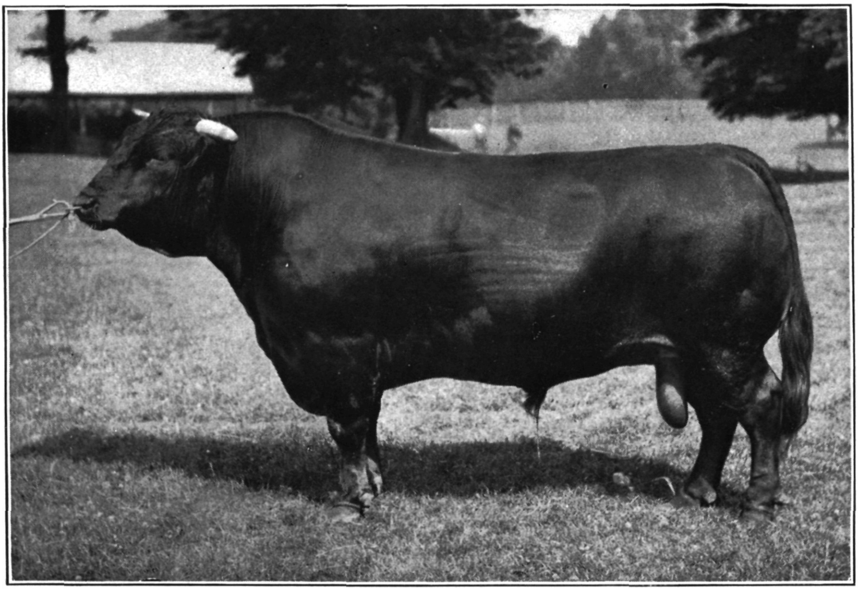


FIG. 1.—WELSH BLACK BULL MALLARD 433 N. W.

Four years old. Winner of first prize at Royal Show, 1901.

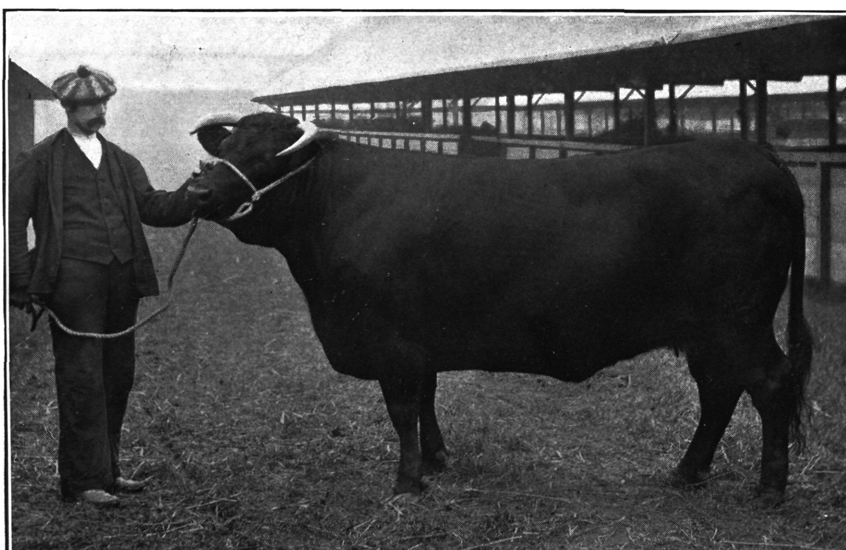


FIG. 2.—WELSH BLACK HEIFER WERN GEM.

Champion female at Royal Show, 1903.

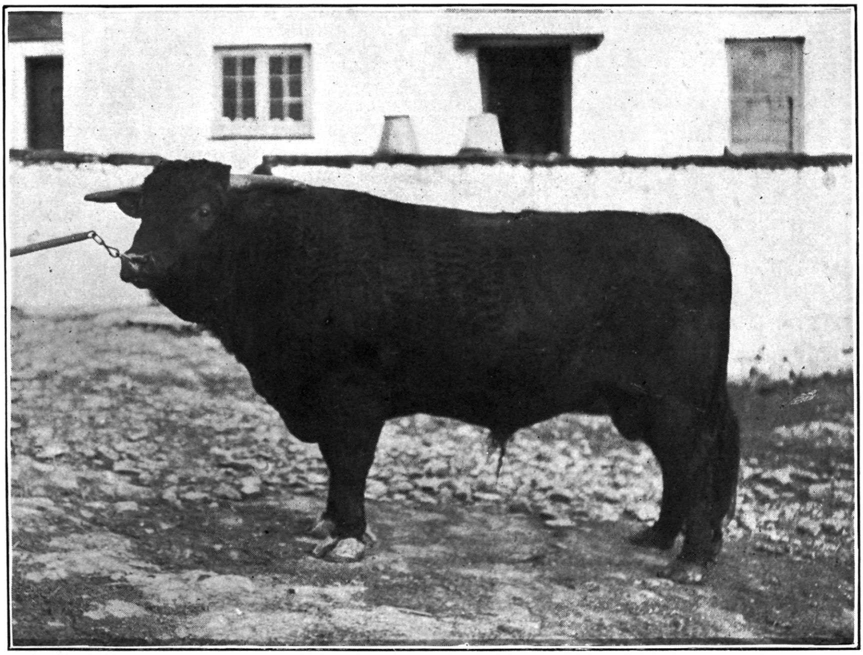


FIG. 1.—WELSH BLACK BULL LLOFFWR 161.

Four years old. Winner of first prize at English Royal Show, 1905; second at Welsh National Show, 1905; and a great number of other prizes.

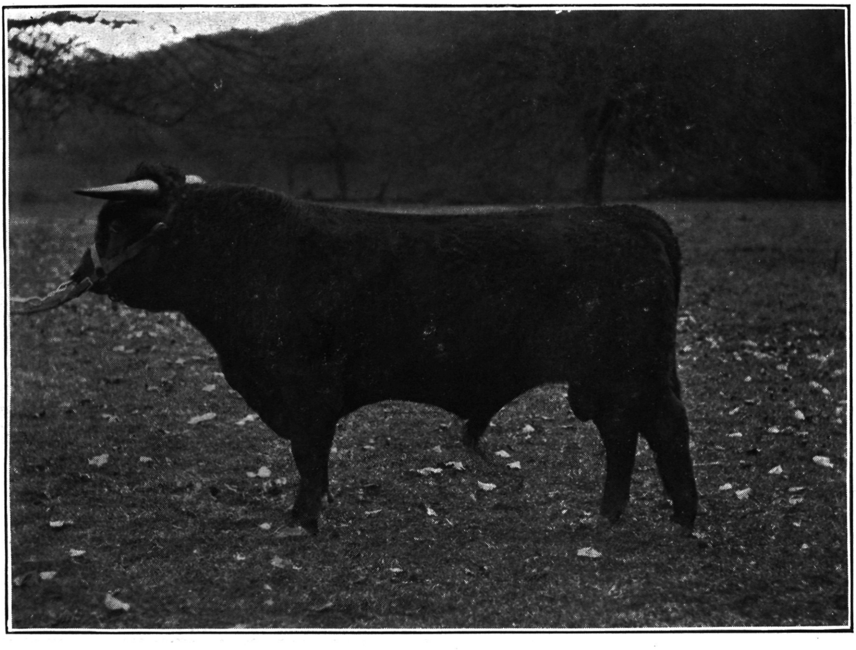


FIG. 2.—WELSH BLACK BULL DERW BOY 111.

One and one-half years old. First in class at English Royal Show, 1905, and first and special at Welsh National Show, 1905.

CARCASS COMPETITIONS AND THE BLOCK TEST.

It has before been stated that Welsh cattle are remarkable for their profitableness as butchers' animals. Their value in this respect is the chief reason for bringing them to the notice of cattlemen. Robert Wallace, in Farm Live Stock of Great Britain (1889), states that these cattle had long been highly appreciated by the graziers of the English midlands, and that their dressed carcasses ranked in the London market with the best Scotch, which is equivalent to saying they were market toppers.

There is evidence that Welsh cattle were preeminent for their beef qualities over a century ago. Youatt states that about that time a certain strain of the breed—the Glamorgan—commanded the highest price as beef cattle both in the metropolitan and provincial markets. The cattle in question were not black, but were dark brown, with some white on both the under and upper lines, and they are supposed to have originated by crossing the old Welsh breed with imported Normandy cattle. In the early part of the last century, however, owing to changing conditions of husbandry, the Glamorgans began to suffer from neglect, and it was not long before their prestige in the markets was a thing of the past.

CROSSING WITH SHORTHORNS.

The above-mentioned variety of Welsh cattle suggests the possibility of crossing the latter with Shorthorns for the purpose of producing a good animal suitable for the feed lot. There is, in fact, a practice in vogue in certain places of using Shorthorn bulls with Welsh cows, which seems to be successful.

Mr. Joseph E. Wing, of Mechanicsburg, Ohio, writing in The Breeder's Gazette (Chicago) of a visit to a provincial market in England in 1903 where store cattle (stockers) of the leading beef breeds and grades were being sold at auction, mentions a blue-gray cross produced by white Shorthorn bulls and Welsh Black cows, and says of them, "these sold very well."

WELSH CATTLE AT SMITHFIELD.

The data presented in the following pages in connection with the slaughter test at the Smithfield show, London, England—the premier test of beef cattle in Great Britain—show that the Welsh breed has fairly earned a most enviable reputation at these contests. The favor in which these cattle are held by the butchers is attested by the fact that the visitor to this show will generally find all the stalls containing Welsh cattle marked "Sold" on the first day.

One of the largest butchers in North Wales wrote as follows of the Welsh carcass:

The Welsh steer carries, in proportion to its fatness, more lean, nutritious marbled meat than any other, without an upper layer of fat (a failing of many breeds), a combination in which the Welsh stands almost alone. With this appreciable quality they carry also great thickness of flesh on their sirloins and chines without being heavy and coarse in the inferior joints. They scale remarkably well, several lots weighing in August, after four months grass and cake, 850 pounds, and those kept on until Christmas making from 1,200 to 1,250 pounds the carcass.

The annual slaughter tests at Smithfield have been in existence since 1895. They have been deservedly growing in popularity of late years because of the benefit they undoubtedly confer upon both the cattlemen and the butchers by bringing them together to discuss their mutual interests. It is asserted that a vast improvement has been brought about in the quality of the carcasses since these contests were instituted; at any rate it is significant that the overfed and wastefully fat carcasses of former years are no longer seen.

The accompanying table gives a comprehensive idea of the performances of the various breeds at these tests from the commencement to date.

Annual standing of breeds at Smithfield carcass competitions, with live weights and percentages of dressed weight of placed animals, 1895–1905.

[Compiled from the London Live Stock Journal.]

Class and rating.	1895			1896		
	Breed.	Live weight.	Per cent dressed.	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		Pounds.			Pounds.	
First	Crossbred	1,320	65.91	Aberdeen-Angus	1,158	67.19
Second	Sussex	1,556	65.81	Sussex	1,452	66.12
Third	Shorthorn	1,398	65.88	Crossbred	1,322	64.82
Fourth	Aberdeen-Angus	1,246	63.08	do	1,359	66.59
Unplaced	Hereford			Aberdeen-Angus (2).		
Do	Aberdeen-Angus			Galloway		
Do	Shorthorn			Sussex		
Do	Sussex			Welsh (2)		
Steers over 2 and under 3 years:						
First	Highland	a1,396	a77.36	Welsh	1,576	65.00
Second	Galloway	a1,689	a54.88	Galloway	1,398	66.38
Third	do	1,658	64.23	do	1,385	64.70
Fourth	do	1,436	68.31	do	1,430	65.94
Unplaced	Aberdeen-Angus			Crossbred (4)		
Do	Red Poll			Galloway		
Do	Crossbred (3)			Highland		
Do				Shorthorn		
Do				Sussex		

a There is evidently a mistake in the figures reported in the Live Stock Journal for these two animals as the percentage comes out in one case too high and in the other too low. They are therefore not taken account of in calculating averages shown in the table on page 174.

Annual standing of breeds at Smithfield carcass competitions, with live weights and percentages of dressed weight of placed animals, 1895–1905—Continued.

Class and rating.	1897			1898		
	Breed.	Live weight.	Per cent dressed.	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		*Pounds.*			*Pounds.*	
First	Crossbred	1,193	64.96	Galloway	1,178	64.77
Second	Galloway	1,262	65.13	Crossbred	1,222	65.46
Third	Crossbred	1,164	64.43	Aberdeen-Angus	1,286	65.47
Fourth	Galloway	938	65.88	Crossbred	1,068	64.51
Unplaced	Aberdeen-Angus			Crossbred (2)		
Do	Crossbred			Galloway (2)		
Do	Devon			Red Poll		
Do	Red Poll			South Devon		
Do	Sussex (2)					
Steers over 2 and under 3 years:						
First	Galloway	1,355	66.42	.....do	1,604	65.21
Second	Dexter-Kerry	946	62.05	Crossbred	1,436	66.71
Third	Crossbred	1,432	64.94	.....do	1,332	65.84
Fourth	Highland	1,308	62.00	Welsh	1,608	64.43
Unplaced	Crossbred			Aberdeen-Angus (2).		
Do	Galloway (2)			Crossbred (2)		
Do	Shorthorn			Devon		
Do	Sussex			Galloway (3)		
Do	Welsh			Hereford		
Do				Highland		
Do				Sussex		
Do				Welsh		
Heifers under 3 years:						
First				Galloway	1,157	64.04
Second				Devon	1,296	62.89
Third				Crossbred	1,285	64.59
Fourth				Dexter-Kerry	971	65.50
Unplaced				Crossbred (4)		

Class and rating.	1899			1900		
	Breed.	Live weight.	Per cent dressed.	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		*Pounds.*			*Pounds.*	
First	Crossbred	1,358	64.51	Crossbred	1,192	66.02
Second	Sussex	1,541	64.50	.....do	1,297	65.00
Third	Galloway	990	64.75	.....do	1,315	64.41
Fourth				.....do	1,295	65.64
Unplaced	Kerry					
Steers over 2 and under 3 years:						
First	Aberdeen-Angus	1,308	68.35	Aberdeen-Angus	1,332	65.92
Second	Galloway	1,716	67.31	Crossbred	1,381	67.13
Third	Welsh	1,680	64.76	.....do	1,418	63.26
Fourth	.....do	1,590	62.77	Dexter	1,241	65.83
Unplaced	Ayrshire			Crossbred (3)		
Do	Highland					
Do	Shorthorn					
Do	South Devon					
Heifers under 3 years:						
First	Crossbred	1,099	60.78	Aberdeen-Angus	1,304	62.65
Second	(Only one entry)			Kerry	1,064	62.69
Third				Crossbred	1,290	62.09
Fourth				.....do	1,434	65.27
Unplaced						

Annual standing of breeds at Smithfield carcass competitions, with live weights and percentages of dressed weight of placed animals, 1895–1905—Continued.

Class and rating.	1901			1902		
	Breed.	Live weight.	Per cent dressed.	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		*Pounds.*			*Pounds.*	
First	Welsh	1,624	65.88	Crossbred	1,079	64.23
Second	Crossbred	1,355	65.24	Aberdeen-Angus	1,022	62.72
Third	Sussex	1,260	65.79	Crossbred	1,235	62.27
Fourth	Galloway	1,043	68.84	do	1,328	67.17
Unplaced	Aberdeen-Angus					
Do	Crossbred (5)					
Steers over 2 and under 3 years:						
First	Aberdeen-Angus	1,388	65.85	Welsh	1,698	64.25
Second	Crossbred	1,368	64.69	Aberdeen-Angus	1,230	68.13
Third	Kerry	1,371	64.26	Crossbred	1,528	65.05
Fourth	Crossbred	1,252	65.50	do	1,384	66.84
Unplaced	Aberdeen-Angus			do		
Do	Crossbred					
Do	Galloway (2)					
Heifers under 3 years:						
First	Aberdeen-Angus	1,348	65.95	Aberdeen-Angus	1,332	68.17
Second	Crossbred	1,226	64.44	do	1,106	64.20
Third	do	1,324	64.65	Crossbred	1,339	65.20
Fourth	do	865	62.54	Dexter	799	63.58
Unplaced	Crossbred (2)			Crossbred		
Do				Sussex		

Class and rating.	1903			1904		
	Breed.	Live weight.	Per cent dressed.	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		*Pounds.*			*Pounds.*	
First	Welsh	1,267	59.67	Crossbred	1,444	66.90
Second	Crossbred	1,103	63.10	do	1,192	63.67
Third	Sussex	1,297	67.39	Aberdeen-Angus	1,104	64.76
Fourth	Shorthorn	1,188	64.90	Crossbred	1,032	63.28
Unplaced	Aberdeen-Angus			Aberdeen-Angus		
Do				Crossbred		
Do				Sussex (2)		
Do				Welsh		
Steers over 2 and under 3 years:						
First	Welsh	1,480	65.34	Crossbred	1,566	68.14
Second	Crossbred	1,403	65.86	Aberdeen-Angus	1,487	65.37
Third	Kerry	1,196	62.96	Crossbred	1,378	63.72
Fourth	Aberdeen-Angus	1,339	67.06	Galloway	1,340	66.12
Unplaced				Aberdeen-Angus		
Do				Galloway (2)		
Do				Welsh (3)		
Heifers under 3 years:						
First	Crossbred	1,161	65.63	Aberdeen-Angus	1,160	63.88
Second	Galloway	1,100	64.73	Crossbred	1,681	66.33
Third	Crossbred	1,204	64.87	Red Poll	1,008	65.38
Fourth	Dexter	1,014	65.29	Welsh	1,268	64.91
Unplaced	Welsh			Aberdeen-Angus		
Do				Crossbred (4)		
Do				Kerry		

Annual standing of breeds at Smithfield carcass competitions, with live weights and percentages of dressed weight of placed animals, 1895–1905—Continued.

Class and rating.	1905		
	Breed.	Live weight.	Per cent dressed.
Steers under 2 years:		*Pounds.*	
First	Welsh	1,346	64.86
Second	Crossbred	1,302	64.13
Third	do	1,200	65.67
Fourth	do	1,204	62.21
Unplaced	Red Poll		
Steers over 2 and under 3 years:			
First	Welsh	1,470	64.76
Second	Crossbred	1,458	63.65
Third	do	1,008	63.00
Fourth	Welsh	1,656	63.71
Unplaced	Crossbred		
Heifers under 3 years:			
First	do	1,247	65.12
Second	do	1,160	64.83
Third	Red Poll	1,157	64.22
Fourth	Welsh	1,374	64.05
Unplaced	Crossbred		

COMPARATIVE SHOWING OF BREEDS AT THE SMITHFIELD SLAUGHTER TESTS.

In order to make as close a comparison as possible from the data in the preceding tables a summarized statement showing the performance of each breed for the entire eleven-year period is now presented.

Summary of placings of breeds at Smithfield carcass competitions for eleven-year period, 1895–1905.

Breed.	Total animals entered.	Number of times—				
		First.	Second.	Third.	Fourth.	Unplaced.
Aberdeen-Angus	29	8	4	2	2	13
Ayrshire	1					1
Crossbred	87	10	14	16	10	37
Devon	3		1			2
Dexter	3				3	
Dexter-Kerry	2		1		1	
Galloway	29	3	5	3	5	13
Hereford	3					3
Highland	5	1			1	3
Kerry	5		1	2		2
Red Poll	6			2		4
Shorthorn	6			1	1	4
South Devon	3	1				2
Sussex	15		3	2		10
Welsh	22	7		1	5	9

It is seen that the majority of the breeds in the above tables have only a few scattered entries, and only five (including the crossbreds) run into double figures. The crossbreds have by far the most numerous entries and it is therefore not surprising they have captured the most prizes. It should also be stated that they help to represent the Shorthorn breed in these competitions, as the great majority of the crosses contain Shorthorn blood.

It is somewhat difficult to place the breeds in order of merit by reason of the uneven number of entries and the necessity of giving a different weight to each one of the four grades of prizes. It can easily be seen, however, that the Welsh have more firsts to their credit in comparison with the total number of entries than any of the others, but the general excellence of the Angus carcasses is undeniable, and probably on the whole showing this breed is entitled to come first, with the Welsh a close second, the crossbreds third, and the Galloway fourth. This placing is arrived at by assuming a scale of points ranging, by tens, from 100 for first to 60 for unplaced. On this scale the percentages for each breed work out as follows: Aberdeen-Angus, 77; Welsh, 76; crossbred, 74; and Galloway, 73. The remaining breeds do not make as good a showing as the four mentioned, and are not included because of the smallness of their total entries.

LIVE WEIGHTS AND PERCENTAGES OF DRESSED WEIGHT TO LIVE WEIGHT.

In order to obtain an idea of the relative size and dressed percentages of the leading breeds in the carcass tests, the following statement of the average live weights and percentages of dressed weight to live weight of the prize winners (taken from the table on page 170) for the eleven-year period is given. Only the four leading breeds above mentioned are used, for the same reason as before stated.

Average live weights and dressed percentages of prize winners of four leading breeds at Smithfield slaughter tests for eleven-year period, 1895–1905.

Breed.	Average live weight.			Average dressed percentage.		
	Steers under 2 years.	Steers over 2 and under 3 years.	Heifers.	Steers under 2 years.	Steers over 2 and under 3 years.	Heifers.
	Pounds.	*Pounds.*	*Pounds.*			
Aberdeen-Angus	1,163	1,347	1,250	64.68	66.73	65.04
Crossbred	1,243	1,382	1,255	64.85	65.37	64.47
Galloway	1,082	1,465	1,128	65.83	66.15	64.38
Welsh	1,412	1,595	1,321	63.68	64.36	64.46

It is seen that the Welsh are the weightiest animals in all the classes. On the other hand, they are lowest in dressed percentages in the steer classes, but the heifers come out with a good average.

EARLY MATURITY.

Welsh cattle are sometimes criticised on the score of late maturity. They probably were somewhat slow feeders in the past, but the adherents of the improved breed claim it is now in the front rank of rapid fatteners. In order to give this matter a thorough test the statement below has been prepared, showing the average age and the average daily gain of the steers under 2 years old at the Smithfield show for the past six years. Seven of the leading beef breeds are taken, and the ages and daily gains of all their entries (as stated in the London Live Stock Journal) are averaged for each year; finally an average is computed for the whole period as well, and this is assumed to be a fair indication of what each breed is capable.

It is seen from this that although the Welsh come in two or three weeks later than the others they are above the average in daily gains. It is rather singular that two extremes are found in one breed—the Galloways—averaging lowest in gains and next to the youngest in age. Only four of the breeds have daily average gains exceeding 2 pounds, and they come out very close to each other, there being less than one-tenth of a pound between the highest and the lowest. The four in question, with their average daily gains, are: Shorthorn, 2.17 pounds; Hereford, 2.14 pounds; Aberdeen-Angus, 2.12 pounds; and Welsh, 2.08 pounds.

Average age and daily gain of steers under 2 years old of seven leading breeds at Smithfield for six years, 1900–1905.

Breed.	Number of entries.	Average age.	Average daily gain.	Breed.	Number of entries.	Average age.	Average daily gain.
1900.				1903—Continued.			
		Days.	*Pounds.*			*Days.*	*Pounds.*
Aberdeen-Angus	4	680	2.18	Red Poll	4	617	1.87
Devon	8	686	1.86	Shorthorn	5	690	2.07
Galloway	4	656	1.86	Welsh	7	680	1.97
Hereford	5	694	2.14				
Red Poll	4	688	1.82	1904.			
Shorthorn	5	697	2.16				
Welsh	6	708	2.06	Aberdeen-Angus	5	682	2.00
				Devon	6	673	1.70
1901.				Galloway	3	699	1.82
				Hereford	4	662	2.15
Aberdeen-Angus	6	687	2.11	Red Poll	2	645	1.74
Devon	4	669	1.83	Shorthorn	5	669	2.20
Galloway	5	647	2.00	Welsh	6	715	2.18
Hereford	5	671	2.09				
Red Poll	4	629	1.83	1905.			
Shorthorn	6	648	2.26				
Welsh	4	718	2.18	Aberdeen-Angus	9	676	2.00
				Devon	4	679	1.93
1902.				Galloway	6	645	1.77
				Hereford	5	677	2.24
Aberdeen-Angus	7	682	2.17	Red Poll	4	641	2.00
Devon	6	683	1.81	Shorthorn	7	682	2.19
Galloway	2	694	1.85	Welsh	6	708	2.02
Hereford	5	682	2.07				
Red Poll	2	647	1.94	*Average for 6 years.*			
Shorthorn	5	680	2.12				
Welsh	7	708	2.12	Aberdeen-Angus	37	678	2.12
				Devon	33	679	1.81
1903.				Galloway	25	663	1.65
				Hereford	30	672	2.14
Aberdeen-Angus	6	660	2.32	Red Poll	20	644	1.87
Devon	5	679	1.74	Shorthorn	33	677	2.17
Galloway	5	670	1.79	Welsh	36	705	2.08
Hereford	6	650	2.13				

THE BLOCK TEST.

Under this heading the London Live Stock Journal has been accustomed from year to year to publish reports procured from the butchers relating to the slaughter of the fat stock exhibited and sold from the Smithfield show. The purpose of the Journal was to get data on the important question of how the cattle fared after they had passed through the auctioneer's hands, and so the various slaughtering firms were annually requisitioned for the details given in the table below. This practice had been carried on for many years previous to the inauguration of the carcass competitions at this show, when the necessity of showing such details was much greater than it was after these tests became an annual fixture; but the work was considered so useful that it has been continued up to the present time.

The butchers' reports from this source of some of the Welsh cattle slaughtered from the Smithfield show of last Christmas, together with a tabular statement showing details of slaughter, are as follows:

No. 183. Welsh steer Cymro, commended in his class, 2 years 11 months and 6 days old. The butcher who purchased him reports "it was a splendid body of beef, not too fat, and had plenty of kidney suet."

No. 193. Welsh heifer Queen, second in class (also second at Birmingham), aged 2 years 9 months and 14 days. The purchaser states it was a "most satisfactory body of beef."

No. 175. Welsh steer Cymro, third in class, age 1 year 11 months 23 days. Butcher reports "a real good butcher's bullock, no waste, good color, and a grand cutter."

No. 177. Welsh steer, first in class, age 1 year 10 months. The purchaser states it was a "good butcher's bullock and a grand body of beef, well laced, with very little waste; flank and briskets lean."

No. 184. Welsh steer, age 2 years 11 months. The slaughterer reports it was a "lovely butcher's beast, not patchy of fat anywhere, good flesh, well mottled, and no trouble to sell."

Butchers' reports of Welsh cattle slaughtered from the Smithfield show of 1905.

Catalogue No. and description.	Age.	Live weight.	Average daily gain.	Dressed weight.	Percentage of dressed weight to live weight.	Weight of hide.	Weight of loose fat.
Steers under 2 years old.	*Days.*	*Pounds.*	*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*
174. Welsh steer (Duke)	716	1,374	1.91	838	60.99		
175. Welsh steer (Cymro)	718	1,497	2.08	898	59.98		
176. R. Roberts's Welsh steer	716	1,412	1.97	756	60.62		
177. W. Hughes's Welsh steer	665	1,437	2.16	916	63.74		
Steers over 2 and under 3 years old.							
179. Welsh steer (Twm Shon Catti)	1,021	1,859	1.80	1,152	62.27		104
183. Welsh steer (Cymro)	1,066	1,685	1.58	1,114	66.11	96	95½
184. R. Hughes's Welsh steer	1,060	1,568	1.48	976	62.24	110	72
187. Welsh steer (Jero)	1,085	1,519	1.40	944	62.14	102	62
188. Welsh steer (Jack)	1,084	1,555	1.43	952	61.22	109	67
190. Welsh steer (Sarn Boy)	1,085	2,011	1.85	1,296	64.44	130	82
Heifers under 2 years.							
192. Welsh heifer (Waen)	692	1,593	2.30	1,002	62.90	82	120
Heifers over 2 years.							
191. Welsh heifer (Angharad Du)	1,081	1,887	1.74	1,236	65.50	106	110
193. Welsh heifer (Queen)	1,014	1,544	1.52	1,026	66.45	79	88

PRICES OF PEDIGREED WELSH CATTLE.

The Welsh is not one of the so-called "fashionable" breeds; consequently purebred animals of good quality can generally be bought for much less than the prices paid for well-bred specimens of such breeds as the Shorthorn, Hereford, or Aberdeen-Angus. In order to give stockmen in the United States a line on the probable cost of investing in purebred Welsh stock, the following particulars of two public sales, one in the northern and one in the southern portion of the principality, are presented. It should be understood, of course, that it would probably cost about $20 per head additional to land the animals in this country.

The only account at hand of a public sale of the northern, or Anglesea, branch of the breed is that of a sale held at the Madryn farm, near Bangor, North Wales (since become the experimental farm of the University College of North Wales), on September 24, 1901. The particulars of the lots sold at this sale were furnished by Messrs. W. Dew & Son, auctioneers, Bangor, North Wales, and are as below. Mr. Dew, it may be mentioned, was one of the pioneers in the movement for improving the Welsh breed, he having been editor and honorary secretary of the first herdbook, issued in 1883, of the North Wales Black Cattle Society.

	Guineas.[a]	
Bulls:		
Mafeking,[b] 3½ years old, sold for	31	=$158
Ringleader, 19 months old, sold for	30	= 153
Winner of 3 prizes, 2 firsts and 1 second.		
Marion Duke, 20 months old, sold for	19	= 97
Winner of a second prize.		
Madryn Plumer, 19 months old, sold for	18	= 92
Bull calves:		
San Toy, 7 months old, sold for	15	= 77
Winner of 2 first prizes.		
Iarll Tanybwlch, 9 months old, sold for	15	= 77
Cows:		
Gafaill, 3 years old, sold for	22	= 112
Winner of 4 prizes, 1 first, 2 seconds, and 1 third.		
Gweno, 2½ years old, sold for	19½	= 100
Fawnog, 6 years old, sold for	15	= 77
Winner of 3 prizes, 2 firsts and 1 second.		
Heifers:		
Marion Beauty, 20 months old, sold for	21	= 107
Winner of 3 prizes, 2 firsts and 1 third.		
Plas Dolly, 17 months old, sold for	19	= 97
Mari Ddu, 1 year old, sold for	17	= 87
Winner of a first prize.		
Averages for the above sale:		
4 bulls averaged	24½	= 125
2 bull calves averaged	15	= 77
3 cows averaged	$18\frac{5}{6}$	= 96
3 heifers averaged	19	= 97

There is an annual sale of Welsh Black cattle held at Whitland, South Wales, every fall. Mr. W. E. Evans, Priory House, Milford

[a] One guinea=£1 1 s.=$5.1098.

[b] A picture of Mafeking (at 9 years old) is seen in the group on plate 11.

Haven, South Wales, who is the official auctioneer at this sale, has kindly furnished the following particulars of the last one, held October 24, 1905:

	Guineas.	
Bulls:		
Duke of Connaught, 3 years, sold for	45	=$230
Winner of 2 firsts and 1 first and champion.		
Duke of Pembroke, 16 months, sold for	21	= 107
Togo, 13 months, sold for	21	= 107
Winner of 1 second.		
Dyffryn Hero, 1 year 9 months, sold for	20	= 102
Winner of 1 first.		
Matchless, 13 months, sold for	20	= 102
Chris, 17 months, sold for	18	= 92
Brython, 1 year, sold for	17	= 87
Ap Iorwerth, 1 year 4 months, sold for	14	= 72
Milwr, 1 year, sold for	14	= 72
Robert II, 1 year 1 month, sold for	14	= 72
Mikado, 1 year 1 month, sold for	12	= 61
Elwyn, 1 year, sold for	12	= 61
Gwron, 1 year 4 months, sold for	12	= 61
Black Duke, 1 year, sold for	12	= 61
Bull calves:		
King Bruce, 11 months, sold for	25	= 128
Winner of 1 third.		
Jimmy Jones, 11 months, sold for	22	= 112
Llwynog, 11 months, sold for	20	= 102
Cardo, 9 months, sold for	15	= 77
Conin Prince, 10 months, sold for	14	= 72
Prince Alfred, 9 months, sold for	14	= 72
Llanboidy Squire, 9 months, sold for	13	= 66
Golden Prince, 11 months, sold for	12½	= 64
Defiance, 8 months, sold for	12	= 61
Brynach, 11 months, sold for	12	= 61
Robin Du, 11 months, sold for	12	= 61
Victor, 9 months, sold for	12	= 61
Winner of 1 first.		
Prince, 11 months, sold for	10	= 51
Model, 8 months, sold for	10	= 51
Togo, 7 months, sold for	10	= 51
Ap Hywel, 9 months, sold for	10	= 51
Billy II, 10 months, sold for	9	= 46
Duke of Fishguard, 3 months, sold for	7½	= 38
St. George II, 6 months, sold for	7	= 36
Cows:		
Blodwen, 8 years, sold for	35	= 179
Winner of 40 first and second prizes and 4 silver cups.		
Cornfelen II, 2 years 1 month, sold for	14½	= 74
Pensquar, 2 years 3 months, sold for	13	= 66
Calf at foot, sold for	2½	= 13
Little Jane, 9 years, sold for	10½	= 54
Heifer calves:		
Emily, 11 months, sold for	10	= 51
Berny Posy, 11 months, sold for	10	= 51

Averages of above sale:	Guineas.	
14 bulls averaged	18	=$92
19 bull calves averaged	13	= 66
4 cows averaged	18½	= 93
2 heifer calves averaged	10	= 51

THE ILLUSTRATIONS.

Plate 11. A portion of the herd of Welsh Black cattle at the University College of North Wales experimental farm, located at Madryn, near Bangor, North Wales. This was formerly the farm of Col. Henry Platt, for a long time one of the best-known and most successful breeders of Welsh cattle in North Wales. The mountain in the background is Penmaenmawr (1,553 feet high). It is at the northern end of the Snowdonian Range and has upon its summit the ruins of an ancient British fort. The sea is near by to the left, although not shown in the illustration. The herd in question is a very profitable one, both from the dairy point of view and in breeding for the butcher. An account of its management is given on page 166.

Plate 12, fig. 1. Welsh bull, Mallard 433 N. W. The picture was taken at the time the animal was shown at the English "Royal" at Cardiff, South Wales, in 1901. He took the first prize for aged bulls on that occasion, he being then 4 years old and described as a very weighty animal, deep and well built, with grand back. He was bred in Anglesea, North Wales, and shown by Col. H. Platt.

Plate 12, fig. 2. Heifer, Wern Gem, champion female in the Welsh classes at the "Royal" of 1903. Bred by the well-known breeder and exhibitor, R. M. Greaves, of Portmadoc, North Wales. This heifer was sired by Mafeking and was described as a most massive, deep, and well-ribbed animal.

Plate 13, fig. 1. Four-year-old bull, Lloffwr 161. A level and weighty bull, with good fore end and back; bred and exhibited by John Scourfield, Whitland, South Wales. Among the latest honors secured by this bull was a first and cup at the "Royal" of 1905; but a little later, at the Welsh National Show, he was placed second to Ap Klondike, bred by Lord Stanley, of Anglesea, North Wales.

Plate 13, fig. 2. Derw Boy 111, 1½ years old, a son of the above (Lloffwr). This smart youngster is very level and correct in outline and full of quality. He achieved the highest show honors in his class last year, having swept the board at both the English Royal and Welsh National shows. He is now owned by John Worthington, of Fishguard, Pembroke, South Wales.

Plate 14. Heifers, Madryn Beryl 611 and Madryn Mair 610. These level and good-looking heifers are prominent members of the herd at the University College of North Wales experimental farm and were brought out and photographed (among others) during the writer's visit to this herd. Madryn Beryl, to the left of the picture, has been

the more distinguished of the pair in the prize ring, having been first in her class at the "Royal" of 1905, besides winning another first and a second during the year named. Madryn Mair has had success in the ring also. The latter was sired by Hyfwr and bred by Humphrey Ellis, Bangor. Madryn Beryl was sired by Mafeking, the herd bull at the above-mentioned farm, who is shown in the group on plate 11.

Plate 15. Madryn Sally 595 and calf. This is one of the most useful dams of the University herd, above alluded to, and was 6 years and 2 months old when photographed. Madryn Sally has won much distinction in the ring, having more than one first to her credit in North Wales shows, but she is somewhat lacking in style, and for this reason has generally failed to land the chief prize when pitted against the best of her sex at the big shows.

Two Welsh Black Heifers, Madryn Beryl 611 and Madryn Mair 610, at the University College of North Wales Experimental Farm.

Winners of several prizes.

An. Rpt. B. A. I. 1905.

WELSH BLACK COW MADRYN SALLY 595 AND CALF.

Members of herd at University College of North Wales Experimental Farm. The cow is 6 years old and has won several prizes.

BABY BEEF.

By Ernest G. Ritzman, B. S. A.,
Assistant Animal Husbandman, Bureau of Animal Industry.

INTRODUCTION.

Statistics show that the leading meat-consuming and meat-producing people of to-day are those speaking the English language. It is in the countries inhabited by these people that domestic live stock has been brought to the highest state of perfection, and the taste for the meat of these animals has been cultivated to a point which among the well-to-do classes has reached a stage not far below the proverbial luxury of the ancient Romans, inasmuch as specialization in breeding and feeding is necessary to produce that excellence in flavor, grain, and quality essential to please the palate of the modern epicure.

It is interesting to follow the changes that have taken place in the prevailing ideas regarding high-class beef. We are told that during the time of Henry VIII the English people were "strangers to beef and mutton." In those days, according to Youatt, the cattle industry was grossly neglected, and beef, the consumption of which is said to have been confined principally to the summer months, was worth per pound only the equivalent of 3 cents of our present money; but allowance should be made for the fact that the purchasing power of money was greater in those days than it is now. The general form and appearance of the cattle in that period, which are described as "diminutive" in comparison with our modern beef breeds, show the animals to have been little adapted for the production of choice meat, especially when it is considered that the proportion of choice cuts was rather small, and when the time required to put an ox on the market was from five to seven years, the greater part of the time being often spent working in the fields instead of grazing on them; it is therefore quite evident that beef produced under such conditions was tough and inferior, lacking the juicy character which is now desired.

It was about two hundred years later, during the latter half of the eighteenth century, that specialization in growing cattle especially adapted for beef production began, but even then it seems that more attention was given to develop size and quantity rather than quality, the result being those ponderous, rough-appearing specimens with huge bodies, bearing great lumps of meat (and tallow), which still required five or more years to produce, and of which the Newbus ox (fig. 7), Colling's famous "Durham Ox," or his equally famous "White Heifer that Traveled," were regarded as the most improved examples.

That the ideas regarding excellence of form and quality of meat differed very essentially from our present-day standards is shown by Culley (1794), who states that "short legs are not necessary to excellence in animals," although he was an advocate of fine bone and symmetry of form; these characteristics, as he states it, "being indicative of a more responsive feeder and of producing a finer-grained meat."

Even in Culley's time cattle were not thought fully mature until 5 or 6 years old, and the tender, juicy meat of young animals was considered far inferior to that of older oxen. Highland oxen, which were seldom put into the yoke and of which great numbers were brought into England to be fattened, seldom reached the block before 5 years

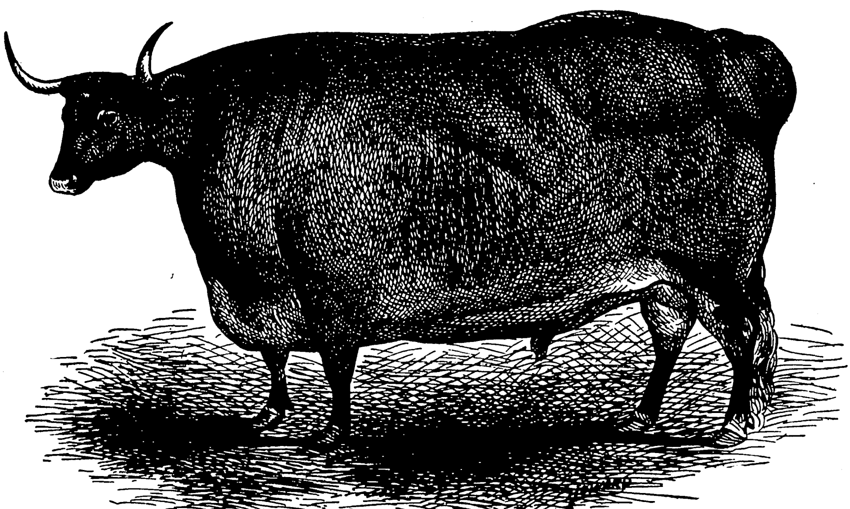


FIG. 7.—Newbus ox.

of age, yet the quality of their meat had become proverbial for its excellence. Animals exhibited at fat-stock shows in those days no doubt underwent a preparation very different from that of the show candidates of to-day. An example may be cited of two oxen exhibited at the Smithfield fat-stock show in 1800, one 5 and the other 7 years old. These animals had been worked three and one-half and two years, respectively, and the preparation for the show consisted in feeding with grass, hay, and a few potatoes for about five weeks previous to the exhibition. To-day such animals could find a place at fat-stock shows only as curiosities.

If fat-stock shows are a fair criterion of market demands in age and type of cattle; their records indicate that at the beginning of the nineteenth century the acme of perfection, both in this country and in England, was the 5 or 6 year old steer weighing 2,500 to 3,000 pounds and often more. In fact, the popular verdict was, "the larger the better." Even up to as recent a period as the early eighties a steer was not deemed mature or profitable enough for slaughter until seasoned by four or five years of life and was still of enormous size and weight.

The Chicago fat-stock show of 1891 led the way in eliminating classes for 3-year-olds, and since that date finished steers above 36 months of age have been the exception rather than the rule on the markets, while 2-year-olds are gradually becoming the maximum. With the reduction in age came a reduction in size, which brought out as the ideal butchers' beast the pony beef, an animal weighing from 1,200 to 1,400 pounds when fully finished. But even the latter weight has been found too large during certain seasons of the year, especially the spring months, for animals that furnish the ideal cuts now in demand, and pony beef was eventually followed by baby beef, the latter being a pony steer finished at a younger age.

That this early mature (baby) beef has taken a strong hold on the consumer and is gradually becoming more popular with the producer was plainly shown at the latest Chicago live-stock show (1905), when the car lots of fat cattle were represented by 24 loads of yearlings, or baby beef, against 31 loads of older cattle. Individual animals or carload lots averaging over 1,800 pounds a head have become almost entirely eliminated from the show ring, and such animals as were fed up to that weight were generally relegated to a back seat in the prize list with the criticism "overdone" or "tallowy." The demand for prime yearlings (baby beef) and the prices at which they sell, as compared with the prices paid for older cattle, indicates that the former prejudice has been cast aside, and the well-finished young meat is as popular to-day as that of cattle of more mature age.

HOW BABY BEEF CAME ABOUT.

The origin of baby beef dates back not more than twenty to twenty-five years. Regarding the first mention of it the National Farmer and Stock Grower says:

> Incidental to this subject of baby beef we desire to say that the first time baby beef was mentioned in print in our recollection was in about the year 1884, in a letter written to the editor of the Texas Live Stock Journal, by Mrs. C. Adair, of London, England, widow of John G. Adair, the owner and capitalist of the Adair & Goodnight herds in the Panhandle. Mr. Adair had extensive estates in Ireland, and fattened cattle for sale on the London and Liverpool markets, and at the request of Mr. George B. Loving, then owner of the Texas Live Stock Journal, Mrs. Adair wrote a letter which contained a statement of the process of feeding calves from birth to market which could not be improved upon with all the light obtained by experience and experiment to this day.

Baby beef has been brought to a high state of excellence by the American feeder's art and now has a firm hold on the market. As we have already seen, the most important and perhaps the most noted progress in the improvement of domestic live stock has been the continuous advance toward early maturity, earlier maturity having been one of the chief objects kept in view by all great improvers of live stock.

Selection and breeding have been the principal means through which the time required for the natural maturing of domestic cattle has been reduced several years. It is also recognized that heavy feeding exerts a marked influence in producing early maturity, this being an artificial method through which animals are matured for the block in less than the normal time.

Numerous reasons have been given as causes of the growing popularity of early fattened baby beef with both consumer and producer. Doubtless it may be said to be based on economic principles. The first step toward baby beef was the demand for and production of smaller and more compact animals, already referred to as pony beef. The butchers claimed that this change was a good one for economical reasons, because small, compact carcasses cut up with less waste fat and furnish the thick, light steaks which are most in demand by the consumer because of their greater cheapness. As the demand regulates the price, it was natural that the producer should furnish the smaller and more compact carcass for which there was a steady demand and for which he would receive a good price.

Again, experimental evidence shows that young animals will feed more economically than those more mature in age, so that baby beef will give from 25 to 50 per cent more meat for the grain consumed than the same animal would if kept until two or three years of age. This was the economical solution of the problem of cheapening the production of meat. Therefore the greater profit in small joints, together with the greater economy of producing young beef, may be regarded as the most potent factors in bringing about baby beef.

WHAT IS BABY BEEF?

Baby beef is a prime butchers' beast, thoroughly fattened and ripe for the block at from 12 to 24 months of age. Growth has been artificially promoted by continuous heavy feeding from birth, with the object of obtaining in the shortest time possible the maximum amount of well-matured beef. The customary ages at which cattle are put on the market are as 2-year-olds or 3-year-olds, the greater part of the time being required for natural growth, while about four to six months at the end are devoted to fattening. In the production of baby beef the fattening process is begun at birth and carried on simultaneously with growth. In order to make calves thoroughly prime and fit for the block as yearlings it is absolutely essential that they be always fed to the limit of their ability of transforming food into beef.

The Breeder's Gazette of December 14, 1904, makes the following comments on the nature and production of baby beef:

> The making of baby beef is a continuous performance with shows three hundred and sixty-five days in the ordinary year and three hundred and sixty-six days in the leap year. * * * It is readily observable that there is no such thing as "warming up" or "short-feeding" calves intended for the buyers of prime baby beef. * * * Cattle may be 16 or 18 months of age and afterwards warmed up a bit, but they will not class as baby beef and they will not bring the prices of that article.

Baby beef is a special article in which the essential characteristics are early maturity, quality, finish, and thickness of flesh. Nine out of ten yearlings sent to market for slaughter do not class as baby beef, because they lack finish or quality, while some are overfed or "overdone." This results from lack of a proper understanding of the qualities that constitute the condition known as "ripeness" or "finish." It thus happens also that much disappointment in regard to prices often results from marketing such unfinished and overdone cattle.

EARLY MATURITY.

Maturity for the block in beef cattle means that condition when they have reached full growth of body and are thoroughly fat or ripe for slaughter. The average age at which cattle are now fully grown and fattened for the market is between two and three years. Early maturity, therefore, means that the animal has been fully grown and fattened in less than the average length of time required by that class of stock.

In addition to the factors already mentioned through which early maturity can be produced—namely, selection, breeding, and feeding—there is a great difference between individual animals in their tendency to mature early. Small-framed, compact animals that possess quality, indicated by fine bone, a soft, mellow hide, and silky hair, generally mature in less time than is required by the average of the breed. Feeding is the strongest means by which advantage can be taken of this tendency in an animal to hasten its maturity. Another way of producing stock that will mature early is by breeding very young animals, but this is not recommended, because it is a dwarfing process and therefore associated with more or less chance as to the result.

When early maturity is attempted by means of liberal feeding with nutritious feed, carbonaceous in character and lacking in bulk, the tendency to produce flesh and fat is readily developed; but owing to the smaller proportion of nitrogenous constituents contained in such feed and its lack of bulk the animal's frame does not make a proportionate development, and its natural growth is checked at the expense of the development of flesh and fat. Consequently a slight reduction in size and greater fineness of bone are generally associated with early maturity.

When very heavy feeding is resorted to there is always the danger of overfeeding, which often results in permanent injury to the animal.

BREEDS AND TYPES BEST SUITED FOR BABY BEEF.

The comparative value of breeds for the production of beef has been studied at various State experiment stations. The results so far obtained in regard to early maturity indicate that it is not so much a matter of breed as of type.

Early maturity is generally found in animals that combine a good feeding and assimilative capacity with a certain fineness of quality.

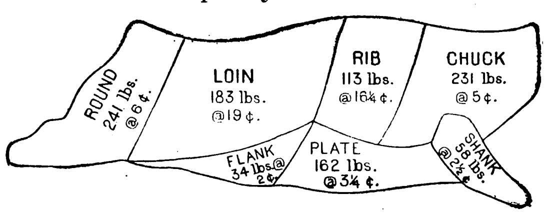


Fig. 8.—Chicago wholesale dealers' method of cutting beef.

Each of the various beef breeds offers more or less diversity in this respect, some individuals in each conforming more closely to this type than others of the same breed.

While early maturity is not entirely a matter of size, it is most often found in individuals a little smaller than the average of the breed. Good specimens of such have a compact form, fine bone, soft, pliable skin, and good digestive capacity, the latter being indicated by well-sprung ribs, great depth of body, and wide chest. Large animals which are more or less rangy in appearance and heavier in bone generally mature somewhat more slowly.

Another phase of the comparative value of breeds is the butchers' idea of type in regard to profit. This type represents the animal that will turn its feed to best account by developing a comparatively large per cent of meat in those cuts which sell for the highest prices. (See figs. 8 and 9.)[a] Thickness of flesh over back and loins carried well down over the ribs and well-rounded hind quarters with flesh to the hocks are the qualities which make the animal of most value on the block. It is therefore evident that the further we recede from the extreme dairy type with the protruding spinal column, narrow back,

[a] These illustrations are reproduced from Farmers' Bulletin No. 71, first issued in 1898. Since that time prices of beef have advanced, but it is believed that the relation between the prices of various cuts, as shown in the figures, has not materially changed.

and thin cat-hams the greater will be the proportionate weight of high-priced meat and the smaller the percentage of waste. It is in this feature that the beef breeds are superior to the dairy types and scrubs. Experimental evidence indicates that animals of inferior beef type may make as large gains per pound of feed consumed or as

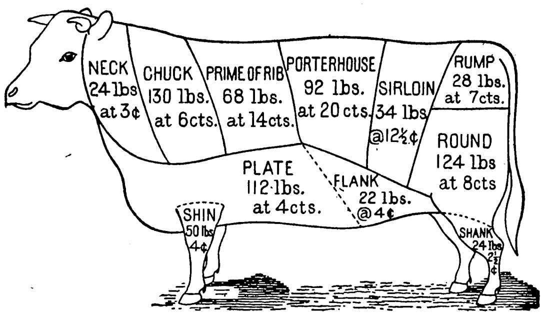


Fig. 9.—Chicago retail dealers' method of cutting beef.

rapid daily gains as well-bred beef animals, but while the beef steer turns his feed into thickness of flesh, the dairy or scrub develops his frame and fattens on the inside, thus accumulating too much loose tallow around the internal organs. This is illustrated in the following tables, taken from Bulletin No. 22 of the Iowa Experiment Station:

Carcass comparison of various beef and dairy breeds and valuation by three expert buyers at the stock yards.

Breed.	Average live weight.	Average dressed weight.	Dressed percentage.	Experts' valuation per hundred-weight.	Loose tallow.	
	Pounds.	*Pounds.*			*Pounds.*	*Per cent.*
Hereford	1,525	1,022	67.0	$6.62	129	12.6
Shorthorn	1,660	1,092	65.8	6.37	145	13.3
Galloway	1,635	1,088	66.5	6.37	147	13.5
Aberdeen Angus	1,725	1,137	65.9	6.37	156	13.8
Red Polled	1,520	990	65.1	6.25	125	12.6
Swiss	1,570	1,017	64.8	6.00	119	11.7
Devon	1,290	815	63.2	5.75	122	15.0
Holstein	1,410	862	61.1	5.00	155	17.9
Jersey	1,430	880	61.5	4.50	165	18.8

Percentage and value of the various cuts in Shorthorn and Holstein steers.

Cuts.	Shorthorn.		Holstein.	
	Percentage.	Value.	Percentage.	Value.
Loins	17.1	$35.48	16.6	$27.18
Ribs	9.9	15.78	10.2	14.29
Rounds	22.9	15.00	23.3	12.05
Chucks	21.1	11.52	21.9	9.44
Plates	15.4	5.37	14.2	4.08
Shanks	5.7	1.55	6.4	1.38
Minor cheap parts	7.9	1.73	7.4	1.28
Total	100.0	86.43	100.0	69.70

Value per hundredweight of live weight on the basis of total value: Shorthorn, $5.21; Holstein, $4.94.

These tables indicate that there is little or no difference between the breeds which are bred principally for beef, while dairy-bred animals yield a greater amount of waste and a proportionately smaller weight in the high-priced cuts, as is illustrated by the comparison between the Shorthorn and the Holstein in the last table. This point is also emphasized by the packers, who make practically no discrimination between Angus, Shorthorn, Hereford, or Galloway.

From the butcher's point of view there is no difference between purebred, grade, crossbred, or common stock, provided they all possess the same beef qualifications. From the breeder's and the feeder's points of view the choice is decidedly with purebred animals, as they are most likely to breed and develop true to type and to present a uniform appearance. At present the feeder relies principally on grade stock, and when such animals possess a high concentration of the blood of any one breed they are generally equal to pedigreed animals for feeding purposes. Crossbreeding is not very common in this country. In England, where it is more generally practiced for the production of special beef qualifications, excellent results have been obtained; but unless the breeds are well selected bad results are liable to follow, especially after the first cross. Stress is often laid on the importance of uniformity in color, although the packers claim that it does not increase the value except as it might catch the eye of the buyer.

HEIFERS AS GOOD AS STEERS FOR BABY BEEF.

Under present conditions the market does not discriminate between steers and heifers for baby beef, as the latter sell for equally high prices as the steers, provided they are equally well finished. Heifers under 2 years of age fatten more readily and take on a better finish than steers of the same age. They possess finer bone, and consequently dress with less waste. Heifers are therefore as well adapted as steers for the production of baby beef, and this provides the most suitable method for disposing, at profitable prices, of heifers not intended for breeding.

QUALITY IN MEAT.

The problem that puzzles the average feeder more than any other is how to gauge accurately what is known as "condition" in animals. He is unable to distinguish between the criticisms which he generally hears at the stock yards, such as "lack of finish" and "overdone," and the condition known as "prime" or "ripe." It has already been stated that the consumers demand lean meat. Fat or tallow as a food by itself is generally regarded as unwholesome and unpalatable. Lean meat, without a due admixture of fat, is dry, tends to be fibrous, and lacks flavor. It is therefore evident that the ideal cut is one in which fat and lean are interwoven in such proportions that the lean forms the basis of nourishment, while the quantity of fat present is just sufficient to render the lean meat juicy, tender, and palatable, imparting to it flavor and life.

MEANING OF THE TERMS "PRIME," "UNFINISHED," AND "OVERDONE."

If the lean muscle fibers are regarded as the skeleton upon which to build, the fattening process consists of filling in between these fibers, and when the amount of fat interwoven is such that it has completely filled out and swelled the muscle the condition attained is that known as "prime;" when the filling out is not complete, and the proportion of fat to lean is too small to make the meat juicy and palatable, the criticism is "lack of finish;" but if the deposition of fat is carried beyond the "prime" point, fat is formed into layers and lumps in excessive quantities on the outside of the muscle, and the condition is criticised as "overdone." Craig states the following regarding the external indications of these conditions:

> If the covering of flesh is evenly distributed over the steer and it is springy and mellow to the touch, it is considered ready for the block (prime). If in denting the side with the finger the dent lingers some time, the condition is due to soft, flabby fat that brings but a small price at the butcher's stalls.

When this latter condition is found all over the animal it is a strong indication that the animal is overdone and has been fed beyond the profitable, or prime, point. Lack of finish is marked by too firm a touch, one wanting in elasticity. Successful production of baby beef requires great thickness of natural flesh, and this must be obtained by combining breeding with feeding. Condition, however, depends upon the judgment exercised in feeding.

The best way to become thoroughly familiar with these conditions is to examine and handle cattle both before and after slaughter. Ample opportunities for this are afforded at fat-stock shows, where cattle are judged before and after slaughter and where competent judges give their opinion on the merits and demerits of individual animals.

CHARACTERISTICS OF BEEF FLESH.

The meat of each species of animal possesses distinctive characteristics and peculiarities which, even in a single breed, are more or less modified by such factors as sex, age, feed, condition of health, and environment. The characteristics by which we describe beef are color, texture, quality of the grain, and flavor, while the streaky mixture of fat and lean meat is termed its "marbling." The combination of these factors determines the value and quality of the flesh as an article of food. Edelman describes the quality of beef as follows:

Beef in general has a deep red color, with a light touch of brown, texture firm, cut surface glossy, smell characteristic, as is also its marbling (the mixture of fat and lean). The connective tissues are white in color and moist. The fat (tallow) after cooling is hard, white to yellowish in color, and has a characteristic smell. In old cattle the fat is a deeper yellow, and softer. Deep yellow coloring of fat may also be found in pastured cattle. Liberal feeding with mashes, oil cake, peanut cake, and cotton-seed cake produces a soft, loose, yellow fat. The bone marrow, which varies in color from clear white to a reddish yellow, is stiff and crumbly.

In old, mature animals the flesh is dark red, the grain is moderately coarse, and the muscles through age and use have become harder and more fibrous. The fat, which has partly replaced the water in the muscle tissue, is much greater in proportion to the lean, and it is also found collected in larger deposits between the layers of muscle, the streaky mixture of the white fat and the darker colored lean meat giving the appearance known as "marbling." (See pl. 16.)

The flesh of young cattle, when compared with that of old steers, is brighter in color, and, like the young plant, is filled with juices. It has not developed that coarseness of grain and fiber characteristic of the flesh of old animals, and is therefore more tender and delicate. The proportion of fat to lean is smaller in the young animals and the fat does not accumulate in such large deposits or lumps between the layers of muscle, but is more evenly distributed in flakes between the muscle fibers. The flesh of young cattle contains a large amount of water, which, as the animal grows older, is partly replaced by fat. This is illustrated by the following table, compiled from Bulletin No. 28, Office of Experiment Stations, which shows the comparative composition of the various parts of the carcass in beef and veal:

Comparative composition of beef and veal.

Cuts (edible portion).	Water.		Protein. (N.×6.25.)		Fat.		Fuel value per pound.	
	Beef.	Veal.	Beef.	Veal.	Beef.	Veal.	Beef.	Veal.
Rib:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Calories.*
Lean	67.9	....	19.6	....	12.0	....	870	....
Medium fat	55.5	72.2	17.5	20.7	26.6	6.1	1,450	640
Fat	48.5	60.9	15.0	18.7	35.6	19.3	1,780	1,160
All analyses	57.0	69.8	17.8	20.2	24.6	9.4	1,370	775
Loin:								
Lean	67.0	73.3	19.7	20.4	12.7	5.6	900	615
Medium fat	60.6	69.0	18.5	19.9	20.2	10.8	1,190	825
Fat	54.7	61.6	17.5	18.7	27.6	18.9	1,490	1,145
All analyses	61.3	69.5	19.0	19.9	19.1	10.0	1,155	790
Round or leg:								
Lean	70.0	73.5	21.3	21.3	7.9	4.1	730	570
Medium fat	65.5	70.0	20.3	20.2	13.6	9.0	950	755
Fat	60.4	....	19.5	....	19.5	....	1,185	....
All analyses	67.8	71.7	20.9	20.7	10.6	6.7	835	670
Hind quarters:								
Lean	66.3	....	20.0	....	13.4	....	935	....
Medium fat	59.8	....	18.3	....	21.6	....	1,250	....
Fat	52.1	....	17.7	....	30.7	....	1,625	....
All analyses	62.2	70.9	19.3	20.7	18.3	8.3	1,130	735
Fore quarters:								
Lean	68.6	....	18.9	....	12.2	....	865	....
Medium fat	60.4	....	17.9	....	21.4	....	1,235	....
Fat	53.5	....	15.9	....	30.0	....	1,560	....
All analyses	62.5	71.7	18.3	20.0	18.9	8.0	1,135	710

The table indicates that the relative proportion of protein is nearly the same in veal as in beef, the proportionate amount being a little larger in veal. The amount of water in the composition of veal averages about 9 per cent higher than in beef, it being replaced in the latter by a correspondingly larger proportion of fat, thus giving the beef a higher nutritive efficiency, as is indicated by the columns sohwing caloric values.

In the early matured, thoroughly fattened yearling this process of filling up with fat between the muscle fibers has been completed before the muscle has become hard and coarse in the fiber through age and use, and if the young animal is sufficiently fat its meat will be more juicy, tender, and palatable than that of an animal more advanced in age.

Animals which are fattened after they have completed their full natural growth are more likely to develop excessive fat and to become patchy or uneven than animals which are fattened while growing, as the nutritive material of the feed is directed largely to the production of fat. Animals which have not completed their full natural growth utilize the protein constituents of feed in the production of bone, muscle, hair, horn, connective tissue, etc. Thus fat forming is not only deprived of this source of origin, but as this part of the feed constituents is employed in enlarging the framework upon which the fat is deposited, it is evident that fat can not become excessive so long as the animal is growing in frame. This also accounts partly for the fact that some feeders find it difficult to thoroughly finish yearling animals which are rapidly growing in frame.

LESSONS FROM THE FAT-STOCK SHOWS.

One of the principal things to be learned from the fat-stock shows held during the last five years is the increasing necessity for producing early matured beef. The rapid progress made along that line, especially in the range-cattle exhibits, indicates the great improvement brought about in live stock. Yearlings have alternated with 2-year-olds in taking the prizes for carload lots. While the grand championship honors have been won by animals weighing upward of 1,800 pounds, yet carload lots averaging over 1,500 pounds per head have generally been discriminated against on the ground of overweight, other things being equal. This is especially significant when it is considered that carload lots are generally judged by professional stock-yard buyers, who judge them on the basis of the market demands. The general tendency has been toward producing the largest amount of beef in the shortest time possible, and as a result carloads of yearlings from 18 to 22 months of age are exhibited averaging from 1,200 to 1,300 pounds. On the other hand, 2-year-olds, if fed with a similar object in view, especially when upward of 30 months old, often run above the desirable "handy weights" demanded by the trade.

The following table shows the results of the slaughter tests at the International Live Stock Expositions for the years 1901 to 1905, inclusive.

A comparison is made between the yearlings and 2-year-olds, showing in each case the live weight, the dressed weight, the per cent of dressed weight, and the weight and per cent of tallow. The total number of animals used in this comparison is 36 yearlings and 35 2-year-olds, and the information given comprises the individual figures, the annual averages, and the average for the five-year period.

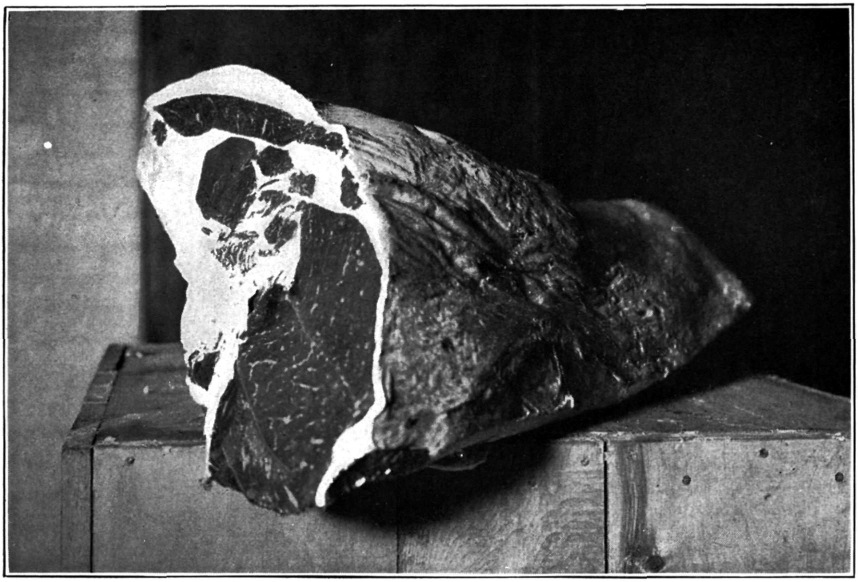
It is to be regretted that the reports do not give the exact age of the animals in days, as this would make the data a trifle more complete and also make it possible to compile an additional column showing the average gains of the animals.

Comparison of yearlings and 2-year-olds in slaughter test at International Live Stock Exposition, Chicago, 1901 to 1905.

[Compiled from the Breeder's Gazette.]

Placings.	Live weight.		Dressed weight.		Per cent dressed.		Weight of tallow.		Per cent of tallow.	
	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.
1901.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*			*Lbs.*	*Lbs.*		
First	1,620	1,165	1,023	774	63.15	66.44	142	91	8.77	7.73
Second	1,450	1,290	933	806	63.34	62.48	92	87	6.34	6.74
Third	1,390	1,120	867	687	62.37	61.34	145	110	10.43	9.82
Very highly commended	1,710	1,240	1,050	789	61.46	63.63	160	93	9.36	7.50
Highly commended	1,625	1,415	1,097	906	67.51	64.03	118	87	7.26	6.15
Average	1,559	1,246	994	792	63.77	63.60	131	94	8.43	7.51
1902.										
First	1,555	1,270	1,012	825	65.08	64.96	118	87	7.59	6.85
Second	1,380	1,430	904	955	65.51	66.78	72	110	5.22	7.69
Third	1,355	1,145	830	759	61.25	66.29	127	79	9.37	6.90
Very highly commended	1,350	1,055	814	665	60.30	61.03	88	87	6.52	8.25
Highly commended	1,080	1,080	667	665	61.76	61.57	76	72	7.04	6.67
	....	1,285	....	835	....	64.98	....	86	....	6.69
	....	1,400	....	916	....	65.43	....	87	....	6.22
	....	1,550	....	1,002	....	64.64	....	127	....	8.19
	....	1,095	....	686	....	62.65	....	71	....	6.48
Average	1,344	1,257	845	812	62.90	64.62	96	90	7.15	7.11
1903.[a]										
First	1,345	1,215	926	816	68.88	67.16	....	....	....	....
Second	1,432	1,551	935	1,008	65.29	64.99	....	....	....	....
Third	1,630	1,380	1,088	917	66.75	66.45	....	....	....	....
Very highly commended	1,485	1,406	1,011	953	68.08	67.78	....	....	....	....
Highly commended	1,590	1,230	1,075	778	67.61	63.25	....	....	....	....
	1,355	....	887	....	65.48	....	....	....	....	....
	1,553	....	1,023	....	66.36	....	....	....	....	....
	1,683	....	1,102	....	65.48	....	....	....	....	....
	1,592	....	1,078	....	67.72	....	....	....	....	....
	1,865	....	1,304	....	70.00	....	....	....	....	....
Average	1,551	1,356	1,044	894	67.31	65.95	....	....	....	....

[a] No figures for tallow were given in 1903.



CUTS OF BEEF SHOWING APPEARANCE KNOWN AS "MARBLING."

Upper figure, rib; lower figure, loin.

CARLOAD OF YEARLINGS THAT TOOK FIRST PRIZE AT INTERNATIONAL LIVE STOCK EXPOSITION, CHICAGO, 1901.

Average live weight, 1,338 pounds; average dressed weight slightly over 800 pounds.

Comparison of yearlings and 2-year-olds in slaughter test at International Live Stock Exposition, Chicago, 1901 to 1905—Continued.

Placings.	Live weight.		Dressed weight.		Per cent dressed.		Weight of tallow.		Per cent of tallow.	
	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.	Two-year-olds.	Yearlings.
1904.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*			*Lbs.*	*Lbs.*		
First	1,235	1,200	824	799	66.70	66.60	105	79	8.50	6.58
Second	1,610	1,320	1,046	865	66.40	65.50	115	71	7.14	5.38
Third	1,360	1,050	875	689	64.40	65.60	83	73	6.10	6.95
Very highly commended	1,625	1,245	1,074	806	65.70	64.50	93	79	5.72	6.35
Highly commended.	1,680	1,285	1,075	822	64.00	64.00	152	76	9.05	5.91
	1,650	1,100	1,089	716	66.00	65.10	76	79	4.61	7.18
	1,740	1,190	1,154	710	65.70	59.70	128	79	7.36	6.64
	1,650	1,070	1,107	661	67.00	61.80	131	59	7.94	5.51
	....	1,245	....	760	....	61.00	....	73	....	5.85
	....	1,350	....	828	....	61.50	....	71	....	5.26
	....	1,150	....	706	....	61.40	....	51	....	4.43
Average	1,569	1,200	1,030	760	65.61	63.32	110	72	7.04	5.98
1905.										
First	1,310	1,250	874	807	66.70	64.88	53	54	4.04	4.29
Second	1,300	1,640	853	1,112	65.61	68.70	34	48	2.61	2.92
Third	1,540	1,090	983	733	63.83	67.25	69	34	4.48	3.12
Very highly commended	1,595	1,365	1,032	855	64.70	62.63	70	43	5.00	3.13
Highly commended.	1,630	1,110	1,025	715	61.72	64.41	58	41	3.55	3.70
	1,410	1,200	882	775	62.55	64.58	38	32	2.70	2.66
	1,430	....	993	....	69.44	....	52	....	3.63	....
Average	1,459	1,276	949	833	65.04	65.28	55	44	3.66	2.87
ANNUAL AVERAGES.										
1901	1,559	1,246	994	792	63.77	63.60	131	94	8.43	7.51
1902	1,344	1,257	845	812	62.90	64.62	96	90	7.15	7.11
1903	1,551	1,356	1,044	894	67.31	65.95	(a)	(a)	(a)	(a)
1904	1,569	1,200	1,030	760	65.61	63.32	110	72	7.04	5.98
1905	1,459	1,276	949	833	65.04	65.28	55	44	3.66	2.87
Five-year average	1,507	1,255	980	808	65.40	64.41	96	75	6.42	5.94
Average excess of 2-year-olds over yearlings	252	....	172	....	.99	....	21	....	.48	....

[a] Not given.

It will be seen from the above table that the average for the five-year period shows that the 2-year-olds had an advantage of 252 pounds in live weight, the average varying from 87 pounds in 1902 to 369 pounds in 1904. In average dressed weight per head for the five years the 2-year-olds were 172 pounds heavier, varying from 33 pounds in 1902 to 270 pounds in 1904.

In the percentage of beef dressed the 2-year-olds had an advantage practically of 1 per cent for the whole period. In 1901 the two classes dressed very nearly equal; in 1902 the yearlings dressed 1.72 per cent higher; in 1903 the 2-year-olds dressed 1.36 per cent, and in 1904 2.29 per cent higher, while in 1905 the yearlings again had an advantage of 0.24 per cent.

In the tallow yielded the yearlings had a decided advantage—assuming this to be a waste product, as butchers generally do—and if the figures for tallow were given for 1903 the margin in favor of the younger cattle would probably be still greater, as the 2-year-olds in that year were above the average weight and also double the number of the yearlings. For the four years for which the figures for tallow are given the average amount per head is 21 pounds greater in the 2-year-olds. While in a few individual cases the yearlings yielded a greater amount of tallow, yet in no one year was the average percentage of tallow yielded by the younger cattle as large as that of the older ones. The very low totals for tallow in the last year of the series (1905) seem to indicate that a large measure of success has been obtained by "show feeders" in their efforts to fit animals with a minimum amount of waste fat.

Regarding the average daily gains of the exhibits, although the exact age of the cattle is not given, it can reasonably be assumed that the difference was from six to twelve months, as some of the older ones had been exhibited both as yearlings and as 2-year-olds. Allowing them an average of twenty and thirty months, respectively, the average daily gain per head of the yearlings would be 2 pounds and of the 2-year-olds 1.65 pounds.

ORIGIN OF PRESENT SUPPLY OF BABY BEEF.

Calves which are fed for baby beef are derived from two sources—from the farms of the corn belt, where they are bred, fed, and finished, and from the range, the calves from the range being purchased at weaning time, when about 350 to 500 pounds in weight, and shipped east to be rapidly pushed to maturity.

Some men still hold that calves intended for baby beef should be bred by the feeder himself, who could then select thick-meated early maturing breeding stock, and thus be more sure of getting calves of a similar stamp. On the other hand, it may be said that the range cattle, by the continuous use of the best quality of purebred sires, have been improved to such a degree that in many herds they possess all the characteristics of purebred animals, and calves of this description which have been sent east and fed for baby beef have held their own with eastern-bred calves in topping the market. These range calves can generally be purchased at more reasonable prices than native calves of the same quality, owing to the lack of fattening feeds (especially corn) in the West and Southwest.

It may be said also that the large herds of the range offer greater choice for obtaining uniformity in size, type, and color. Uniformity in these respects is always an advantage, as it will make a lot of cattle more attractive to the buyer, and evidence of purity in breeding will generally bring a little more per pound in the stock yards than a mixture of color, unevenness in size, or a variety of types.

HOW TO PURCHASE CALVES.

In order to make any feeding operation profitable the stock must be obtained at a reasonable price, because even a purebred animal will not bring more on the block than its value for meat, and thus the original cost of the animal, together with the cost of the feed, must be smaller than the selling price. Calves may be bought by the pound or by the head, the latter being the most common way of buying and selling in the West and Southwest. The suggestion is made by Clay, Robinson & Co. that feeders unaccustomed to handling young cattle should buy them by the pound, because they are likely to overestimate their weight, thus at the outset assuming a serious handicap in a profitable sale.

FEEDING FOR BABY BEEF.

The digestive system of cattle consists of a stomach with four compartments, which, when fully developed, is especially adapted to convert coarse or bulky fodders into meat, fat, and heat. The first three compartments—the rumen, or paunch, the reticulum, or honeycomb, and the omasum, or manyplies—are not stomachs in the sense that they digest food, but are simply used in storing and softening coarse food not thoroughly masticated when swallowed. When the animal is at rest the food is returned from these compartments to the mouth to be remasticated, after which it goes directly to the fourth compartment, or abomasum (which corresponds to the real stomach of nonruminant animals), where it is digested and assimilated.

At the time of birth the first three compartments are very incompletely developed. According to Colin[a] the rumen of the sucking calf holds only 2.6 pounds, the reticulum 0.22, and the omasum 0.35 pound, while the abomasum, or true stomach, holds 7.7 pounds. As the animal grows older the first three compartments are gradually developed and enlarged, the first (paunch) to such an extent that in the mature ox it is about nine times as large as the other three combined.

These conditions show that the calf must have feed which is easily digested, and which should contain a very much smaller proportion of bulk per pound of digestible matter than the feed for mature animals. The calf can not utilize coarse fodders to any extent until the first three compartments have become more developed, at least six months after birth. Its food, therefore, should consist of milk and wholesome grain, both being nutritious, easily digested, and form an excellent balance.

Cattle under one year old utilize so large a proportion of the frame and muscle forming constituents of the food and make such rapid

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[a] Feeds and feeding, Henry.

growth of frame that it is often a difficult matter to induce fattening at a uniform rate, so as to produce a prime finish. Young calves which receive liberal quantities of whole milk will make rapid gains and get very fat. This fat, sometimes known as "milk fat," or "baby fat," is very economically produced, and some feeders claim that if this early habit of fat building is lost it is not easily regained. As young animals assimilate their food very thoroughly and make better use of the frame and tissue forming constituents, it is their natural tendency to grow in frame rather than in fat. Calves that are allowed to get thin during the first six months of their lives generally require a long time to overcome this check. Where early maturity is desired, such a system of feeding would be disastrous. The fattening should therefore begin with the whole milk at birth and should be continued until the animal is mature and ripe for the block.

Where very heavy feeding is resorted to, the length of the feeding period should not extend much over one year, as it seems to be the practical experience of feeders that under such circumstances remunerative gains can not be expected for a longer period, this length of time being about the limit which even a young animal can profitably stand heavy and continuous feeding.

FEEDING THE YOUNG CALF.

Whole milk is the most complete and most easily digestible ration for the calf, when considering any feed by itself. It contains all the nutrients necessary for growth the first few weeks of life, and if sufficiently supplied with it the calf will make a rapid growth of flesh and fat. Whole milk until weaning time will make the best calf for any purpose, but economy does not always permit the feeding of such milk and demands a cheaper substitute, especially in the case of calves intended for the dairy, where great development of flesh is not essential. In feeding whole milk it is preferable that the calf be allowed to run with the cow; this gives it an opportunity to take smaller quantities of food and at more frequent intervals, and thus avoids gorging the stomach with a large quantity at one time, and in taking the milk directly from the udder all contamination is avoided and the temperature is regulated to the point that nature intended. In feeding for baby beef, feeders find that the most profitable calves are those which have been kept thrifty and in good flesh since birth, and to this end it has been found most satisfactory to permit them to run with their dams from four to six months before weaning, while show calves are sometimes allowed to nurse cows for a year or more.

For the first few weeks the whole milk will meet all the requirements of the growing animal, but later on even whole milk will become inadequate as a complete ration. As the digestive system develops, solid food becomes necessary and grain should be added, the amount being increased from time to time, according to the gradually increasing physical demands of the growing animal. Calves soon learn to nibble small quantities of shelled corn, or oats, or a mixture of the two, which, if supplied in a clean box and given fresh at every feeding, they eat with great relish. For this purpose it may be practicable, where calves run with their dams all day, to build a small inclosure containing a feed box with fresh grain, to which only the calves have access. In following up this system the calf can be fed to the limit of its capacity and the outdoor exercise will tend to keep it in good health. The grain should be gradually increased to form the basis of nourishment; then when weaning time comes the change is less sudden, and a check in growth or a loss in flesh is not likely to occur.

Where it is desired that the cow should yield a remunerative quantity of milk after weaning this system of running the calf with its dam is detrimental, as the frequent and imperfect milkings by the calf do not tend to develop the large flow of milk that would result from more regular and thorough milking at less frequent intervals, but tends rather to decrease it. It may, therefore, be more suitable under such circumstances to milk the cow by hand and feed the calf whole milk from the pail.

Another system which has also been practiced with success is to allow the calf to run with the cow for several weeks, after which they are separated and allowed to suckle three times daily, the cow being stripped after the calf has had its fill. The advantages of this method are that the calf gets its milk fresh at every feeding, while the cow is milked clean every day, and time is saved by letting the calf do the milking. It also permits a more gradual transition at weaning time if one of the sucklings is discontinued when the calf is about 3 months old, another when it is about 5, and the third when it is about 6 months old, by which time the calf will have become accustomed to the use of grain feed and to drinking water. This method is also recommended in the case of cows that yield a very heavy flow of milk, as such cows will often yield more than the calf requires for a thrifty growth, and thus produces digestive disorders.

Careful stockmen always regard sudden changes in feeding or in the management of cattle as injurious, as such changes are generally followed by a check in growth, or, if the new conditions are decidedly unfavorable, by a loss in flesh.

Weaning time is the greatest change in the animal's life, and many calves which are brought up under almost ideal conditions until weaning are stunted by too sudden a change, or subsequent neglect.

Regarding the effect of weaning Warfield says:

> The weaning is in a great degree a crisis in a calf's life. If cut off from nature's diet too early bad results not infrequently ensue; but if allowed to go on to that period at which in the natural sequence of events the calf would find his milk ration more and more insufficient and his capacity to eat more and more perfect every day, the transition, instead of being violent, is at once natural and easy, and therefore without injurious consequences. The great thing is to keep the growth of the calf from suffering any check. If this growth goes right along, all well. If, however, the weaning is followed by a period of pining and real need of the milk diet, and the calf is for a few weeks unthrifty, the effect will be apparent in the animal's after life; for these short periods of retardation in early life count up largely in the sum. This is not an easy matter to impress upon many men, and yet an animal that has an unbroken calfhood of thrifty growth will mature earlier and develop more completely the possibilities of its nature than another which, with equal promise, was suffered to get again and again out of condition by unwise saving in the first months of its life.

SKIM-MILK CALVES.

The fact that the best results are generally obtained with whole-milk calves does not eliminate skim-milk calves from the range of possibility for baby beef. Whole milk is the ration balanced by nature, and if this balance could be exactly imitated by the use of other healthful food, it seems that there should be no good reason why calves fed on this substitute should not do equally well.

In restoring to skim milk as nearly as possible the qualities contained by whole milk, the skim milk must be warmed to the proper temperature (about 95° to 100° F.). The milk should be fed sweet. As milk sent to the creamery to be separated often returns soured or tainted, it may be suggested that the best way of securing sweet skim milk for the calf is by the use of a farm separator.

The chief difficulty that is met in the use of skim milk is, of course, to find an efficient substitute for the butter fat of whole milk. One of the best feeding stuffs at present known for this purpose is flaxseed meal. The latter contains a high percentage of oil, a low percentage of starch, and has a high rate of digestibility (Jordan), with a nutritive ratio very nearly the same as that of whole milk.

The best results from the use of flaxseed meal are obtained by boiling the meal in water and feeding the jelly thus obtained mixed with the skim milk. It should be fed in small quantities, not to exceed several tablespoonfuls, when the calf is first changed from whole milk to skim milk, which should be done gradually. As the whole milk is decreased the flaxseed meal may be proportionately increased, so that a pound may be fed at the end of a month or six weeks.

Some other feeds which are commonly used as substitutes for butter fat are oil meal (when made by the old process it contains about 4 per cent more fat than by the new process), oatmeal, and corn meal. Cotton-seed oil and corn oil have also been suggested. Of the latter one-half ounce per quart of milk was fed successfully at the Massachusetts Experiment Station. None of these substitutes can, however, completely equal the advantages derived from the use of whole milk during the first month of the calf's life, but calves brought up on corn and skim milk have made as large gains after that age as calves which had the run with their dams.

The Kansas Experiment Station (Bulletin No. 113) reports larger gains from the use of skim milk than from whole milk and with less grain used with the skim milk.

The Iowa Experiment Station (Bulletin No. 35) in a series of experiments in feeding skim milk to calves obtained good results from flaxseed mixed with corn meal; ground oats gave about equal results; but oil meal not only made smaller gains, but increased the cost of the gains considerably over that from flaxseed and corn or oats.

Regarding the safety with which flaxseed can be fed, Curtiss, who conducted the above experiments, says

This feed can not be fed in large quantities. We have only used it to the extent of about 10 per cent of the grain mixture (fed with corn). It is practical to replace considerable of the butter fat by substituting flaxseed, but it is very rich (containing about 35 per cent fat) and highly concentrated and unless fed judiciously produces derangement of digestion.

He further states regarding the economy of these feeds:

The results of all the investigations made at this station (Iowa) strongly indicate that it is not only poor economy but poor practice in feeding to use a highly nitrogenous product like oil meal in combination with separator skim milk. The practice has neither logical reason nor scientific theory for its support, and in the corn-belt States, with their surplus of corn and oats, there is no necessity for the purchase of a high-priced nitrogenous product to be used in supplementing the skim-milk ration.

Theoretically a ration can be compounded by the use of these various feedstuffs in combination with skim milk which will contain the properties of whole milk; but when put into practice it requires the most careful attention to reach even approximately the same results, as the animal can not utilize vegetable fats and oils to the same extent as the fat of milk. Oily feeds readily produce disorder in the digestive system, especially when fed in such quantities as would balance the amount of fat that would be derived from whole milk. Scours and loss of appetite are likely to result.

There is an old German adage that "the eye of the master fattens his cattle." This is especially applicable to the successful feeding of skim-milk calves. The digestive system of the animal is yet undeveloped and delicate; it is nurtured on feeds which are not always in accord with nature's prescription (whole milk). In order, therefore, to secure the largest possible gains it is absolutely essential that the feeding of artificial products be given the most careful attention to prevent any digestive derangement and also in order to guard against undernutrition.

Calves fed on skim milk tend to grow in frame rather than to fatten, although their gains may be as rapid as the gains made by calves fed on whole milk. The use of skim milk in producing baby beef therefore lengthens the period of production. When it is desired to have the calves thoroughly finished for the market in about twelve months, it is advisable that whole milk be resorted to, as the skim-milk calf generally requires from four to six months longer to acquire the same degree of finish.

FEED AFTER WEANING.

From the foregoing it is understood that the calf should be so thoroughly accustomed to the use of grain when weaning time comes that milk can be discontinued without any check to growth. From now on the key to the successful production of early matured beef is to hold the flesh already gained and to continue its rapid and steady growth. The method of feeding adopted to obtain such results will depend largely upon the nature of the feeds available and the season of the year. Previous to weaning the ration consists of whole milk supplemented by grain, or skim milk with a small amount of flaxseed jelly, or some other substitute to take the place of butter fat in addition to grain. Corn with milk produces an excellent balance of heat, fat, and muscle-producing feed. After weaning the protein of the milk must be restored by some other feed, although a relatively smaller proportion of it becomes necessary as the calf grows older.

In the summer time the best combination to furnish the proper balance is a good pasture (bluegrass is preferred for pasture, because it is firm and contains a large per cent of nutrients) and shelled corn or a little oats, if they are cheap enough. Occasionally a little cotton-seed meal, gluten meal, linseed meal, or bran may help to balance the ration and tend to stimulate the appetite. The relative proportion of these feeds will depend in a large measure upon their cost. If bluegrass pasture is not available clover or alfalfa pasture will supply sufficient muscle-producing feed, but such a pasture must be used with care. If calves are to be marketed very early in summer it may not be as profitable to turn them on grass as to finish on dry feed, especially if clover hay is very abundant or if the pasture is not very good. Corn furnishes the most economical feed for the production of fat and heat energy, and, as it is more easily fed and readily balanced, it should be relied upon as the principal constituent of the ration, forming from 50 to 75 per cent of the total concentrates given, whether summer feeding on pasture or feeding in the dry lot is practiced.

Some of the most successful feeders of baby beef have used silage (from 15 to 25 pounds daily) with good results in a ration consisting of about 3 pounds corn meal, 2 pounds wheat bran, and plenty of clover hay. In such a ration the silage will add the succulence, but if silage is not available a small quantity of roots will answer the same purpose.

As to the coarse fodders, there are a variety which will give good results; but, as has already been pointed out, calves can not utilize them as perfectly as older cattle, and while calves should have access to fodder of some kind the grain ration should be so liberal that they need not rely on the coarse fodder to any large extent, and the rough fodders given should not be too fibrous nor such as are difficult to digest.

Of all the fodders good clover or alfalfa hay have no equal, as they will supply the protein or muscle-making properties that must otherwise be supplied in the form of nitrogenous commercial products, which generally prove very expensive. If the roughness consists largely of such feeds as corn fodder, oat hay, timothy hay, or prairie hay, then some nitrogenous concentrate should be added to give the proper balance. Silage has been used with excellent results to substitute some of the bulky feed. A small quantity (15 to 25 pounds) is especially desirable, as it imparts succulence to the ration, and thus helps to sharpen the appetite; but where silage is not available a small allowance of roots can often be fed profitably. A variety of feeds, both of rough fodders and concentrates, can be used in compounding a well-balanced ration, and a closer study of these feeds on the part of the feeder will often result in a greater economy of producing meat and with better health to the stock.

The results obtained in an experiment by this Department in cooperation with the Missouri Experiment Station for the purpose of testing the value of corn as against mixed grains, on pasture, were in favor of mixed feeds when fed to yearlings or 2-year-olds. One of the mixed feeds consisted of one-fourth cotton-seed meal and three-fourths shelled corn; another was one-fourth linseed meal and three-fourths shelled corn; and yet another consisted of one-fourth gluten meal and three-fourths shelled corn. Regarding the value of these mixed feeds as against corn alone, Professor Waters writes: "In every case the younger cattle receiving mixed feeds became fatter, carried a better bloom, and were from every point of view more marketable."

The proportion of protein, or tissue and muscle forming material, to heat and fat-forming constituents in whole milk is about 1 of the former to 4 parts of the latter. This forms an excellent balance for the sucking calf. As the animal grows older it will be able to use more fat in its food and the ration can gradually be widened until it is about 1:5, or possibly 1:6.5, at the end of the first year. The Kansas Experiment Station found that 28 per cent of grain was saved by feeding a balanced ration consisting of a mixture of corn meal, oil meal, bran, and shorts over a ration consisting of corn only. (Bulletins Nos. 34, 39, and 60, Kansas Experiment Station.)

FEEDING METHODS.

The feeding of young stock requires much more care and attention than is necessary with older cattle. Young stock are much more subject to irregularities of the digestive system, and these are especially liable to follow the feeding of very heavy rations when it is done carelessly. To induce calves to eat the greatest possible amount and yet keep their appetite keen it is necessary to feed them regularly at stated times every day, as stock will become accustomed to eat at certain hours of the day and will often come to the trough at that time through force of habit, though they may not be particularly hungry. Under such conditions with a little effort they may often be induced to eat larger quantities than would otherwise be the case. Stale food has the same effect on stock as on human beings; it often takes the edge off the appetite, while a fresh supply of palatable food would be conducive to eating a hearty meal. When the desire for eating is thus aroused by the sight of food it not only induces a greater consumption of food, but stimulates the secretive organs of digestion, so that the food consumed is more thoroughly digested.

Young cattle should be fed more frequently than those nearly mature in age. The grain should be given in two or three feeds daily. If the grain is fed mixed with chopped roughage, it would probably be better to give three daily feeds, but if they have continuous access to the mangers for roughness, or if kept on pasture, two daily feeds of grain would probably be sufficient after the first six or eight months.

WATER AND SALT.

Fresh water should be accessible at all times. In the winter time it should be warmed to a temperature of about 50° to 70° F. When very cold water is given a great amount of heat energy is required to bring it to a normal blood temperature, and when water is given too cold calves often fail to drink a sufficient amount. The cost of heating water is very small. At the Kansas station, where five styles of heaters were used, the cost of warming water in a tank supplying from 5 to 10 head was found to be but a fraction over 3 cents daily, while it could be done just as cheaply for 35 to 40 head with same tank.

Salt should also be accessible at all times, as cattle on heavy feed generally show a strong desire for salt. As a great amount of effort is necessary to obtain a sufficient quantity of it when given in the form of rock salt, it would be advisable to give loose salt, but, like the feed, it should be supplied as fresh as possible by giving it frequently and in small quantities.

PREPARING THE FEED.

The preparation of feed for young stock requires more attention than is necessary with old cattle, because in the former the organs of digestion and mastication are not so well developed. Cooking is seldom resorted to in preparing feed for old cattle, because the advantage derived from feed thus prepared seldom pays for the expense and trouble connected therewith. For young calves cooking the feed is often done with profitable results. For example, hay tea, which is obtained by boiling hay in water, is generally regarded as an excellent food for calves and a good substitute for skim milk. Flaxseed can also be boiled profitably.

The grinding or crushing of grain fed to calves is a question of great importance. Young calves can chew shelled corn very readily, and there would probably be little advantage in grinding corn if the meal were fed dry. Smaller grains, however, such as barley, rye, oats, etc., are much harder to masticate thoroughly, and if fed freely, they should be ground or cracked. Grinding also permits of a better mixing of the feed, especially if mixed with the roughage. Meal when mixed with cut hay gives more bulk and when slightly dampened it adheres to the roughage. This insures a more thorough mastication of the meal and tends to keep the feed loose in the stomach, so that the digestive juices have a better chance to come in contact with all the feed. The same is true when corn is ground with the cob.

GREATER ECONOMY IN FEEDING YOUNG CATTLE.

It is well established that the cost per pound of increasing the live weight of cattle advances with age at the rate of nearly 50 per cent for every year after birth. This is accounted for by the fact that calves assimilate a large portion of the nitrogenous constituents of food (the digestible protein) in the form of muscle, blood, hair, horn, and connective tissue, while a large part of the mineral matter of plants—the lime and phosphoric acid—are retained in the body for the construction of bone. As the animal advances in age, this growth of body gradually ceases, and the nitrogen used in building up the framework becomes less necessary. After growth ceases only a small amount of nitrogen is necessary for repairing the broken-down nitrogenous tissue of the body, and whatever is fed in excess of this demand is voided by the animal and constitutes a waste. As protein contains, in addition to nitrogen, the same elements found in carbohydrates and fats, it has also the power to form fat, or heat energy, in the body, but only to the extent in which these elements are present. Comparing the protein of food with the fat and the carbohydrates, the potential energy yielded by these food compounds as given by Henry is as follows:

Food compounds.	Potential energy.	
	Heat.	Mechanical.
In 1 gram of—	*Calories.*	*Foot-tons.*
Protein	4.1	6.3
Fat (ether extract)	9.3	14.2
Carbohydrates	4.1	6.3

This shows that protein is theoretically about equal to the carbohydrates and a little less than half the value of fat for the production of heat or body fat. If the animal is still growing and can make use of all the nitrogen contained in protein, then feed rich in protein makes an economical ration. That young animals make a greater profit from the feed was shown by Soxhlet, who obtained 1 pound of increase in the live weight of calves from 1 pound of digestible milk solids. In this case nearly 70 per cent of the protein of the feed, 72 per cent of the phosphoric acid, and 97 per cent of the lime were utilized by the calf for the production of body tissue. Full-grown cattle under ordinary conditions require from 6 to 10 pounds of digestible dry matter to make 1 pound of gain. This serves to illustrate the economy with which growing animals will utilize feed, especially of a nitrogenous character.

DAILY GAINS OF CATTLE AT DIFFERENT AGES.

The daily increase in the live weight which can be made by calves fed on a liberal allowance of whole milk with some grain in addition is from 2 to 3 pounds, which is better than the daily increase made by full-grown steers. As calves are smaller, a proportionately smaller amount of food is necessary for maintenance of the body, which in the case of a full-grown steer would be from 7 to 8 pounds of digestible dry matter per 1,000 pounds of live weight.

Canadian experiments show the following results in regard to the influence of age on the cost of producing beef. (Canada Experimental Farms, Reports, 1903.) The animals selected were of as nearly uniform type and breeding as possible and were fed such rations as were best suited to them according to age. There were 9 animals in each of the first three lots and 6 in the last two. The length of time of feeding was one hundred and eighty days for each lot.

Ages.	Average daily gain.	Gain in 180 days.	Cost per 100 pounds gain.
	Pounds.	*Pounds.*	
3-year-olds	1.58	284	$7.05
2-year-olds	1.65	298	6.03
Yearlings	1.65	298	5.54
Six months' calves	1.46	263	5.33
Skim-milk calves, new-born	1.48	273	2.16

In combining the results of two experiments carried on in 1900 and 1901, the purpose of which was to study the comparative cost of feeding a heavy ration from birth to block against feeding a growing ration from birth for about two years and feeding a heavy fattening ration for five or six months previous to slaughter, Grisdale[a] obtained the results given below.

Comparative results of feeding baby beef and long-fed beef.

Particulars for comparison (one steer considered always).	Baby beef (average of 10 steers).	Long-fed beef (average of 10 steers).
Days on feed .... number..	700	913
Weight when put on experiment .... pounds..	122	107
Weight when slaughtered .... do....	1,297	1,235
Gain during feeding period .... do....	1,175	1,128
Daily rate of gain .... do....	1.68	1.26
Amount of feed eaten:		
Roots and ensilage .... do....	15,793	19,529
Hay .... do....	1,150	1,315
Skim milk .... do....	1,645	1,592
Rape .... do....	70	....
Meal .... do....	3,809	1,405
Pasture .... months..	....	9
Total cost of feed .... dollars..	63.06	59.66
Cost per 100 pounds increase live weight .... do....	3.35	5.29
Selling price per 100 pounds live weight .... do....	5.62	4.78

The average weight of the cattle at the end of the feeding period was larger in case of the baby beef fed 700 days than that of the older cattle fed 913 days; the cost of the increase per 100 pounds was practically the same, being only 6 cents higher with the baby beeves, but the great margin in the selling price indicates that the latter were better finished. Subtracting the cost of production from the selling price, the baby beeves gave a profit of 27 cents per 100 pounds, while the long-fed steers show a loss of 51 cents per 100 pounds.

According to Henry (Feeds and Feeding), the sucking calf should gain 3 pounds a day for the first month, 2.5 pounds for the second, and 2 pounds for subsequent months.

The following examples show the rate of gain made by yearling cattle exhibited at the International Live Stock Exposition in December, 1905:

A load of yearlings exhibited by Mr. J. G. Imboden went into the feed lot January 1 weighing 325 pounds and at show time had gained 700 pounds a head, indicating an average daily gain of about 2 pounds a head for a period of over eleven months. Another load fed by the same man made practically the same gains.

A load of yearlings fed by Funk Brothers weighed, when put into the feed lot, January 1, 275 pounds per head and at show time tipped the scale at 1,210 pounds, indicating a daily increase of live weight of nearly $2\frac{3}{4}$ pounds for a similar period.

[a] Canada Experimental Farms, Reports, 1903.

One load of yearlings, bred on the range and fed by D. J. Black, of Ohio, went into the feed lot weighing 475 pounds and at show time averaged 1,240 pounds.

Escher's Angus cattle, champion yearlings in 1904, were weaned in October, when they weighed about 450 pounds, fed on ear corn, oats, oil cake, and hay during the winter following. In spring the corn was ground and supplemented by oats, bran, and oil meal. In addition they had a good bluegrass pasture. They weighed at show time about 1,200 pounds, having gained approximately 750 pounds a head in about thirteen months.

The yearling Shorthorn champions, exhibited by J. D. Waters, were weaned about the same time, weighing about 500 pounds. They were fed on cut feed, corn, and hay, and at harvest time oats were added to the ration. During the summer they were on bluegrass pasture. Two months previous to the show they were given ground corn and oats in equal parts, with abundance of cut hay and a limited quantity of sorghum. When shown they weighed 1,350 pounds, having gained 850 pounds per head in about thirteen months.

A load of Nebraska range-bred Herefords, fed by C. C. Judy, went into the feed lot in the fall, when they weighed 325 pounds. They were fed on corn, oats, and a little oil meal, and had made an average increase per head of 775 pounds when exhibited the following year.

A load of yearlings bred below the quarantine line and fed in Illinois by Steiner Brothers made an average gain of 802 pounds in eleven months, or close upon 2½ pounds a day.

SECTIONS ADAPTED FOR RAISING BABY BEEF.

The location most naturally adapted for the production of baby beef is the farming section of the country where a variety of concentrated feeds, especially corn, is available, and where the number of stock kept is proportionately small, so that constant care and attention can be devoted to their feeding and management. Missouri, Iowa, Illinois, Kansas, Nebraska, and Minnesota produce most of the baby beef that goes on the market to-day; Michigan, Indiana, Ohio, and Wisconsin produce it to a more limited extent. Whether or not some sections in the East and the South could profitably produce beef of this class depends to a certain extent upon the methods of farming which are carried on in those localities. In most of the States and sections named, except New England, corn forms one of the chief agricultural products, while nitrogenous concentrates, in addition to those obtained in the form of dairy by-products, are abundant in the form of leguminous fodder crops, such as clovers, alfalfa (the latter having been grown successfully in some sections of the East), cowpeas, etc. The cotton lands of the South also furnish the highly nitrogenous cotton-seed meal which now forms a material factor in beef production in the North.

Proximity to good markets and good shipping facilities are factors of great value in selecting a location, as they afford the opportunity to take advantage of sudden market fluctuations, while reducing the large shrinkage which inevitably results from shipping long distances.

The climate is a factor of only secondary consideration, since extremes of either heat or cold can be moderated by the construction of shelter, etc.

LOCATION OF THE FEED LOT.

The feed lot should be dry, sunny, and well protected from cold or raw winds. The best location is one that is elevated on the north with a good slope toward the south or east, thus offering a rapid surface drainage. This is especially important in clayey soils which are impervious to water, and in localities where the ground freezes to a great depth, as underground drainage will not carry off the water so long as there is frost above the pipes and thus the yards are often in a muddy, almost impassable condition for several weeks during the spring season. Protection on the north and west sides by a barn, a shed, a tight board fence, or a dense row of trees will make the feed lot more conducive to outdoor exercise. Rather large feed lots are preferable, as they may be kept cleaner and offer more room for exercise.

SHELTER.

Cattle will make the most gain for the feed consumed when they are comfortable in every respect. Extremes of heat or cold give discomfort and should be guarded against. The character of the shelter that is to be provided for this purpose will depend largely upon the severity of the climatic conditions. Where the climate is extremely cold a large amount of food is necessary to maintain a certain temperature of the body, while excessive exposure to the sun in a hot climate gives discomfort, creates restlessness, and often takes the edge off the appetite.

Young animals, being smaller, have a comparatively larger exposure of body surface. They are more tender than older animals and consequently more susceptible to extremes, especially to cold weather. In the summer time the baby-beef calves should be kept in darkened quarters where they are protected from the sun and from flies during the hottest hours of the day.

Better success is usually obtained from feeding baby beeves indoors during the winter, provided their quarters are kept dry and well bedded and supplied with good ventilation. Under these conditions the calves can generally be given more individual attention as to feed. A very successful feeder of baby beef in the Central West, who feeds his calves indoors but turned loose in pens, reports an average daily gain of 3 pounds a head from 20 head for the first month of indoor feeding. This gain was made from a ration consisting of 3 pounds corn meal, 2 pounds wheat bran, and 20 pounds of silage, with clover hay unlimited in quantity. When calves are fed indoors they should have access to small lots where they can take a little exercise and sun themselves occasionally, as this will tend to keep them in better health.

MANAGEMENT OF HEIFERS.

Open heifers come in heat at certain intervals after they are about a year of age. During these periods they are very excitable and if kept with steers or other heifers they get the whole herd excited, not only losing flesh themselves but causing the whole herd to slacken in their gains. Heifers therefore should be watched. Upon coming in heat they should be separated immediately from the herd, and, if practicable, they should be kept in a box stall for a few days.

For this reason heifers which have been spayed are generally preferred by the feeder, and buyers also give them the preference, because there is no chance of their being in calf. The spaying of heifers involves more danger and requires more skill than castrating bull calves, and it is therefore not so generally practiced.

DISEASES.

The most dangerous enemy to the production of baby-beef is the disease known as blackleg, or symptomatic anthrax, which is caused by infection with a germ which enters the system through abrasions or contusions of the skin.[a] This disease, which in some European countries has become the most destructive disease among cattle, has been observed in nearly all the States of the Union except the southern Atlantic and eastern Gulf States. The cattle which are most frequently affected are the young stock between 6 and 18 months of age, and highly-bred animals are more susceptible than common or low-grade stock, because their skin is more delicate. High feeding and lack of exercise create conditions in the animal which favor the rapid growth of the germs and increase the virulence of the disease. As curative measures are of no assistance in combating the disease, preventive measures must be depended upon. It is recommended that calves should be vaccinated with blackleg vaccine before they have reached the age when they become most susceptible to the disease, which is about six months after birth. If, however, the district be infected, all the stock should be vaccinated at once, regardless of age.

[a] See Bureau of Animal Industry, Circular No. 31.

BABY BEEF ON THE MARKET.

While the term "baby beef" is very frequently used in speaking or writing of a certain market class of cattle, the market reports never quote prices for cattle under this name. It might, therefore, be more or less difficult to know exactly in which of the classes such cattle would be quoted or what price they would command.

It has already been stated that the meat from thoroughly finished yearling cattle is as popular on the market to-day as that of cattle more mature in age, provided demand and prices paid rather than the numbers marketed are taken as a criterion. This is well illustrated by the following, taken from the annual live stock report (1904) of the Union Stock Yard and Transit Company, Chicago:

One of the most notable features of the year has been the unprecedented demand for choice, well-bred, fat young cattle, called "baby beef," and at no time was there a dull spot during the whole season for this class of young cattle. Choice yearlings were in demand all the time and the best qualities sold up among the top notchers. There is no question but that "baby beef" has come to stay, and it is as popular with consumers abroad as in this country.

The conditions prevailing on the Chicago market for 1905 were very similar to those in 1904. Prime yearlings sold as high as older cattle with equal finish, but as the supply of such young cattle fit to qualify as baby beef has been small in comparison with that of prime 2-year-olds and 3-year-olds, it is yet questionable whether the demand for the younger beeves would equal or exceed that for the older if the market were equally well supplied with them. At present, however, the demand for baby beef is so inadequately supplied that they find a ready sale at top prices, even on dull market days when the trade for older cattle is more depressed.

NUMBER MARKETED.

Regarding the comparative numbers of baby beeves, yearlings, 2-year-olds, and 3-year-olds put on the market during the past year, Clay, Robinson & Co. give the following information:

It is impossible for anyone to give statistics on this point, as no records are kept of the ages of cattle; hence we can only give our best opinion, based upon observation throughout the year. As a matter of fact the number of cattle marketed at a year old, or thereabouts, is very insignificant as compared with the 2-year-olds and 3-year-olds. Our salesmen estimate that of the fat cattle they handle not to exceed 1 per cent are yearlings. They further state that 2-year-olds and 3-year-olds are marketed in about equal proportions, possibly rather more of the 2-year-olds than of the 3-year-olds.

Of the yearling cattle that come to this market to be sold as beef there is not to exceed 1 carload in 10, and probably it would be nearer correct to say 1 in 12, that could be considered in prime beef condition. The balance are short fed [fed about five months] and sell at considerably lower prices per hundredweight than the finished animals.

During the year 1905 the receipts of cattle at Chicago totaled 3,410,469, of which it is estimated there were 390,000 western rangers and 80,000 Texans, leaving 2,940,469 natives. Applying the above proportions to these figures we would obtain for the yearly receipts of native cattle approximately 29,400 yearlings, against 1,500,000 of 2-year-olds and nearly the same number of 3-year-olds. Carrying the computation still further, we find that only 3,000 to 4,000 prime yearlings, or baby beeves, are marketed during the year, and the proportion of this class of cattle brought to other markets would probably be still smaller.

MARKET CLASSES OF CATTLE.

For the convenience of the trade a system of classification is used by trade and stock journals which divides the cattle into classes and grades, in order to quote approximately the relative prices that are paid for cattle of a certain quality.

The class indicates the use to which the cattle can be put to best advantage, while the grade represents the degree of excellence within a class.

Beef cattle.—Prime steers; choice steers (these two include baby beef); good steers; medium steers; common rough steers.

Butcher stock.—Prime heifers; choice heifers (these two include baby beef); good heifers; medium heifers; prime cows; choice cows; good cows; medium cows; common rough steers; choice bulls; good bulls; medium bulls.

Cutters and canners.—Good cutters; medium cutters; common cutters and good canners; medium canners; inferior canners; bologna bulls.

Stockers and feeders.—Fancy selected feeders; choice feeders; good feeders; medium feeders; common feeders; inferior feeders; feeder bulls; fancy selected yearling stockers; choice yearling stockers; good yearling stockers; medium yearling stockers; common yearling stockers; inferior yearling stockers; good stock heifers; medium stock heifers; common stock heifers.

Veal calves.—Good; choice; medium; common.

The above general classes really comprise everything in the way of cattle sent to the markets. But there are a number of special classes generally recognized which require to be named and defined:

Subclasses.—Texas and western range cattle; distillers.

Miscellaneous classes.—Baby beef; export cattle; shipping steers; dressed beef cattle; stags.

The following classification, by Prof. H. W. Mumford, condensed from the Illinois Experiment Station Bulletin No. 78, and published in Farmers' Bulletin No. 184, will serve to illustrate the requirements for the various classes:

GENERAL CLASSES.

Beef cattle.—This class includes all grades of fat steers and heifers; also everything from common to prime and from light to heavy. It is finished condition that brings animals into this class.

Butcher stock.—This class includes animals that have not fattened well; also animals that have not been fed long enough to become properly fattened. It seldom includes steers of really good quality, as such will usually be sold as feeders. The bulk of butcher stock is made up of cows and heifers.

Cutters and canners.—In this class are included old, thin cows and very thin bulls, steers, and heifers. The cutters must carry sufficient flesh to permit of the loin or rib or both being used for cutting on the block. Those animals which are so thin that no part of the carcass can be used for block purposes constitute the canners.

Stockers and feeders.—This class includes calves, yearlings, 2-year-olds, and older cattle. Cattle 18 months old or older which are ready for immediate use in the feed lot are called feeders. Those which are younger are referred to as stockers.

Veal calves.—This includes all calves which are sold for immediate slaughter.

SPECIAL CLASSES.

Texas and western range cattle.—A few years ago the typical Texas steer had very long horns and long legs, was thin and narrow-bodied, and carried a large, deep brand, and most of the cattle which came from Texas were of this description; but this type is rapidly disappearing. Animals of the best beef breeds have been imported into the State and used for breeding purposes, especially for crossing with the native stock, so that now many of the Texas cattle compare favorably with those from other sections of the country. There is, however, a very wide range between the best and the poorest.

The western range cattle are classed with the Texas cattle, because formerly they were made up largely of southern cattle which were driven northward to winter on the ranges north of the quarantine line. Now, however, a large percentage of the animals in this class are bred on the ranges of the West and Northwest.

All the cattle in this class are branded.

Distillers.—These are cattle that have been fattened on the by-products of distilleries. Formerly only inferior grades of cattle were purchased for feeding on distillery residues, but at present many feeders of better grades are used. When sent to market these cattle are preferred to others of the same grade, because they dress out a higher percentage of beef.

Baby beef.—This term is applied to choice or prime fat steers between 1 and 2 years old, weighing from 800 to 1,000 pounds.

Export cattle.—The cattle exported are in the main good to choice steers, weighing from 1,200 to 1,500 pounds. Comparatively few prime beef steers are bought for export, because of the high price they bring in the home market.

Shipping steers.—This term applies to the animals purchased in the western markets for shipment to the large eastern markets of the United States. They are mainly of medium and good grades and range in weight from 1,150 to 1,600 pounds.

Dressed beef cattle.—This class includes such cattle as are purchased by the large packing concerns of the Middle West. The packers prefer medium to choice steers, weighing from 1,200 to 1,400 pounds, to make up the bulk of their purchases, but conditions of supply and demand cause them to purchase animals of a much wider range in grade and weight, the extreme range in weight being from 800 to 1,700 pounds.

Stags.—This class includes such animals as have reached or at least approached maturity before castration, and hence have the general conformation of bulls. Comparatively few of these come to the general markets, and they are of a wide range in quality, condition, and weight. A few are good enough for export, while the poorest must be sold for canners.

CONCLUSION.

Earlier maturity has been the continuous aim of progressive breeders of live stock, and its imperative necessity is one of the chief features brought out by the fat-stock shows of the present day. Most hogs (except breeding stock) are now matured and sold before they are 12 months old, and a large proportion of the sheep of mutton breeds are fed for the market and sold before they have reached that age. While the minimum age of maturity seems to have been closely approached with both hogs and sheep, this does not seem to be so generally the case with cattle. At a time when steers were marketed at 4 and 5 years of age, finished 2-year-olds were considered an early matured product. Five years ago, and even more recently, a prime steer up to 24 months of age was classed as baby beef, while to-day it is becoming questionable whether an animal over 18 months of age should be considered as such.

Some of the principal advantages derived from the production of baby beef as compared with older beef are (1) the quick returns on the investment, (2) the greater demand for the product, and (3) the greater amount of meat produced per pound of feed consumed.

In feeding baby beef the profit comes in within two years after birth of the calf. In case, also, of the loss of an animal this would be considerably smaller in a young animal, because the latter represents a smaller bulk and has, moreover, been produced at less cost per pound of live weight. On the other hand, the lighter the animals are marketed the more breeding stock is necessary to produce an equal amount of marketable beef. The extra cost of keeping this additional number of breeding stock, however, is offset by doing away with the cost of keeping steers the third year; thus the number of marketable stock kept on the farm is increased.

The production of baby beef involves a question of economics, based on the law of "diminishing returns," which has already lowered the age at which stock is matured by one-half of what it once was. No feeder of the present day would think of keeping a steer four, five, or more years, even if he could sell him at the same price per pound as younger stock, because it would decrease the number of marketable stock; and the same principle is true as regards 2-year-olds and yearlings, only in a less degree.

There are two factors connected with the attainment of earlier maturity, (1) better breeding and (2) better feeding, and it appears certain that those breeders and feeders who make the most of their opportunities along these lines will make the greater profits.

POULTRY MANAGEMENT.

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INTRODUCTION.

The importance of poultry is becoming better and better un[illegible] by the farmer every year, and in spite of the fact that the farm fowl is so often neglected and forced to shift for itself, the poultry and egg crop constitutes one of our most important agricultural products.

The Twelfth Census shows that in 1900 there were 5,737,372 farms in the United States,[a] and that poultry was kept on about 90 per cent of these farms. The census also shows that there were 250,623,354 fowls (chickens, guinea fowls, turkeys, ducks, and geese) in the United States. The total value of poultry on farms June 1, 1900, was $85,756,593. The total value of poultry raised in the United States in 1899 is given as $136,830,152. The production of eggs for the same year was 1,293,662,433 dozens, the total value of which was $144,240,541. This gives a total value of poultry products for the year 1899 of $281,070,693. The raising of poultry in the villages and cities of the country is a matter of no small consequence, and would no doubt greatly augment the farm totals.

In 1890 all fowls, whatever their age, were enumerated, while in 1900 the census enumerators were instructed to exclude all chickens under 3 months old, and this restriction caused an apparent decrease in the number of poultry in 1900 as compared with 1890. While there is no doubt that the total number of poultry of all ages on farms increased from 1890 to 1900, the census returns show a loss of 10 per cent. The production of eggs in 1899 was in round numbers 474,-000,000 dozen more than in 1889, which would indicate a large increase in the number of fowls. The census does not separate the returns for poultry according to the kind raised, but it is a conservative estimate to say that chickens constitute 80 per cent of all the birds kept, and that hens' eggs constitute a much larger proportion of the eggs marketed. For further information regarding the magnitude of the poultry industry the reader is referred to Circular No. 73, Bureau of Animal

[a] These figures refer only to the continental United States—i. e., they do not include Alaska, Hawaii, or Porto Rico.

Industry, entitled "Distribution and Magnitude of the Poultry and Egg Industry."

It is so easy to figure one's self getting rich raising poultry that a great many people with but little knowledge and experience have embarked in the business on a large scale, only to meet with disastrous failure. They have neglected to recognize the fact that this industry, l[illegible]y other, requires a thorough training and an aptitude for the [illegible]on. Poultry keeping is subject to ordinary business risks, and requires skill and perseverance, and those who have failed at everything else must not expect to find a bonanza in it. That there is good money in poultry, when properly managed, is shown by the many suc[illegible] poultrymen who are making a good living from the industry.

MAKING A START WITH POULTRY.

The safest way for those who are about to make their first attempt at poultry raising is to start in a small way with a few fowls, and learn the business thoroughly before making large investments. Mistakes will be made and many difficult problems will be presented for solution before success in any large measure will be attained. As soon as it is found to be a paying investment, more capital may be put into the plant.

Another good plan for the beginner who wishes to learn the art of poultry keeping is to secure a position with some successful poultryman. One or two years of work on a large, practical plant will be found a great help, as the methods of caring for the birds and of marketing the products can thus be learned better than in almost any other way.

The question is often asked as to what is the best time of the year for one to begin. When to begin is not very important, but the fall of the year is a good time, for then stock can be purchased for less money than at any other season. It is also advisable that the fowls be moved to their new quarters before they begin to lay.

If the beginner has had experience in poultry keeping it will be all right to purchase eggs, otherwise he should begin with the fowls and thus gain some knowledge of caring for poultry before attempting to raise chickens.

Purebred fowls do not require any more house or yard room, feed, time, or labor in caring for them than mongrels. The first cost is greater, but for that extra cost one will have a flock of fowls which will produce carcasses and eggs of a much more uniform shape, color, and size, all of which is desirable in effecting a ready sale. Then there is the inward satisfaction of having something which makes a better appearance than the average mongrel flock.

If one already has a flock of mongrel fowls and can not afford to buy a flock of purebreds he should choose a purebred male bird of the breed preferred and mate him with a few of his best females. Thereafter each season, or second season, buy others of the same breed and mate them to females produced from the previous matings, and in a few years one will have a high-grade flock, practically as good as purebreds so far as the market for dressed fowls and eggs, other than for hatching, is concerned.

CLASSIFICATION.

For convenience, chickens may be classified as egg breeds, meat breeds, general-purpose breeds, and fancy or ornamental breeds. This is a somewhat arbitrary classification and must be understood as expressing general characteristics, for not only many of the general-purpose breeds, but also many individuals of the meat and fancy breeds are good layers. One person might class a certain breed as a meat breed, while another would place the same breed in the general-purpose class.

EGG BREEDS.

The egg breeds include the small or medium-sized fowls which are very active, quick to mature, producers of white-shelled eggs, usually nonsitters or at most poor sitters, and rather poor mothers. The various varieties of Leghorns and Minorcas are good representatives of this class. Because they are poor sitters, some other breed, or at least a few other fowls, should be kept if natural methods of incubation are to be employed. On account of their early maturity it is not uncommon for individuals to begin laying at the age of four and one-half months. As mentioned above, these breeds are very active and do not fatten as readily under ordinary conditions as the larger and less active breeds. The fowls of this class have large combs and wattles, which make them rather sensitive to low temperatures.

MEAT BREEDS.

The largest fowls are represented in this class, and these breeds are especially suitable for the production of large roasters. They are slow and somewhat sluggish in movement, with little desire for foraging, easily confined by low fences, rather slow to mature, persistent sitters, and rather indifferent layers of large brown-shelled eggs. Many poultrymen, however, are getting very good egg yields from them. The Brahmas, Cochins, and Langshans may be mentioned as belonging to this class.

GENERAL-PURPOSE BREEDS.

This class includes fowls which are fair of size and which will also produce a good quantity of brown-shelled eggs, making them especially adapted to the person wishing a supply of both eggs and meat. As one has to make frequent sales of flesh in the shape of surplus cockerels and hens, the carcass as well as egg production should be considered. The general-purpose breeds are usually good sitters and good mothers. They have medium-sized combs and wattles and endure cold weather well. They occupy a medium position between the egg and meat breeds as to size, egg production, and docility. The Plymouth Rocks, Wyandottes, Orpingtons, and Rhode Island Reds are good representatives of this class.

ORNAMENTAL BREEDS.

As a rule the breeds in this class are not so well adapted for farm purposes as are the breeds of the other three classes. The Polish, Exhibition Games, Silkies, Sultans, Frizzles, and Bantams are representative ornamental breeds.

A full description of the various varieties of fowls is given in Farmers' Bulletin No. 51, "Standard Varieties of Chickens."

SELECTION OF A VARIETY.

The choice of a variety of fowls will depend largely on the purpose for which they are to be kept, the market demands, and whether sitters or nonsitters are desired. If eggs are desired for the market and the market calls for eggs having white shells, one of the Mediterranean varieties will be suitable. If eggs that have brown shells are required, one of the American or Asiatic varieties may be chosen. Where meat is the chief object, the heavy-bodied fowls, such as the Asiatics, should be chosen. If fowls are to be kept for the production of both eggs and meat, some variety of the general-purpose class should be chosen. While these do not attain the great size of the Asiatics, they are sufficiently large to be reared profitably for supplying the table with meat, and at the same time have the tendency for egg production developed sufficiently to produce a large number of eggs during the year.

HOUSES AND INCLOSURES.

SYSTEMS OF HOUSING.

In the manner of housing fowls we have two systems widely different in their extremes. At one extreme is the colony plan, shown in plate 18, figure 1, which consists in placing small houses for small flocks far enough apart to obviate the necessity of fences, thus giving free range with but little mingling of the different flocks. At the other extreme, we have the continuous apartment house shown in plate 19. This kind of house consists of a series of separate pens, under one roof, opening directly into a hall way in the rear, or having doors between the pens without the hall way, or opening into a hall way and also into one another. There are several plans and arrangements

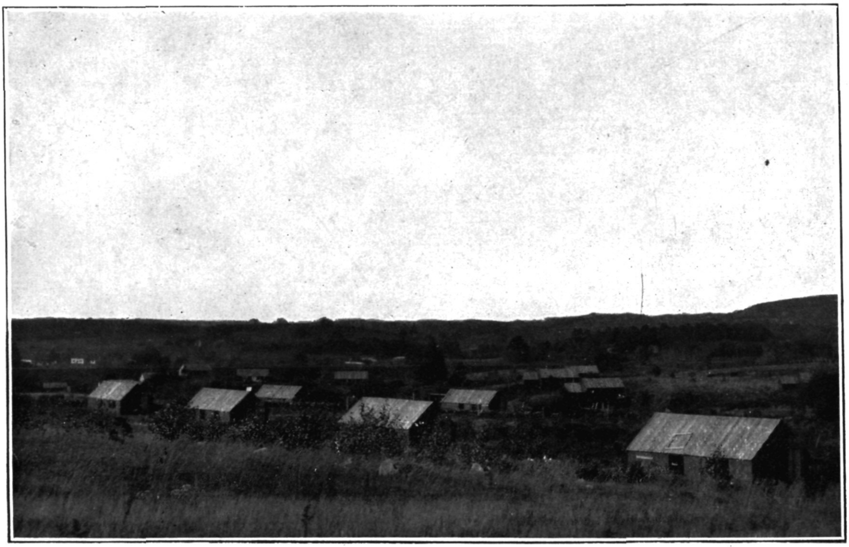

FIG. 1.—A CONNECTICUT POULTRY RANCH.

Note arrangement of colony houses, which does away with necessity of fences.

FIG. 2.—A BREEDING AND LAYING HOUSE.

One of the houses shown in figure 1 of this plate.

FIG. 1.—A CONTINUOUS HOUSE ON A NEW YORK POULTRY FARM.

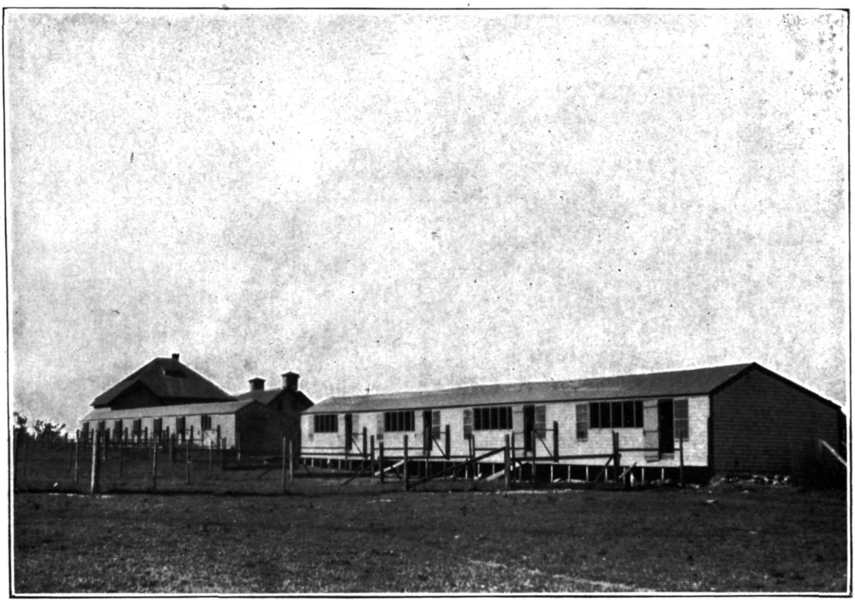

FIG. 2.—CURTAIN-FRONT HOUSES AT THE MAINE AGRICULTURAL EXPERIMENT STATION.

between these two extremes which may be built to suit varying conditions.

The advantages of the colony plan are—first, small flocks on free range; second, no expense for fencing; third, there is less need for scrupulous attention to cleanliness and providing regular supplies of animal and vegetable food during summer months. This plan, however, has the following disadvantages: First, extra cost of labor in caring for fowls in stormy weather when it will often be difficult to get around to feed and care for the fowls regularly; second, houses built on colony plan, if built as well, cost more than a continuous house of the same capacity, for partitions, which may be constructed largely of wire netting, are much cheaper than two end walls; third, the colony plan allows but about 100 birds per acre, while the continuous-house system, with suitable yards allows 450 to 500 birds per acre.

LOCATION AND CONSTRUCTION OF HOUSES.

Location of buildings.—The first consideration is a suitable location for the poultry house or houses. If possible, it is best to select an elevation having a natural drainage away from the building, for damp ground means cold ground. If the house can be built in the lee of a wind-break or a hill, or in front of farm buildings, so much the better. A dry porous soil, such as sandy or gravelly loam, is preferable to a clay soil, for the former is more easily kept in a sanitary condition. If it is impracticable to select a soil that is naturally dry, the soil should be made dry by thorough underdrainage. A purely sandy soil should not be selected, for a soil not good enough to support plant life is unfit for poultry.

As sunlight and warmth are essential to success, the buildings should face the south; other things being equal they will be warmer and drier. When a direct southern exposure can not be obtained a southeastern is preferable to a southwestern exposure, for fowls seem to prefer morning to afternoon sun. A gentle slope facing the south is the most suitable.

When to build.—It is best to build the houses during the spring or early summer, for then they have time to dry out during the hot days. Lumber is often rather damp and should be thoroughly dried out before winter. Cement floors and foundation walls will also have an opportunity to dry thoroughly, and thus may be avoided much of the dampness so often attributed to them.

Size and dimensions of house.—The size of the building required will depend largely on the number of fowls to be kept and on the size of the flocks. From 40 to 50 seems to be about as many as it is safe and economical to keep together. With flocks of this size about 5 square feet of floor space should be allotted to each bird, which will suffice in most cases where careful attention is given to cleanliness and ventilation. If the fowls are kept in smaller flocks more floor space per bird will be needed. Where the climate is so mild that it is unnecessary to keep the fowls confined, except for a few days at a time, less space per bird will be sufficient. The smaller breeds, being more active and restless, require about as much room as the larger breeds.

For the greatest amount of floor space for the least cost, a building should be square, for, other things being equal, the nearer square a house is the less lumber it will take. It is, however, out of the question to have a large house built square.

The building should not be so wide that the sun can not reach the back of the house, otherwise it will be damp. Fourteen feet is a convenient width if there are no alleyways.

The house should be built as low as possible without danger of the attendants bumping their heads against the ceiling. A low house is more easily warmed than a high one.

Foundation walls.—When permanent houses are to be built it is usually most economical to erect them on foundations made of brick, stone, or concrete. These should be built deep enough to prevent heaving by frost and high enough to prevent surface water from entering. Where large stones or bricks are not readily available good walls may be made from small stones. In case none of these foundation materials is available the building may be erected on posts.

The roof.—There are three general styles of roofs—the single pitch, shown in plate 21, figure 2; the gable roof, or double pitch with equal sides, shown in plate 18, figure 2, and in plate 20; and the combination, with one long and one short pitch, shown in plate 19, figure 2.

The single-pitch roof is the easiest to build. It gives the highest vertical front exposed to the sun's rays, and throws all the rain water to the rear, but in order to have the back wall of sufficient height to allow a person to work conveniently in the rear portion of the house, it is necessary to have the front wall very high—unless a very slight pitch is used—which requires much more lumber for the front side than in the case of the other two styles. The gable roof provides for a garret space which may be filled with straw, thus helping to make the house warm and dry.

It takes the same amount of material to build any one of the roofs mentioned if the pitch of the roof and the ground plan are similar. Most roofs can be one-fourth pitch. Shingle roofs, however, should generally be one-third pitch. In any case, the steeper the pitch the greater will be the cost of roofing and the longer the roof will last.

There are several prepared roofing materials which are good, or the roof may consist of matched lumber or shingles.

Floors.—The floor may be of earth, wood, or cement. It is important that the floor be dry, otherwise it will be impossible to keep litter on the floor fit for use. Straw and similar material gathers moisture, and when the litter becomes damp enough to be limp it is practically useless for fowls to scratch in for their grain feed.

Earth floors are excellent, provided they are kept dry. Except in very dry climates, however, they are apt to be damp. Where an earth floor is used it should be 3 or 4 inches above the level of the ground outside. An objection to earth floors is the difficulty of cleaning them, for it is usually necessary to remove 2 or 3 inches of the top and to replace this with fresh soil, and even then one can not be certain that all of the droppings have been removed.

Board floors are usually short lived unless air is allowed to circulate under them. This may be provided for by means of openings in the foundation walls, which should be closed during the winter months. A board floor covered with one-fourth inch of fine sand, with scratching material on this, makes a good floor. The litter and sand can be readily removed when desired and fresh materials provided. If the wooden floors are constructed within 2 or 3 inches of the ground it is essential that the foundation walls be constructed in such a way that rats can not gain access beneath the floor.

A good cement floor is the best, for it is easily cleaned and very durable. It should be covered with one-fourth or one-half inch of fine soil or sand and plenty of litter. In constructing this floor the ground should be excavated to the depth of 3 or 4 inches and then filled in with small stones or coarse gravel to make a good foundation. Cover with about 2 inches of mortar, made by mixing thoroughly, while dry, one part of good cement to three or four parts of sand, and then wetting with water and mixing thoroughly.

Further details regarding the construction of cement floors are given in Farmers' Bulletin No. 235, "Cement Mortar and Concrete."

Windows.—Too much glass makes a house cold at night and during the winter months and warm during the summer days. One square foot of glass surface should be allowed to about 16 or 18 square feet of floor space. The windows should be placed high and vertical rather than horizontal, for if the windows are placed low the sunlight will not reach the rear portions of the floor space, especially during the winter when the sun is lowest. An 8 by 10 inch glass is a good-sized light used in a 12-light sash, making the sash about 3 feet 10 inches by 2 feet 5 inches. A 10 by 12 inch glass is another good-sized light to be used in an 8-light sash, making the sash about 4 feet 5 inches by 2 feet. Use two of these sashes for a house having about 250 square feet of floor space. In the coldest parts of the United States it is well to double glaze the windows, leaving one-fourth or one-half inch space between the glass.

Quality of construction.—It is not necessary to build expensive houses, but they should be serviceable, fairly roomy, well lighted, and well ventilated without drafts. The house should be built with a view to simplicity, economy, and convenience, and should be constructed according to the location and climatic conditions.

The walls may consist of (1) one thickness of boards, matched or unmatched; (2) one thickness of boards, matched or unmatched, covered with one or two thicknesses of building paper or roofing; (3) one thickness of boards covered with paper, then shingled or covered with lapped siding or matched lumber, making a solid double wall; (4) double boards with dead air space between; (5) double boards with space between filled with straw, hay, or other similar material. The second and third methods are the most common.

INTERIOR ARRANGEMENTS.

As far as possible interior fixtures should be so constructed as to permit them to be readily removed and cleaned.

Roosts.—A 2 by 3 inch scantling set edgewise with the upper edge slightly rounded makes a satisfactory perch. Allow 7 to 10 inches for each fowl; that is, a perch 16 feet long would furnish room enough for 20 fowls. A smooth platform should be placed under the perches to catch the droppings. The perches should be from 6 to 10 inches above this platform so as to allow the droppings to be removed without removing the perches. It is usually desirable to have the platform some distance from the floor, from 2 to 3 feet, in order that all the floor space may be available. If the roosts are located at the rear of the building it is possible to reduce the size of the roosting apartments at night by having a curtain swung from the ceiling which may be hung up against the ceiling during the day. A curtain of heavy unbleached muslin or duck tacked to a light wooden frame will be found very useful on cold nights in the Northern States.

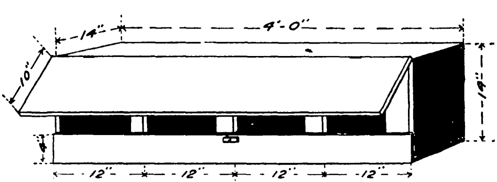

FIG. 10.—Row of nests for laying hens.

Nests.—The nests should be situated in a more or less dark place, for then the hens will be less apt to eat the eggs. A good place is directly beneath the roost platform, with the nests so arranged that the hen enters from the side toward the wall. Each nest should be from 12 to 14 inches square, and high enough (about 12 or 14 inches) to be convenient for the hen to enter. The partitions between the nests should be high enough to prevent the hens from rolling the eggs from one nest to another, and low enough to permit hens to go from one nest to another, otherwise they will fight and eggs will be broken. Fine hay or straw makes a good nesting material.

Dust boxes.—Chickens never wash, as many other birds do, but cleanse themselves of insects by wallowing in soil. Where board or cement floors are used, some means for dusting should be provided during the winter months. For a flock of 50 to 60 fowls a dust box 3 by 5 feet or 4 by 4 feet will be found large enough in most instances, and should be placed where it can be reached by sunlight during as much of the day as possible. Fine, light, dry dust is the best, but sandy loam is good. Road dust is recommended by many, but it is apt to be filthy. Coal or wood ashes may be mixed with the soil if desired.

Drinking fountain.—The water receptacle should be large enough to hold plenty of water to last twenty-four hours, so that the fowls will never suffer for the lack of water, and should be elevated a little above the floor to prevent the water from becoming dirty, as it would otherwise. Drinking vessels should be carefully rinsed when fresh water is given.

Feed trough and grit boxes.—In figure 11 is shown an easily and cheaply constructed feed trough, which is so constructed that the fowls can not get into it with their feet and soil the feed.

Several small boxes for shell, grit, beef scraps, etc., should be fastened against the wall at a convenient distance (12 to 16 inches) above the floor, where the fowls can have constant access to them.

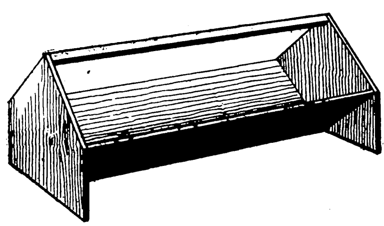

FIG. 11.—Feed trough.

Ventilation.—As it is better to have a cold dry house than a warm damp one, some means of ventilation should be provided. There is no better way to ventilate than by opening doors and windows as much or little as weather conditions require, but in all cases care should be taken to avoid any drafts. A cloth curtain over an opening has proved a very successful method of ventilation.

YARDS.

If convenient it is well to have double yards, for then one may rotate green crops. The yards may be sown to clover, rye, bluegrass, etc., and while the fowls are using one yard the green food in the other is getting a fresh start.

If the yards are to be on only one side of the house, they should be on the south side in order that the fowls may have the benefit of the first dry ground in early spring. It not infrequently happens that in localities where snow is abundant the ground on the south side is dry many days before that on the north side.

If the yards are to be in permanent sod and are to furnish green feed for the fowls, 70 to 80 square feet should be allowed for each bird. If part of the green feed is to be otherwise provided for, and the yards used mainly for exercise grounds, 35 to 40 square feet per bird will be sufficient.

Wire netting, 2-inch mesh, is suitable for fencing and can be bought cheaply. Where several runs are adjoining, the fences must be boarded up at the bottom to a height of 2 to 2½ feet to prevent the males fighting with one another. Height of fences will need to be regulated by the variety of fowls. The heaviest breeds, like the Brahmas, may be restrained by a 4-foot fence, while most other breeds can be kept in by a 6-foot fence. Some of the Hamburgs and Leghorns, however, need an 8-foot or 10-foot fence. Gates should be provided in order to permit access from one yard to the next.

Shade of some kind should be provided, and this can often be advantageously furnished by planting fruit trees (such as pear, plum, cherry, and apple) in the yard.

SOME SUCCESSFUL HOUSES.

In the preceding pages some of the important principles of house construction and of the internal arrangements of the house have been given, leaving it to the individual to choose the kind of house best adapted to his purpose. There is no one house which is best for all locations and for all purposes. In the following pages some descriptions of practical houses in actual use are given. Some of these houses are expensive and others are cheap. It is impossible to give an approximate cost of any house for all sections of the country, because the cost of material and labor varies so greatly.

During a six-weeks' trip in the fall of 1905 the writer visited a number of leading poultry establishments of the East. Some of the houses inspected during that time are described.

CONTINUOUS HOUSES.

In plate 19, figure 1, is shown a long continuous house in use at the White Leghorn Poultry Yards in New York State. It is 250 feet long by 16 feet wide, and 7 feet high at the eaves. Along the north side is a 4-foot passageway, which is separated from the pens by a matched-board partition. The house, exclusive of this passageway, is divided into 20 pens 12 by 12 feet and a feed room 10 by 12 feet. A door opens from the passageway into each pen, and there is also a door in each partition between the pens. These partitions consist largely of wire netting, but all are boarded up to a height of 2½ feet from the floor, in order that males in the adjoining pens may not fight through the wire and thus injure each other. Several of the partitions in the house are boarded up solidly from floor to ceiling to prevent the drafts which are so likely to be found in long houses.

In the front or south side of each pen are placed two windows, each window consisting of two 12-light sashes. The windows are arranged to slide up and down as in an ordinary dwelling, special care being exercised to have them move freely in order that they may be opened at any time, regardless of weather conditions. Unless this point is considered the windows are very apt to become frozen in on the arrival of cold weather, and it becomes difficult to open them, hence ventilation is frequently neglected. During the past winter one window in each pen was arranged as shown in figure 12, the upper sash being dropped to the window sill and the opening thus made covered with a piece of 8-ounce duck, the latter being tacked to the upper bar of the lower sash and to the sides and top of the window frame. In extreme cold weather the lower sash is slipped up to the top of the window, thus effectually closing it. This method proved to be very satisfactory, the house being unusually dry and the birds appearing to be in excellent health.

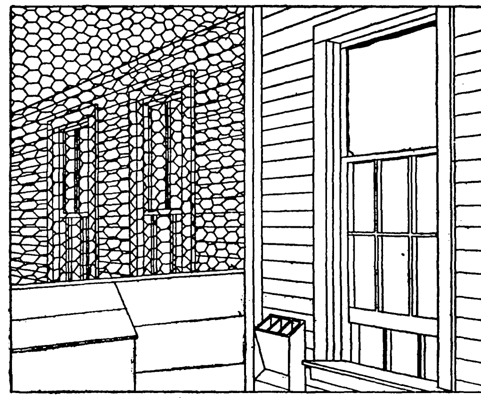

FIG. 12.—Interior of a New York poultry house, showing duck-covered window.

The roosting platform (see fig. 13) is placed in the rear of each pen, and at the front of each platform is hung a duck curtain operated by means of cords run through rings attached to the ceiling. This additional protection effectually prevents the freezing of Leghorn combs in all except the most severe winter weather. The nests are directly under the platforms and are entered from the rear. The bottoms of the nests are attached to one side by means of hinges and are held in place by a number of hasps. To clean the nests it is simply necessary to unfasten the hasps and the entire bottom swings downward.

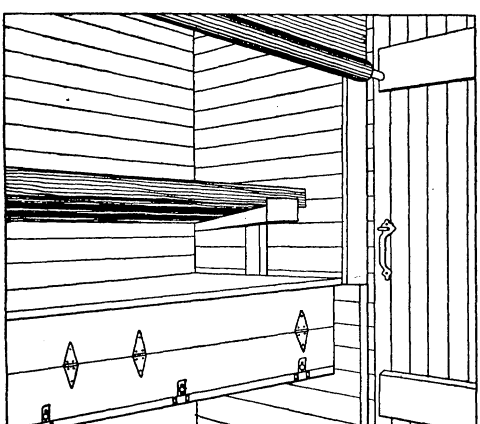

FIG. 13.—Curtained roosts and hinged nest boxes.

The floor consists of matched boards. The outside of the studs of the walls are first boarded, then covered with paper and clapboarded. The inside of the studs is covered with matched boards, making a 4-inch dead air space between the two walls. The ceilings are made of matched boards. Over each pen in the ceiling is a trapdoor about 20 by 24 inches opening into the attic. At each end of the attic is a window, and at regular intervals along the peak of the roof are ventilating cupolas. Straw may be placed in the attic, thus providing an effective means of absorbing the moisture.

In the foreground of plate 19, figure 2, is shown one of the curtain-front houses in use at the Maine Experiment Station. Fresh air has been a big consideration in the building of this house, which has a curtained front to the house proper and a curtain-front roosting room. Professor Gowell, expert in charge of poultry raising at this station, has found this method of ventilation very satisfactory.

The building is 120 feet long and 16 feet wide. The front wall is 6⅔ feet and the rear wall 5½ feet high from the floor to the top of the plate. The roof is of unequal span, the ridge being 4 feet in from the front wall, and the height of the ridge above the floor is 9 feet. The sills are 4 by 6 inches and rest on a rough stone wall. The floor, consisting of two thicknesses of hemlock boards, rests on 2 by 8 inch timbers, which are placed 2 feet apart. The rest of the frame of the building consists of 2 by 4 inch material. The building is boarded, papered, and shingled on both roof and walls, and in addition the rear wall and 4 feet of the lower part of the rear roof are ceiled on the inside of the studding and the space packed with dry sawdust. Outside of the building a 3-foot platform extends across the ends and along the front.

The house is divided into four 30 by 16 foot pens. In the front side of each pen are two 12-light windows and a door 2½ feet wide. The space between the window and door comes close up to the eaves, leaving an unbroken front 3 feet high below the eaves. The opening is 3 by 14 feet and is covered by a wooden frame, covered with 10-ounce duck. This curtain is hinged at the top and is swung in when opened, and it is always kept open, except on stormy days and winter nights. Each pen is of suitable size to accommodate 100 fowls, thus allotting 4.8 square feet of floor space to each bird.

A roost platform 4 feet 10 inches wide and 3 feet above the floor extends along the rear side for the entire 30 feet. Three perches of 2 by 3 inch material are placed on edge 10 inches above the platform. The rear perch is 11 inches out from the wall, and the space between the perches is 16 inches, which leaves 15 inches between the front perch and the duck curtain. The two curtains in front of the roost are each 15 feet long and 30 inches wide. They are hinged at the top, and open out into the room and fasten up when not in use.

At one end of each pen are placed 12 trap nests and 8 at the other end. Several small boxes are placed against the wall 1½ feet above the floor for shell, grit, bone, etc. The doors between the pens are wooden frames covered with 10-ounce duck and are hung with double-action spring hinges, so as to open in either direction. Tight board partitions are used between the pens to avoid drafts.

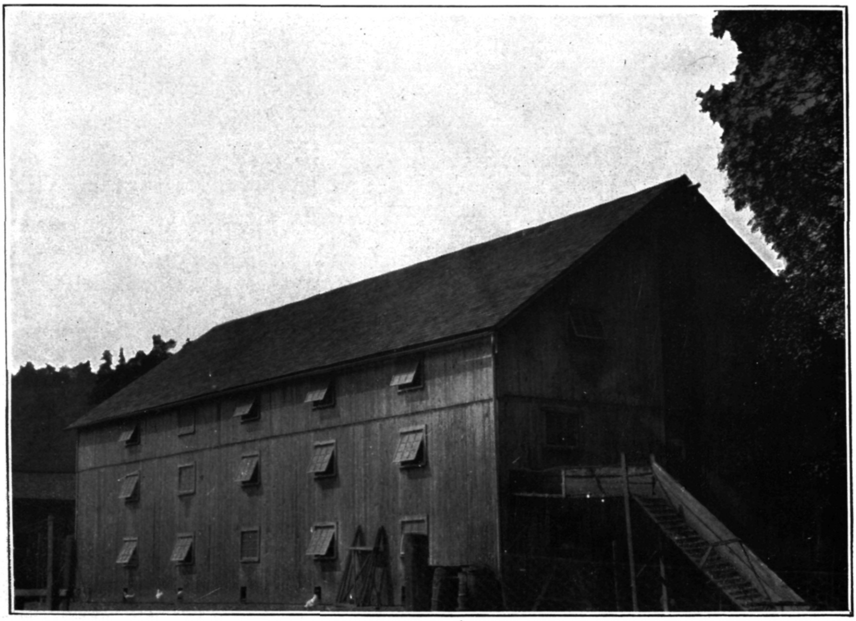

FIG. 1.—A THREE-STORY LAYING AND FATTENING HOUSE.

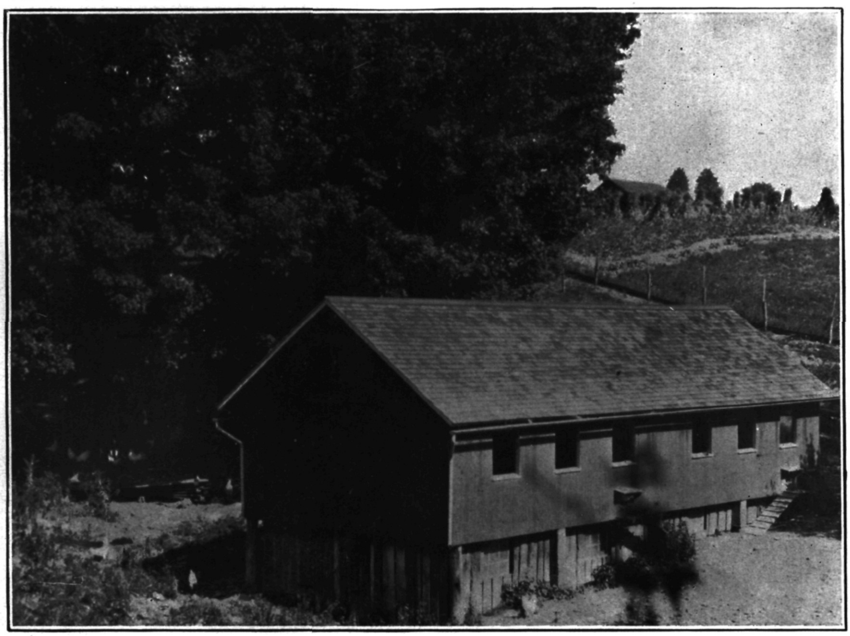

FIG. 2.—LAYING HOUSE AND OPEN RANGE ON A NEW YORK POULTRY FARM.

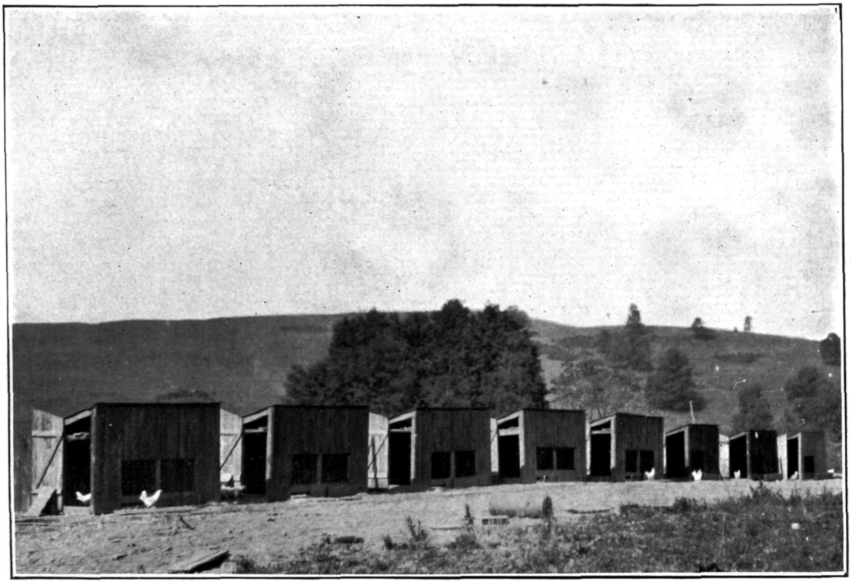

FIG. 1.—A ROW OF COLONY HOUSES.

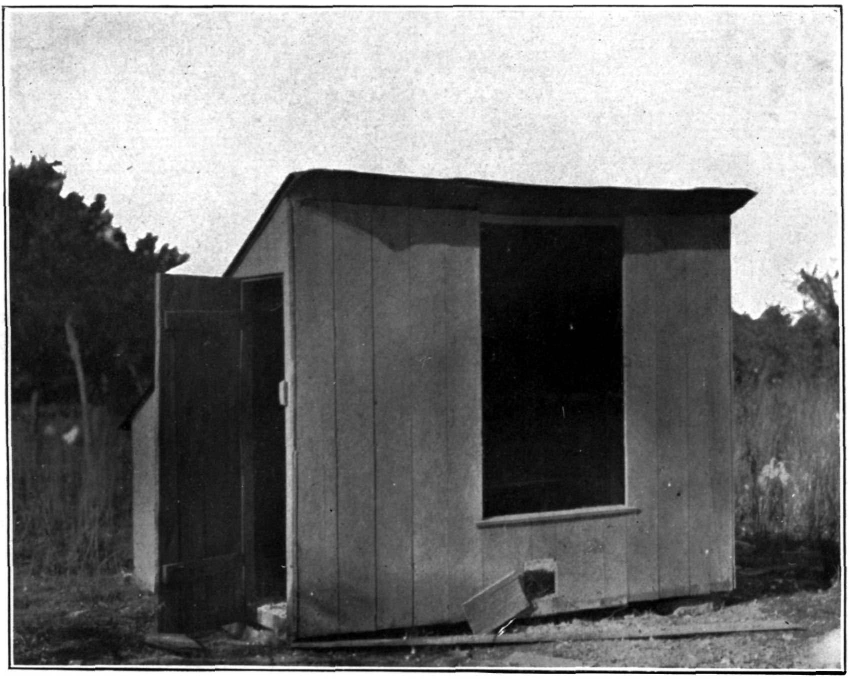

FIG. 2.—A SINGLE COLONY HOUSE.

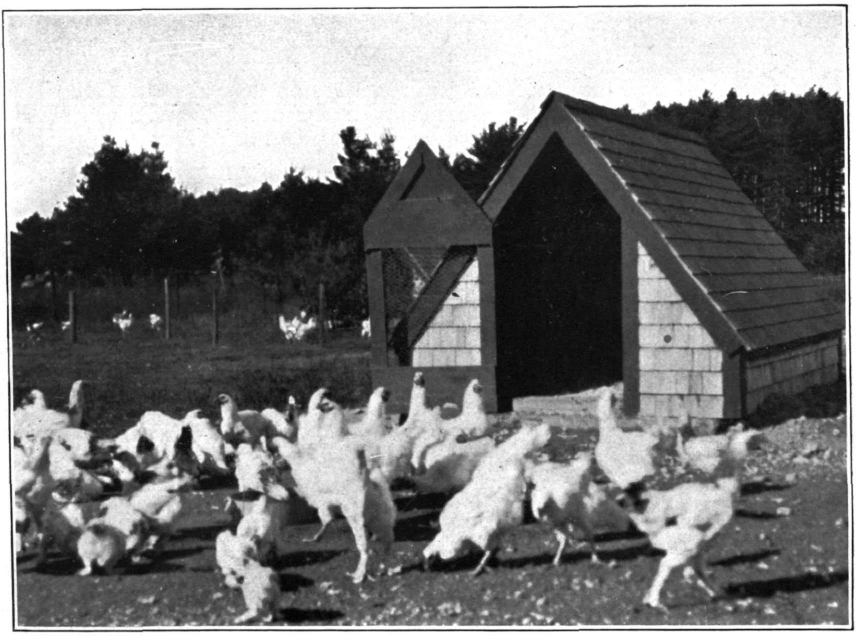

FIG. 1.—"NEW HAMPSHIRE" FORM OF POULTRY HOUSE.

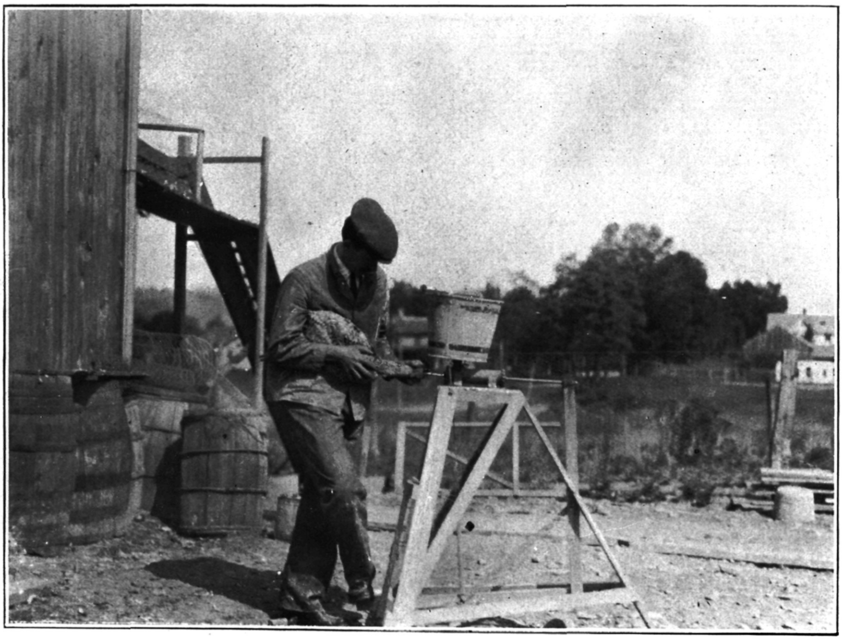

FIG. 2.—CRAMMING MACHINE IN OPERATION.

The chief point about this house is that only two cloth curtains are between the birds and the night air, it being located in a cold climate where the mercury often falls considerably below zero in winter. The floor is covered to the depth of 6 or 8 inches with straw, and some grain scattered in the litter early in the morning induces the birds to exercise as soon as they leave the roost. It would be unwise to open the curtains of the roosting pen and let the birds into the cold atmosphere of the room without some inducement to work.

In plate 18 are shown the houses of Mr. Tillinghest's plant in Connecticut. The single house shown in figure 2 of that plate is 10 by 20 feet, 4 feet high at the eaves, and 6½ feet at the center. The whole construction, including the roof, is of 1-inch cypress boards, matched. The floors consist of earth, and are not found damp, owing, no doubt, to the excellent natural drainage. The only fixtures in each of these houses is a hopper having a capacity of about 1½ bushels for wheat screenings, a smaller hopper for beef scraps, and 4 or 5 soap boxes for nests. In the rear of the house are placed 3 or 4 perches about 3 feet from the ground. No board for droppings is used.

The great point at this plant is the simplicity and economy of labor in caring for the birds. Nature has greatly aided the owner by providing not only excellent drainage, but also a fine stream, which furnishes plenty of water and serves as a natural fence. The elevated ground abounds with wild berries, and insects are usually plentiful during the summer.

The supply of grain in summer consists of wheat screenings fed from self-feeding hoppers, which are usually filled but once a week. A small quantity of beef scraps is fed in the afternoon, when the eggs are gathered. The fowls get their supply of water by going to the creek in both winter and summer. In winter a little cracked corn is added to the wheat screenings, and beef scraps are accessible to the fowls at all times.

Plate 20, figure 1, shows a three-story house used by Alba Skinner & Son, of New York State. This house is 72 feet long, 32 feet wide, 18 feet high at the eaves, and 28 feet high at the center. The walls consist of two thicknesses of 1-inch boards with a 4-inch space between, which is filled with straw. The ground floor is of cement, and the second and third floors are of wood. The first story is divided into 12 pens, 6 on each side of a 4-foot alley which runs through the center of the building. Each pen is 14 by 12 feet and accommodates about 35 fowls. The perches are placed in the rear of each pen, about 8 inches above a roost platform, which is 3 feet from the floor. The nests are directly under the platform and are so arranged that the eggs can be gathered from the alley. In the front side of each pen is placed a 9-light sash. This sash is hinged at the top and can be swung outward, so as to provide for good ventilation. The second story, with the exception of having a board floor, is arranged similar to the first, and both stories are used for laying hens. The birds from the second story reach the ground by means of an inclined platform or bridge. The third story serves mainly as a fattening pen, where the birds are kept in crates and fattened by means of a cramming machine.

Plate 20, figure 2, shows one of the winter laying houses at H. J. Blanchard's farm, in New York State. This building is 40 feet long and 16 feet wide, the distance from the floors to the eaves being 7 feet. The walls are double, with a 4-inch space filled with straw. On the south side are 6 double-glazed sashes, which make a warm house for the cold northern portions of the United States. There is a loft with slatted ceiling filled with straw, which absorbs the moisture from below. At each end of the loft is a door which is opened on warm days to allow the straw to dry out. Below the floor is a basement, which furnishes an ideal scratching shed for winter use. To the rear of this house is a small grove, which furnishes plenty of shade, and about 20 feet from the front of the house is a stream of water.

COLONY HOUSES.

In plate 21, figure 1, is shown a row of colony houses at Alba Skinner & Son's poultry farm in New York State. Each one of these houses is 8 feet long and 5 feet wide, 5 feet 8 inches high in front and 4 feet in rear. A brooder for 150 chicks is placed in each house, and when the chicks are 7 or 8 weeks of age, unless the weather is cold, the brooder is removed. Each 150 chicks have a yard 50 by 20 feet. When the chicks are about 7 weeks old the fences are removed, thus giving the chicks free range.

Plate 21, figure 2, shows one of the colony houses for chickens in use at the poultry farm of White & Rice, in New York State. This house is about 8 feet long and 7 feet wide, 7 feet high in front and 3½ feet in rear. The walls are built of one thickness of matched boards. The floor is of wood. A hover is placed in this house, and the chicks are placed here when first hatched. When the chicks are from 6 to 10 weeks old (depending largely on weather conditions and the development of the chicks) the heater is removed and perches are placed in the rear of the house about 16 or 18 inches above the floor.

Plate 22, figure 1, illustrates a "New Hampshire" house, one of many such houses in use on Mr. Hicks's poultry farm in Massachusetts. This building is about 9 feet long and 7 feet wide, and about 6 feet high at the center and 18 inches at the eaves. The door is covered with fine wire netting, so as to provide for light and ventilation. If desired the door can be covered with a muslin curtain, which can be swung open during the day and on warm nights. Such a house will accommodate 10 to 15 fowls, according to amount of yard room, breed, etc. This house is portable, and can be readily moved from place to place. The chief recommendation of a house of this shape is the economy of labor and material needed to build it.

MANAGEMENT OF HENS FOR EGG PRODUCTION.

The problem of feeding is one of great importance, and should be carefully considered, for on it depends to a large extent not only the general health of the birds, but also the economy which promotes success. It is a subject, however, which should be studied with a large amount of common sense, for there are no hard and fast rules which can be laid down as applying to every case. The price of feeds and the general environment should be considered in determining the right rations.

For the largest profit a good proportion of the eggs should be secured during the winter. If two extra eggs per week can be obtained from each hen a good profit will be made, while if the product is increased by only one egg per week in winter, this one egg will pay for all the feed the hen eats. To obtain this greater production, not only should the fowls be young and of a good laying breed, but the feeder should have a full knowledge of the proper feed and its preparation.

The nutriment in the feed of laying hens serves a twofold purpose—to repair waste and furnish heat to the body and to supply the egg-making materials. As only the surplus over what is needed for the body is available for egg production, the proper feeds should be fed in sufficient quantities to induce this production.

In supplying feed to fowls there are three kinds of constituents which should be present in certain fairly well-fixed proportions if the desired results are to be obtained most economically. These constituents are mineral, nitrogenous, and carbonaceous, all of which are contained in corn, wheat, oats, and barley, but not in the right proportions to give the greatest egg yield. In addition some animal feed and green feed should be supplied.

In feeding poultry a valuable lesson may be learned from nature. In the spring the production of eggs on the farm is an easy matter. Fowls which are at liberty to roam find an abundance of green and animal feed on their range, which with grain furnishes a perfect ration for laying hens. In addition to this they get plenty of exercise and fresh air. So far as lies within his power, then, the feeder should aim to make the winter conditions springlike.

SYSTEMS OF FEEDING.

There are two systems in use for the feeding of fowls, in one of which all the feed is given dry and in the other of which one or more of the daily feeds consists of a moistened mash. For convenience they may be termed the "dry-feed" and the "mash" systems, although in the dry-feed system a dry mash is often fed.[a] Dry feeding is used by many where it is not convenient to make and feed a moistened mash. The greatest advantages to be derived from the dry system are the saving of labor and the lessened danger of bowel trouble resulting from sloppy or soured mashes.

DRY FEEDING.

In the dry-feed system for laying hens, as successfully practiced on a New York poultry farm, the whole grains fed are as follows, in the proportions indicated:

200 pounds cracked corn.
360 pounds wheat.
130 pounds oats.

This mixture is scattered in the litter early in the morning and again at about 11.30 a. m., and this induces abundant exercise.

A hopper containing a dry mash is hung against the wall. The mash is made up of the following ingredients, in the proportions indicated (by measure):

32 parts corn meal.
30 parts meat (animal) meal.
30 parts ground alfalfa.
2 parts oyster shell.
1 part grit.
1 part charcoal.

The hopper containing this mash is opened about an hour after the noon feed of grain, or about 12.30 p. m., and the fowls have access to it for the remainder of the day.

Of all grain feeds that are usually supplied to farm poultry, corn has been and still is the most popular, which is probably due to its abundance and relative cheapness, and because it is the most relished of all the grains. Corn is heating and fattening, and when fed to closely confined fowls in large quantities fat rather than eggs is the usual result, and it should be balanced with meat, bone, linseed, gluten, and such feeds as are rich in nitrogenous matter, for corn is deficient in this constituent. When corn is fed to laying hens that have opportunity to take plenty of exercise and to secure insects and green food, much more satisfactory results are likely to be obtained than when it is fed to the same fowls closely confined. It may be fed quite largely in the cold climates during winter, but should be fed sparingly during summer.

Wheat is generally considered the safest grain to be fed alone. It is not quite so fattening as corn, still it is too fattening when fed alone.

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[a] By the term "mash" poultrymen mean a mixture of ground feed, which may be either moist or dry.

This grain should be supplemented by some meat feed or skimmed milk to increase the proportion of protein. Wheat contains more protein than corn, about the same amount of carbohydrates but less fat, and on the whole is considered not so valuable for fattening, but better for growth. Wheat screenings, if they are of a good grade, can frequently be purchased and fed to advantage. Of course there is always the danger of introducing weed seed on the farm. "Burnt wheat" can seldom be fed advantageously; the difference in price between this and good wheat being usually too slight to warrant one in feeding it.

Oats are often fed for variety, but are not well liked unless hulled, the hulls being tough and rather indigestible. Hulled oats, on the other hand, are relished by poultry and are excellent for producing eggs. When they can be obtained at a reasonable price in comparison with other grains they may be fed quite largely.

Barley does not seem to be greatly relished by hens, but may be used to give variety to the grain ration. It has a little more protein than corn and a little less than oats.

Buckwheat is quite well liked by fowls, but is not very widely fed. It may be fed to vary the ration. Buckwheat middlings are rich in protein and make a good mixture with corn meal.

Rye is not fed largely, and does not seem to be much relished by poultry. It is supposed to cause bowel trouble when fed freely.

MASH FEEDING.

It is the practice of a large percentage of the most successful poultrymen to feed a part of the daily grain ration ground. Most of them feed the ground grain moistened with either milk or water, although some feed it dry. A fowl's gizzard is capable of grinding all kinds of grain, but it is generally considered to be more economical to have a part of the grinding done by steam or water power. The soft-feed idea, however, must not be overworked. A beginner often reasons that it is cheaper for the miller than for the fowl to grind the grain; but the powerful muscles of the gizzard are there to be used, and experience has shown that the balance of power of functions in the fowl's economy makes the vigorous exercise of the gizzard beneficial. When feeding moistened ground feed have it a comparatively dry, crumbly mash, and not a thin slop. Give what they will eat readily in 15 or 20 minutes.

Poultrymen do not agree as to the time of day when the soft feed should be fed. Some assert that it should be fed in the morning, others at noon, and still others at night. The greater proportion give the ground feed in the morning, a large number at night, and a few at noon. The number who feed at noon, however, is becoming larger. Those who give the soft feed in the morning reason that the fowls which have been on the perches during the night have largely digested the feed consumed the day before, and consequently have comparatively empty crops and digestive organs, and in order that the morning meal may be easily and quickly digested the fowls should be fed only ground and moistened feed. Other careful feeders state that if a moistened mash is fed in the morning the hen is likely to become gorged with feed early in the morning and take to the roost for the remainder of the day. It is probably more important that a part of the grain should be ground than that it should be fed at any particular time of day. In an experiment in West Virginia the egg production was practically the same whether mash was fed in the morning or at night.

The following are given as sample mashes:

150 pounds corn meal.
300 pounds ground oats.
250 pounds buckwheat middlings.
100 pounds wheat bran.
50 pounds gluten meal.
50 pounds alfalfa meal.
50 pounds beef scraps.

100 pounds corn meal.
50 pounds ground rye.
100 pounds wheat middlings.
100 pounds malt sprouts.
50 pounds wheat bran.
30 pounds cotton-seed meal.
30 pounds beef scraps.

100 pounds corn meal.
150 pounds ground oats.
150 pounds wheat bran.
30 pounds linseed meal.
30 pounds beef scraps.

100 pounds wheat bran.
100 pounds ground corn.
100 pounds ground oats.
100 pounds ground barley.

100 pounds corn meal.
100 pounds ground oats.
100 pounds buckwheat middlings.
100 pounds gluten feed.

500 pounds wheat shorts.
500 pounds corn meal.
500 pounds alfalfa meal.
250 pounds wheat middlings.
100 pounds beef scraps.

100 pounds corn meal.
100 pounds ground oats.
100 pounds wheat bran.

100 pounds wheat bran.
100 pounds corn meal.
75 pounds wheat middlings.
75 pounds cut clover or alfalfa.

MISCELLANEOUS FEEDS.

Animal feed.—Chickens eat a large amount of animal matter in the form of insects, worms, and other low forms of animal life when allowed to range at will. If the poultry keeper is to get the best results from his fowls in winter he must furnish a substitute for this class of feed. For this purpose green cut bone, meat scraps, and animal meal may be used. Green cut bone is usually fed by itself, while the scraps and meal may be readily mixed with the mash. Cut bone consists of green or fresh bone sliced or shaved into thin pieces by a bone cutter. Bones fresh from the butcher have more or less meat adhering, and the more of such meat the better, for the combination of bone and meat is excellent for producing eggs. Where a good supply of fresh bone can be obtained regularly it is very useful, but it can not be kept sweet for such long periods as the beef scraps and animal meal. Green cut bone should be fed carefully and in a sweet condition, otherwise bowel trouble may result. One pound a day is sufficient for 20 hens, but not over one-half pound should be fed to that number when first beginning to feed it. From one-half to three-fourths pound of animal meal or meat scraps may be fed to 12 or 15 hens. Any form of meat is likely to loosen the bowels of the hen when first fed, and the hens should be watched carefully and not fed too much. After the fowls have become accustomed to the animal meal or meat scraps it may be kept constantly before them.

Green feed.—If the best results are to be obtained with poultry they must be furnished with a plentiful supply of green feed. Where fowls have unlimited range on a farm they will secure green feed during the spring, but during the winter it must be supplied for them. The question of how to supply the best feed at the least cost is one that each poultry keeper must decide largely for himself. It will probably make but little difference what kind of green feed is supplied provided it is relished by the fowls. Cabbages, turnips, beets, potatoes, etc., are suitable for this purpose. The larger roots and the cabbages may be suspended by means of a wire or string, or they may be placed on the floor, in which case it would be well to split the turnips or beets lengthwise with a large knife. Potatoes and turnips should be fed cooked. The mangel is an excellent root for feeding raw. Cut clover soaked in boiling water fed alone or with the mash is good. Clover meal and ground alfalfa make very good feeds for this purpose. Where the fowls are yarded and not enough green feed is furnished by the yards, a small patch of clover, alfalfa, or rape may be sown. Any one of these, if frequently mowed, will furnish a great quantity of green feed in a form which is relished by the fowls. Canada field peas may also be sown for this purpose, and when fed in a tender, crisp condition are eaten readily. Rye is a good crop for late fall and early spring, for it will germinate and grow in very cold weather and will live through the winter. As a general thing, fowls should have once a day about all the green feed they will eat.

Hay.—Clover hay may be fed economically to laying hens and may be prepared as follows: Cut into as short lengths as possible (one-fourth to one-half inch) and place in a bucket. Then pour boiling water over it and allow to stand for two or three hours or over night. When ready to feed, drain off the water and mix the hay with the mash. The hay may constitute about one-half the bulk of the feed, although the exact proportion is immaterial. Clover hay is best, but any kind is valuable. The feeder must be careful not to give too much bulky feed, for the hen, having a small crop, can not make use of a large amount of it as the cow and other ruminants can.

Water.—Plenty of fresh water should always be accessible to the hens. If supplied irregularly they are likely to drink too much at a time. It should not be exposed to the sun's rays in summer or be allowed to freeze in winter if this can be avoided. In very frosty weather it is often worth while to give them slightly warmed water two or three times a day rather than permit them to drink water at the freezing point. A flock of 50 hens in good laying condition will require 4 to 6 quarts of water a day.

Milk.—When properly fed, milk makes an excellent feed for poultry. In feeding sour milk or buttermilk, however, the feeder must exercise care not to give too much or bowel trouble will likely result. Skimmed milk is an economical food. In skimming, the most valuable food constituents—the nitrogenous substances—are left in the skimmed milk. Not only does this skimmed milk contain much nutritive material, but it contains it in a form which, as a rule, is easily digested. Skimmed milk may often be advantageously substituted in part for meat. Milk may be used in mixing the soft feed, or it may be given the fowls to drink in addition to water.

GRIT AND OTHER SUBSTANCES.

Grit.—Grit is essential to the health of fowls and to economy in feeding. Grit takes the place of teeth in preparing the feed for further digestion and is required for the proper preparation of feed in the gizzard. When the feed is not properly taken care of in this organ an undue strain is thrown on the fowl's system, often resulting in disease, and also allowing much of the nutriment to pass through the bird's body without being absorbed. In every pen or yard a box of grit should be kept. Recent investigators have asserted that grit is a part of the necessary feed, giving the fowls strong bones and a bright plumage.

Lime.—Ordinarily, the hen does not consume enough lime to form the shells of eggs if she is laying abundantly unless something besides the ordinary grain feeds is accessible to her. Oyster shells are very good for this purpose. A box of crushed shells may be placed before the fowls, allowing them to eat at will. Old mortar and fine gravel are also useful in supplying lime.

Salt.—A little salt is undoubtedly beneficial, but if taken in large quantities salt is poisonous. There are frequent reports of fowls being injured by eating salt. They are probably frequently misled in eating it, supposing they are eating grit, rock salt being particularly dangerous on this account. When fowls have a wide range they eat grass and many other things that furnish salt in some form. Experiments made at the New York Agricultural Experiment Station showed that salt was not injurious in quantities below 0.06 ounce per day for each hen (that is, nearly one-half pint per day for 100 hens).

Charcoal.—Charcoal has a great absorptive power for gases, impurities, and acids, and thus acts as a corrective when the stomach is sour and digestion has been impaired.

METHODS OF FEEDING.

Fowls should have empty crops in the morning, and the crops should never be quite full until it is time to go to roost at night. For the first feed, grain scattered in the litter early in the morning is preferred, the sooner the better after the birds leave the roosts. This induces them to exercise, which is especially important on cold winter mornings. In the middle of the day a warm moistened mash should be given, about what they will eat within 15 or 20 minutes, and at night, about an hour before they go to roost, a liberal feed of grain should be scattered in the litter.

FREQUENCY OF FEEDING.

Some poultrymen feed their flocks twice a day, while others feed them three times a day. The best plan is to feed fowls in confinement three times a day, and those having free range in summer twice a day. When there is a very long interval between feeds it is difficult to keep fowls busy which are kept in confinement. Idle fowls often contract bad habits, such as feather pulling and egg eating, besides going out of condition from lack of exercise.

In case it is not convenient to feed three times a day, the moistened mash may be fed in the morning, and at the same time the noon feed of grain may be scattered in the litter, which will keep the fowls busy a great part of the day.

For those who can not conveniently feed their fowls early in the morning, a good plan is to scatter grain plentifully in the litter after the birds have gone to roost. This grain will furnish feed for the early morning.

Some poultry keepers can look after their fowls only once a day. If this is in the morning, moistened mash may be fed, followed by throwing grain in the litter to furnish food for the remainder of the day. If it is in the evening, before dark, a moistened mash may be given, and either after the fowls go to roost or in the morning, before daylight, grain may be scattered in the litter for eating during the day.

AMOUNT OF FEED.

It is impossible to state any exact quantity of feed that should be given to each fowl per day, as the appetites of the birds vary according to the conditions under which they are kept, the season of the year and the kind of fowl, some being much greater eaters than others. The general rule is to keep the birds slightly hungry during the day, not giving all they will eat until just before roosting time. The birds should be handled now and then when they are on the perch, and if they are either too fleshy or too poor their rations should be modified.

IMPORTANCE OF A VARIED RATION.

In feeding grain the aim of the feeder should be to give a variety. No one kind of grain alone is best. Variety may be secured by mixing the grains or by feeding the different kinds of grain on different days. This variety is in accordance with nature. When on free range the fowls obtain a little of several different kinds of feed. Grain should not be made the sole feed, for then fat and not eggs is the usual result.

EFFECT OF FEED ON CHARACTER OF EGG.

In extreme cases the flavor and the odor of the feed has been imparted to the egg. Onions have been fed in sufficient quantity to bring about this effect. Feeds of high and objectionable flavors should not be fed by those who desire to produce a first-class article. In no case should tainted feed be allowed to enter into the ration. Feed also has an influence on the color of the yolk. Corn fed exclusively will give a deep yellow or highly colored yolk, while wheat fed alone will produce a much lighter-colored yolk. A fairly high-colored yolk is usually preferred and can generally be obtained by feeding a moderate amount of corn. Plenty of green feed also enriches the color of the yolk.

FEEDING A BALANCED RATION.

So far as we know at present, the best general results with laying hens will be obtained by feeding a balanced ration containing about 1 pound of protein to 5 pounds of carbohydrates and fat (i. e., a ration which has a nutritive ratio of 1:5). The ratio best adapted to egg laying, however, will differ somewhat with conditions, such as the breed of fowls, their age, and the weather conditions.

To find the nutritive ratio of a feed, multiply the amount of digestible fat by 2¼, add the result to the amount of digestible carbohydrates, and divide this sum by the amount of digestible protein. The quotient shows how many parts of digestible carbohydrates (plus 2¼ times the fat) there are to one part of digestible protein. As an example let us take the following mash and find its nutritive ratio:

Balanced ration for laying hens.

Feed.	Digestible nutrients.		
	Protein.	Nitrogen-free extract (carbohydrates).	Fat.
	Pounds.	*Pounds.*	*Pounds.*
100 pounds corn meal	6.26	65.26	3.50
100 pounds ground oats	11.53	52.06	5.93
100 pounds wheat bran	12.01	41.23	2.87
15 pounds beef scraps	7.46		2.78
	37.26	158.55	15.08

158.55 plus 33.93 ($2\frac{1}{4}$ times 15.08) equals 192.48.

192.48 divided by 37.26 equals 5.17. Nutritive ratio 1:5.17.

For the composition of feeding stuffs, see Farmers' Bulletin No. 22, "The Feeding of Farm Animals."

Observation and experience soon teach the feeder how to vary his rations to meet changes in the weather and apparent changes in the condition of his fowls. The most common fault in the ration of well-fed fowls is an excess of heat and fat producing nutrients. If on account of prices or other reason one wishes to change the ration it is best to make the change gradual, for radical changes in a diet usually have some bad effect.

THE DROPPINGS AS AN INDICATION OF HEALTH.

The condition of the droppings furnish a good indication of the hen's health. They should be of sufficient consistency to hold their shape, but should not be too solid. In color they should be dark, tapering off into grayish white. If the droppings are soft or pasty, and of a yellowish or brownish color, it indicates too much carbohydrates or a lack of meat. If, on the other hand, the droppings are watery and dark with red splashes of mucus in them, it indicates too much meat. A greenish, watery diarrhea usually indicates insanitary conditions, either in the surroundings, the feed, or the water.

MOLTING.

Where a specialty is made of producing winter eggs it is important that the hens shed their feathers early so that the new plumage will be grown before cold weather begins. Henry Van Dreser has proposed a way by which it is possible to cause a flock of fowls to pass through the molting period early and uniformly. This method consists in withholding part of the feed for about two weeks, which stops egg production and reduces the weight of the fowls, and then feeding heavily on a ration suitable for the formation of the feathers and the general building up of the system. This method was tried at the West Virginia Experiment Station with good results. The hens molted more rapidly and with more uniformity, entering winter in better condition than similar fowls fed continually during the molting period on an egg-producing ration. Whether this method is employed or not, the fowls should receive a more nitrogenous ration than the one ordinarily fed. The addition of a little linseed meal during the molting period will aid in the production of a new coat of feathers. An increase in the amount of animal feed will also be beneficial.

EXERCISE.

During the spring season fowls having free range get abundant exercise. Close confinement without exercise is not conducive to the best results, although the feed provided may be the best, for idle hens soon grow too fat to lay. It is almost impossible to give laying hens which are confined too much exercise. The fowls may be encouraged to exercise in various ways, such as feeding corn on the cob, suspending cabbage heads, beets, etc., so that the birds have to jump for them, and scattering grain in the litter. The litter should be from 4 to 8 inches deep and may consist of straw (either cut or whole), hay, leaves, buckwheat hulls, shredded corn fodder, or any convenient material of this nature. The hens should be kept hungry enough so that they will work diligently all day for the grain scattered in this litter, which should be removed whenever it becomes damp or soiled.

AGE OF BIRDS FOR PROFITABLE EGG PRODUCTION.

There are people who have the right variety of fowls, who house and feed them properly, and yet who can not obtain eggs early in the winter because their fowls are too old. It is seldom that it pays to keep hens for laying after they are two and a half years old; not that they will not give a profit, but that younger fowls will give a greater profit. A great many poultrymen who make a specialty of winter-egg production keep nothing but pullets, disposing of the 1-year-old hens before it is time to put them in the winter quarters. Early hatched pullets, if properly grown, ought to begin laying in October or early November and continue to lay through the winter. Yearling hens seldom begin laying much before the first of January and older hens not until later. It is the November and December eggs that bring the high prices. The laying breeds should begin laying when about 5 months old; general-purpose breeds at 6 months, and the meat breeds at 7 or 8 months.

OPINIONS OF POULTRY RAISERS ON FEEDING FOR EGG PRODUCTION.

In the preparation of this article, requests for methods and experience in poultry keeping were sent to raisers in different parts of the country. These opinions are the personal experiences of men in the industry and represent various ideas, and it is therefore obvious that the Bureau is not responsible for any statements made therein.

The following were among the replies to the question, "What is your method of feeding hens for egg production?"

I. K. Felch, Natick, Mass.: In the morning I feed a mash made from a meal prepared by mixing 1 bushel of ground corn, 2 bushels of ground oats, 1 bushel of ground barley, 2 bushels of wheat bran, and ½ bushel of charcoal. To such portion as the fowls will eat up clean, 20 per cent in bulk of ground beef scraps is added. The rest of the day I feed mixed small grains—barley, first-class oats, and wheat—

provided the fowls have a free grass run from which to glean what vegetable substance they need. If fowls are confined in winter quarters or in barnyards they must be furnished vegetable substance to the amount of 25 per cent of the bulk of the feed given, 15 per cent meat and 60 per cent grain making up the remainder of the day's rations. They have grit or gravel and oyster shells to eat at their pleasure. In the winter months in making the meal for use I add 1 bushel of ground clover meal, and let the balance of the 25 per cent come either in boiled potatoes or turnips, to be mashed in the morning feed, or else cabbages, mangels, and lettuce to be eaten raw. In barnyards in summer there is nothing as good as green clover. Such feeding of breeding and laying stock is the very best course. All dry grain should be fed in open scratching sheds to induce the greatest exercise possible in the flock.

Nathan W. Sanborn, Bellingham, Mass.: Dry bran, wheat screenings, and meat scraps before hens all the time in hoppers. Green feed (cut clover, mangels, turnips, etc.) used the year round. This for well-grown pullets when working for egg records.

Daniel P. Shove, Fall River, Mass.: Morning, mash of one-third corn meal, one-third wheat bran, one-third cut clover and scraps; afternoon, one-third cracked corn, one-third oats, one-third wheat.

George A. Barrows, Groton, N. Y.: In the morning the hens are given a liberal feeding of beets or other green feed and their drinking pans filled with thick milk. Between 10 and 11 o'clock we feed a mash consisting of 4 parts ground oats, 4 parts corn meal, 6 parts bran, 2 parts beef scrap, and 1 part oil meal. This mash is wet in the summer with milk, and in the winter with hot water. After dinner the drinking pans are filled with fresh water. At night the hens are given a feeding of whole grain, consisting of equal parts of oats, cracked corn, and either wheat or buckwheat. At this time we aim to give a little more grain than the hens will clean up and thereby give them something to work for in the morning. Shells and granite grit are kept before them at all times.

Forest Poultry and Fruit Farms, Lockport, N. Y.: We have adopted the hopper method of feeding our laying hens. In each house are placed large hoppers holding a week's supply of grain, so that the fowls have access at all times to all the grain they want. They also have meat scraps, grit, sea shells, and charcoal before them. Our fowls are kept yarded, so are supplied with cut clover, grass, and vegetables. The grain mixture is composed of wheat, corn, and oats in about equal proportions by weight. We expend considerable effort in keeping the buildings and yards clean. We have two yards to each house, and as soon as the ground becomes foul we turn the hens into the extra yard and plow up and seed the ground with some quick-growing crop, such as rape, which we are using this year and which seems desirable for the purpose.

Fred. H. Hough, Binghamton, N. Y.: Morning, 2 ounces whole wheat to a fowl; noon, 1 ounce whole oats to a fowl; night, 2 ounces cracked corn to a fowl. Ground green bone or beef scrap is substituted for the noon meal three times a week. Fresh water, grit, charcoal, and oyster shells are accessible at all times. In summer the fowls are allowed on grass run; in winter, cabbage, onions, and beets are furnished in the morning, three or four times a week.

Michael K. Boyer, Hammonton, N. J.: Morning, mash composed of equal parts of bran, middlings, corn meal, and ground oats, by measure, to which is added 15 per cent meat scraps and 5 per cent linseed meal. Allow a large iron spoonful to every 2 fowls in pen. Green feed at noon and a grain feed at night composed of half wheat and half cracked corn. Allow a handful of grain to each fowl.

F. C. Louhoff, Yancey Mills, Va.: For breakfast I feed a mash composed of equal parts by measure of corn meal, wheat bran, wheat middlings or shorts, cut clover, and ground oats, to which I add 10 per cent beef scraps, a teaspoonful of salt to 1 gallon of the mixture, and sufficient water to make the mass crumbly—cold water in summer and hot in winter. I aim to feed each hen a good handful. At noon and night I feed alternately dry cracked corn and whole wheat, also keep fresh water, grit, and crushed oyster shells always before them. I will add that in the winter time the mash is usually mixed with cooked refuse vegetables.

Mrs. John Starr, Atlanta, Ga.: For egg production we feed each lot of 100 hens, at 6 a. m., one-half peck clipped oats in deep litter. At 8 a. m., all cull vegetables and fruit they will eat. At 12, mash composed of one-half peck bran, one-half peck shorts, 3 quarts prepared beef scrap, 3 pints ground bone, 1 tablespoonful air-slacked lime, 2 tablespoonfuls common salt, one-half tablespoonful bicarbonate of soda, mixed with boiling water to crumbly mash and fed cold. At 5 p. m., 1 peck cracked corn in deep litter. For grit, oyster shells crushed. Fresh water three times daily in clean pans. When vegetables are unprocurable, add to mash one-half peck clover meal. Hens are confined in yards.

W. W. Turner, Lagrange, Ga.: My experience as a poultryman is limited to four years, my operations to a city lot, and annual output to 400 chicks. The hopper system is used exclusively. From May until November breeding stock has free access to oats, whole corn, ground bone, oyster shells, charcoal, sharp grit, and fresh water. From November to May beef scraps are added. From spring until hard winter they have Bermuda grass, alfalfa, rape, and lettuce; in winter, such green feed as can be had.

J. A. Winsloe, Ocean Springs, Miss.: Morning feed—a handful of grain to each fowl, scattered in litter; grain consists of wheat, oats, barley, and cracked corn, fed each day alternately, leaving out corn entirely during months of June, July, and August. Evening feed (4 p. m.)—mash composed of 30 per cent clover meal, 15 per cent bran, 15 per cent middlings, 15 per cent unbolted corn meal, 15 per cent ground oats, 10 per cent beef scrap, by measure. I boil the clover meal till it takes up most of the moisture and mix the other ingredients with it, making a mash nearly dry. After this feed of 1 quart to 8 fowls I feed whole corn, just a little to each, say, a handful to 3 fowls. The eggs come and they are fertile. I keep charcoal, grit, and ground bone before the fowls all the time.

S. T. Campbell, Mansfield, Ohio: Wheat, oats, barley, corn, feeding twice a day; morning, wheat; evening, corn; next day oats soaked in water overnight for morning feed, kafir corn for evening. Next day, in morning, barley which has been soaked overnight; evening, wheat; and so on. Keep grit and charcoal in hoppers where fowls can help themselves. Green cut bone or beef scraps, or both, twice a week. Fresh water all the time. Make fowls exercise by putting grain in straw or leaves.

Lyman H. Hill, Jackson, Mich.: In winter I feed three times a day, first feed at daylight, consisting of grains scattered in a litter of cut straw and chaff. Second feed at noon, consisting of grain in litter as above. Last feed is just before roosting time and consists of a warm mash made as follows: 100 pounds ground corn and oats (with the oat hulls sifted out), 50 pounds wheat bran, 50 pounds wheat middlings, 50 pounds cut clover or alfalfa meal. This mash is scalded in the afternoon and fed warm. In feeding same I see that it is not sloppy, but rather in a crumbly state. As to quantity, feed all they will eat; if any is left over, pick up their dishes after they have gone to roost, and if free from dirt and straw use it the following day. The grain that is fed for the first two meals of the day consists of oats, wheat, cracked corn, or barley, fed in rotation. Regulate the amount by their appetites. If they are anxious and crowd each other to get it, feed a full handful to each bird. If they do not seem hungry, feed less. Always have a cabbage hung on a string a little out of reach in their pens for them to pick at, and feed fresh cut bone three times a week. In spring, summer, and fall do not use the mash at all, but substitute the grain. Feed twice a day, at sunrise and in evening. Fowls are allowed to run on rye sown in their runs; 100 square feet to each bird. Fresh water, grit, charcoal, and oyster shell always before them. With this system I get eggs at all times of the year and plenty of them. No sickness at all. Coops dry, not too warm, clean roosts, and dropping boards covered with ground lime. Fowls dipped in a solution of oil of cedar and water two or three times in summer to kill body lice. Medicated nest eggs in nests.

Brent & Eddy, Oconomowoc, Wis.: We find the following ration the best for laying hens: Mash mixture of 15 pounds oats or barley (barley preferred), 5 pounds corn meal, 5 pounds bran, 10 pounds meat meal or green cut bone, 10 pounds clover meal, 5 pounds wheat middlings, making 50 pounds of dry mixture. For 30 hens we feed 6 pounds each morning, mixing feed with skimmed milk or pure water. At noon 3 pints wheat, and at night 2 quarts of cracked corn. Feed in deep litter to make the hens hustle for it. Where hens have free range and plenty of vegetation, grasshoppers, bugs, etc., omit the meat meal, clover meal, and green cut bone. Vary dry foods each week.

Edward Podhaski, Monticello, Iowa: In the morning I scatter a pint of oats in deep litter for each 12 hens, and at noon I give them all the cut vegetables, such as red beets, mangel-wurzels, cabbage, and potatoes that they will eat. For supper I scatter a full feed of barley or corn in the litter. I always keep a box each of grit, oyster shells, beef scraps, and dry bran where they can get it whenever they need it, and also plenty of pure, fresh water.

Jordan & Bennett, Fargo, N. Dak.: Oats are fed for the morning meal and wheat at night during the spring and summer months. As soon as cold weather sets in oats are fed in the morning, in a litter composed of straw and chaff. At noon a mash composed of equal parts of mangel-wurzel beets and potatoes, chopped fine and cooked thoroughly mixed with an equal part of bran and fed warm. At night whole corn and whole wheat is fed, the corn being fed only in extremely cold weather. Macaroni wheat is preferred to a poor grade of northern wheat.

E. Albertson, Seattle, Wash.: Wheat, cracked corn, commercial "egg food" (prepared ground), barley, oats, whole corn, meat scraps, grit, oyster shells, charcoal always before them in boxes suspended to side of shed. They have large grass runs the year round. Grass is a little short in December and January, and then I help out with cabbage, carrots, beets, and turnips. As I have both back and front yards, the yards are alternately pastured two weeks and then allowed to rest two weeks.

Harry H. Collier, Tacoma, Wash.: I may divide my answer as follows: 1. There must be plenty of shed room, with good litter on floor, where the fowls can scratch for all of their grain. 2. I prefer an earth floor where the ground is high enough to keep perfectly dry. 3. I feed my grain at night after the fowls have gone to roost and rake the same well into the litter, so that they will have to work for every grain they get. 4. I feed oats, corn, wheat, and barley, one kind of grain for each day in regular rotation. 5. Where I have the fowls penned I feed cabbage and any other variety of green stuff that I can get. I suspend the cabbage on wires, so that the fowls have to jump up to get it. I find that this gives them good exercise. 6. I keep grit before them at all times in hoppers, and find that broken crockery makes the best grit. 7. I use bone meal in a similar hopper, and find that the fowls are very fond of it.

George R. Albers, Los Angeles, Cal.: I feed a mash composed of heavy bran 80 pounds, beef scrap 8 pounds, fine ground bone 12 pounds, salt and sulphur each a trace, and mix feed in hoppers holding a month's supply. Morning, very light feed of wheat. Afternoon, heavy feed of green cut alfalfa and Swiss chard beets in troughs.

W. K. Hays, Henleyville, Cal.: All the feed in the world will not make a hen a good layer if she is not naturally such. It is our aim to feed layers 4½ ounces of feed to each bird a day. Morning, 2 ounces wheat scattered in straw; noon, green alfalfa or alfalfa hay chopped fine and soaked in water about an hour, all they will eat; evening, one-half ounce whole barley cooked, 1 ounce wheat bran, one-half ounce meat meal, mixed with milk, damp, not wet. This is the standard feed. It is sometimes varied according to conditions and the availability of other feeds. All birds are yarded—100 by 25 feet for 25 layers.

RAISING CHICKENS.

To be successful in raising chickens it is necessary to have healthy and vigorous breeding stock, for the lack of vigor in the newly hatched chicks is often traceable to weak parents. Only the most vigorous and the best-grown birds should be put in the breeding yards. Each bird should be full of life and energy and free from any serious deformity. Yearling hens are usually better than pullets for breeders, for the reason that the hens are more mature and do not lay so many eggs during the early winter, and consequently do not reduce their vitality so much before the breeding season. Vigorous hens 2 to 4 years old can often be advantageously retained in the breeding yard. The male bird chosen should be young and active. An early hatched well-developed cockerel is usually satisfactory, or a good vigorous yearling or 2-year-old cock may be chosen. The hens used for breeding purposes should be given the best care possible; they should be provided with large runs and should not be forced for heavy egg production during the early winter.

FEEDING THE MALE BIRD.

There is now and then a cock of such a gallant nature that he refuses to touch any feed before all the hens have been fed. He will call the hens to the feed and endeavor to see that they get enough, but will not touch it himself until they have finished eating. Unless the feeder is observant, this bird will get but little to eat and will become run down in condition, infertile eggs resulting. Where such a bird is found, either a little more feed should be given him or he should be fed by himself.

NUMBER OF FEMALES TO ONE MALE.

Of the light, active breeds, such as the Leghorns and Minorcas, 1 male will be sufficient for a pen of 12 to 15 females under ordinary conditions. In the case of the medium-sized fowls, such as the Plymouth Rocks and Wyandottes, 1 male should be provided for every 10 or 12 females. With the heaviest breeds like the Brahmas and Cochins, 1 male should not be mated with more than 10 females. Where 20 or 30 females are kept in one flock no better means of securing fertile eggs is known than to keep 2 male birds, allowing one of them to run with the hens one day, and the other the next day, having a coop or extra pen in which to keep the one not with the hens.

HATCHING CHICKS.

There are two methods of hatching and brooding chicks—the natural, in which the chicks are hatched and brooded by hens; and the artificial, in which they are hatched in incubators and brooded in houses or in separate outdoor brooders. For the person with a small flock the natural method will be found the easier and less expensive. For the person, however, who has a hundred or more hens and intends raising large numbers of chicks, and for all who keep only the nonsitting varieties, the artificial method is the more practical. There is also the added advantage with the latter method of being able to hatch chickens at any time of the year.

EGGS FOR HATCHING.

The eggs intended to be incubated should be kept at a rather cool temperature, 50° to 60° F. It is not advisable to keep them longer than two weeks before being incubated, and the fresher they are when set the better the chances of a good hatch and strong chicks. Only well-formed eggs with good strong shells should be set. When eggs are bought outside and delivered by rail or wagon they should be rested for twenty-four hours to allow the contents of the eggs to regain their normal condition.

Number of eggs to hen.—This depends on the season, the size of the hen, and the size of the eggs. The usual number for an average-sized hen in the spring is 13. The same hen set in winter should not be given more than 11. After the middle of May she can take care of 15. It is better to give less than she can cover than to give more, for when too many are given most of the eggs, if not all, will be chilled at some period of the incubation.

Testing the eggs.—Each sitting should be tested for the removal of the infertile eggs, which gives a better chance to those left. If there are many infertile ones, and several hens have been set on the same day, some of the hens may be reset. The eggs should be tested about the sixth or seventh day. Egg testers are sold by incubator manufacturers and by dealers in poultry supplies, or a homemade tester can be made in a few minutes from a small pasteboard or wooden box of such size and dimensions that a common hand lamp, a lantern, or a candle can be placed in it. A hole should be cut in the top directly over the flame and another a little smaller than an ordinary sized hen's egg in one side opposite the flame. The testing should be done in a dark room. If the pen in which the hens are set can not be made dark enough, it is best to test after dark. In testing, the light shining through the egg, held against the hole in the side of the box, shows the condition of the egg. An infertile egg is clear, while the fertile egg will show a spiderlike formation, a center with long, crooked threads, leading outward, and this formation will float as the egg is turned. The infertile eggs may be removed and used for cooking purposes.

HATCHING CHICKS WITH HENS.

The quarters for sitting hens should be comfortable and convenient. The hen should be free from disturbance, and be provided with a yard or run. A good nest for medium-sized hens is a box 12 by 14 inches, and 12 or 14 inches high. For large hens the nest should be 16 by 16 by 16. The narrow strip at the bottom of the front of the box should be 4 to 5 inches wide, according to the height of the box. (See fig. 14.) Barrels, half barrels, and boxes of various kinds may be used. Hay, straw, or excelsior makes a good nesting material, and this as well as the hen should be dusted with a good insect powder. When a hen is not to sit in the nest in which she has been laying, it is best that she be moved after dark, for the majority of hens will then settle down more quietly in their new quarters than if moved during the day.

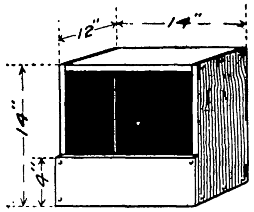

FIG. 14.—Nest for a sitting hen.

Feeding sitting hens.—Sitting hens should be well fed. Grain should be left where they can get it whenever they desire to come off the nest. Their feed should consist mostly of a variety of whole grain, such as corn, wheat, and oats. The feed a sitting hen requires is that needed for her bodily maintenance. Very little vegetable or meat feed should be given, for too much vegetable feed would tend to loosen the bowels and too much meat feed would tend to stimulate a desire to quit sitting and begin laying.

Taking chicks from nests.—Chicks should be removed from the nest about twenty-four hours after the first chicks are hatched. By the time the first chicks hatched are a day old they want to get out from under the hen and move about, which is liable to make the hen restless and often causes her to leave the nest.

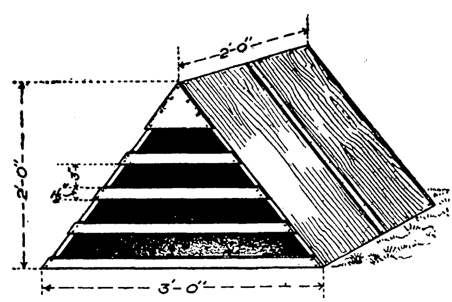

FIG. 15.—Λ-shaped coop for hen and chickens.

Number of chicks to a hen.—If the weather is cold, 10 to 12 chicks are enough for 1 hen. As the weather becomes warmer a few more may be given, but it is seldom advisable to give more than 15. The best place for the young chickens is an orchard which furnishes an abundance of shade and also admits plenty of sunlight.

Coops for hens and chickens.—The simplest coop is the common Λ-shaped coop (fig. 15). It is quickly and easily made. This coop may be made either with or without a floor. A floor is desirable, except during warm weather and where the soil drains quickly.

Another good coop is the box coop (fig. 16), which in some respects is preferable to the Λ-shaped coop, for in the latter the hen can stand upright only near the middle of the coop, while with the box coop the entire floor space is available for her and the chickens. The box coop is also more easily cleaned. If desired, a small covered run can be made for each coop. This is especially desirable if there is danger of losses from cats, hawks, etc.

INCUBATORS AND BROODERS.

Incubators.—There are several good incubators on the market, any one of which, if properly handled, will be found satisfactory. More depends on the operator in most cases than on the incubator. In buying an incubator the order should be placed early without waiting until the purchaser wishes to begin operating it. Spring is a busy time for the incubator companies, and it is often impossible for them, no matter how well equipped they may be, to fill an order the same day it is received. Again, shipments are often delayed by the transportation companies. It is also advisable for every beginner to have his machine some time before he desires to fill it with eggs, in order that he may become fully acquainted with its operation. A book of instructions accompanies every incubator, which makes it unnecessary to go into details here. Probably the most common cause of failure with incubators is carelessness and neglect in attending to the machines. Some manufacturers may be somewhat responsible for the general impression, among those who have not learned differently through experience, that an incubator can go for twenty-four hours or more without attention. It may be left that long without anything going wrong, but the experienced operator does not take chances of that kind. He attends to the routine work of caring for his machine twice a day and also keeps an eye on it at convenient intervals between times, for some little thing may go wrong, and the loss of an incubator full of eggs is quite an item.

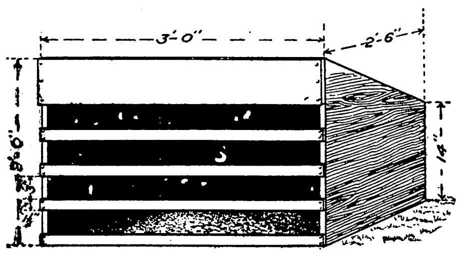

FIG. 16.—Box coop for hen and chickens.

For more details regarding incubators, see Farmers' Bulletin No. 236, entitled "Incubation and Incubators."

Brooders.—The successful growing of chicks in brooders is much more difficult than the successful hatching of eggs in the incubator, because the artificial brooding of the chicks is more foreign to nature.

On a large plant brooder houses are an important part of the equipment. On small plants either indoor brooders in small house or outdoor brooders are used. Brooders may be purchased from the manufacturers or through poultry supply firms. Manufacturers usually overrate the capacity of the brooders, for while a 100-chick brooder may be large enough for 100 chicks when first hatched, it will not be large enough for that number after they are a few days old.

The chicks are usually left in the incubator until they are about twenty-four hours old, when they are placed in the brooder, which should have a temperature of 90° to 95° F. This temperature should be gradually reduced until a temperature of about 70° F. is reached, when the chicks are about 4 or 5 weeks old. However, the temperature after the first day or two should be governed largely by the action of the chicks and not by the thermometer. Crowding of the chicks to the outside of the brooder, panting or breathing hard, indicates too much heat; on the other hand, crowding and huddling about the heater indicates the need of more heat. Where they spread out comfortably at night part way between the heater and brooder walls, or just inside the fringe, where a hover is used, it is a safe indication of the right amount of heat. Chicks must be kept warm while at rest and should always have a warm place ready for them to run to when they feel chilly. They should not be allowed to huddle together outside the brooder, but should be placed inside until they learn to go there of their own accord.

The natural method of applying warmth to chicks is to their backs, and it is a generally accepted fact that in artificial brooding the heat should be supplied from overhead with a very moderate warmth from the floor. Experience has generally shown much bottom heat to be conducive to weak legs.

Pure, fresh air is as essential as heat. The most common way of supplying this air is in connection with the heating system, with a constant circulation of warm air coming in around the heater.

Cleanliness is essential, and brooders should be cleaned and aired every day if possible, and the floor sprinkled with sand or similar material to absorb the droppings. The water fountains or dishes and the troughs used for soft feed should be kept perfectly clean.

Incubator chicks at first are generally free from lice, but during warm weather lice are apt to find their way to the brooder and it is well to keep a sharp lookout for them.

The chicks should be allowed to use the brooder until they are from six to ten weeks of age (depending largely on weather conditions and the development of the chicks) when they may be removed to colony houses or to coops.

FEEDING AND CARE OF CHICKS.

There are two systems in vogue for the feeding of chicks as well as for older fowls—dry feeding and wet feeding. The former is the simpler and easier one. The beginner is advised to adopt the method he thinks he would prefer or would find more convenient and follow it until he has a good reason for modifying or changing it. Choose the one or the combination of the two most suited to your circumstances. There are various methods of dry feeding, just as there are various methods of feeding rations composed in whole or in part of moistened mashes or cakes. The grains may be fed whole or cracked, or a part ground and mixed together, making what is called a "dry mash." The feed may be kept before the chicks all the time, in hoppers or troughs, or a part of it may be scattered in litter to induce them to take exercise. Beginners are usually more successful with a dry grain chick feed, for the reason that moistened mashes are thrown down carelessly in considerable quantities and soon become soiled with the droppings and begin to ferment.

The first rule for getting a good profit from poultry is to get the chicks hatched early, and the next is to keep those chicks growing so that they will reach laying maturity before the commencement of cold weather. There is no profit in keeping a chicken just alive, whether it is intended for laying stock or for the market. One reason why more care should be exercised in feeding chicks than in feeding fowls is that the former know less than the latter as to what is good for them. The healthy chick is a hungry thing and will eat what is given it, and the digestive organs being weak are less able to dispose of objectionable feed than are those of older fowls.

The first feed.—The chicks should not be fed until they are twenty-four hours old. Nature has provided for this by the absorption of the egg yolk into the chick's abdomen just previous to hatching. It is essential that this feed should be digested and assimilated before any other is given to them. Many people are in a hurry to start the chicks growing and hurry feed into their crops before the system is ready to take care of it. This results in bowel trouble and very often in the death of the chick. For the first meal a hard-boiled egg chopped fine, shell and all, mixed with three times its amount of stale bread crumbs, is good. In fact, boiled eggs mashed and mixed with three or four times their bulk of stale bread or cracker crumbs is excellent for pushing the young chicks along for the first week or two. However, hard-boiled eggs are concentrated feed, and if fed long and in much quantity are likely to cause bowel trouble. Stale bread soaked in whole milk or skim milk is also very good for feeding young chicks. After soaking, the milk should be squeezed out until the mass crumbles readily.

Beginning use of grain feed.—When the chicks are a few days old it is well to begin to feed a little grain. Millet seed, finely cracked corn and wheat, "pinhead" oatmeal, and broken rice may be scattered in the litter or short grass about the coop or brooder. It will pay to sift the cracked corn and wheat through sieves, so as to remove both the meal and the larger pieces. A very good mixture of cracked grains for chicks is 2 parts wheat, 2 parts "pinhead" oatmeal, 1 part corn, 1 part rice, and 1 part millet seed. Another good mixture is 10 pounds cracked wheat, 4 pounds cracked corn, 2 pounds millet seed, 2 pounds cracked hulled oats or pinhead oatmeal, and 1 pound fine beef scraps. There are also many prepared chick feeds on the market which are very good.

Frequency of feeding.—Young chicks should be fed a little at a time and often. They should be fed early in the morning and just before going to bed at night, and not less than three times in the intervening period. For the first two weeks they may be fed three meals of soft feed and two of hard, and after that age two of soft and three of hard, feeding less soft feed as they grow older. No more moistened soft feed should be given at one time than they will eat up clean. If any is left it should be removed, for nothing causes more bowel looseness and dysentery among young chicks than sour feed. The finely cracked grains may be safely used from the start, but the chicks do not as a rule grow as rapidly as when a part of the feed is ground. When the chicks are from four to six weeks old, the frequency of feeding may be decreased to four times a day.

Green feed.—Green feed must be supplied in some form. If the chicks are cooped on young grass they will help themselves, but if confined in small yards green feed should be given them. To be easily assimilated, some tender and easily broken green stuff should be furnished, such as finely cut grass from the lawns, lettuce leaves, onion tops chopped fine, or boiled vegetables.

Animal feed.—When on free range the chicks pick up insects and worms. These are most abundant during the spring and summer, and it is at this time that the chickens thrive. When they can not get these abundantly, animal feed must be furnished in some other form. For the youngest chicks the hard-boiled eggs are sufficient, and as the chicks grow older beef scraps and green cut bone may be fed.

Milk.—Young chickens are fond of milk. It is highly nutritious and promotes growth, and may take the place of other animal feed to some extent. Skim milk is excellent; if whole milk is fed it is well to dilute it with one-third to one-half of water.

Grit.—Grit is another necessity. A dish of chick-size grit should be always before them, that they may help themselves.

Water.—Fresh, cool water should be constantly accessible, so that a drink can be taken whenever wanted. Many cases of cramps are caused by letting the chicks become thirsty and then fill up on water.

Charcoal.—Many successful poultrymen keep charcoal before the chicks, while others equally successful never use it. Considering the number of successful growers who use no charcoal, it can not be said that there is much need of keeping it always before chicks, but if they are not thrifty it is one of the simple things to supply before changing feed or beginning to give medicine.

Johnnycakes, etc.—Where only a few chicks are raised the feeding of johnnycakes is often practiced, but when so many chicks are kept that the baking of cakes becomes burdensome mash is preferable. Add a little soda to sour milk and stir in corn meal to make a stiff batter. The addition of a few infertile eggs will improve the cake. Bake until well cooked through. Make the cake thick so to reduce the proportion of crust.

Other cakes may be made as follows: One pint corn meal, one-half pint bran, 1 teaspoonful meat meal, 1 raw egg, 1 teaspoonful soda, add water to make stiff batter, and bake two hours.

Ten parts corn meal, 3 parts wheat middlings, 1 part meat meal, by measure; mix with water or skim milk, and bake.

Exercise.—From the very first chicks should be induced to exercise, for activity is a prime factor in promoting health and growth. Feed grain in the litter and make them scratch for it. A little fine chaff or finely cut clover makes a good litter.

Coops.—Where mature fowls are around it may become necessary, in order to feed with economy, to have slatted feeding coops which will exclude the mother hens and other fowls. These coops may be conveniently made by tacking laths on strips of inch lumber. The soft feed can be placed in these coops on boards or in shallow troughs. A trough may be made from a board 5 or 6 inches wide, of the desired length, with strips of lath or narrow boards nailed around the edges so as to form a shallow box.

Teaching the chicks to roost.—It is often advisable to teach the chicks to roost when 8 to 12 weeks of age. Where they are allowed to remain on the floor it is difficult to keep them clean and to keep them from crowding. If wide roosts—3 to 4 inches—are used there is but little, if any, more danger of crooked breasts than if the chicks are allowed to remain on the floor. The chicks can generally be taught to roost by putting the perches near the floor and placing with them one or two old hens or older chicks that are in the habit of roosting. If this plan is inconvenient or does not prove effective the chicks may be placed on the perches after dark for a few nights until they have learned to go there of their own accord.

Separating the sexes.—If convenient the sexes should be separated, for both the cockerels and the pullets will develop better. In the case of the more precocious breeds they should be separated when removed from the hen or brooder. The more slowly maturing varieties may be allowed to run together somewhat longer, but in any case the separation should be made before the cockerels begin to annoy the pullets.

OPINIONS OF POULTRY RAISERS ON FEEDING AND CARE OF CHICKS.

The following replies were among those given to the Bureau by poultrymen in response to the question, "How do you feed and care for chicks?"

Merrill Hutchinson, Reading, Mass.: I have a building 20 feet long and 10 feet wide, cheaply built, with an earth floor, divided into two parts. Into this I put two indoor brooders, with hot-air heat, holding 50 chicks each. In front of this house is a grass lawn. I made frames 8 feet long, 3 feet wide, and covered with wire netting. These were placed endwise to the house, which gave them a grass run. As fast as the grass was eaten close I simply moved the frames along to fresh ground, while the grass was coming up again on the first run. For feed I purchased one bag of the best white winter wheat at $1.90 per hundred; one bag of the best cracked corn I could find, pure and sweet; and a second-hand coffee mill at a grocery store. I am grinding this wheat and corn, equal parts mixed, and also grind charcoal. These three articles I keep before them all the time with plenty of chick grit and fresh, clean, cool water every day. Three times a week when the chicks are very small I give them sparingly a little meat scrap dry. After they are 2 weeks old the scrap is kept before them all the time and they help themselves. This is the most satisfactory way I have found. Be sure to give them plenty of grit, pure water, and fresh grass runs; after they are 8 weeks old give them their freedom in the orchard with plenty of shade.

Fred H. Hough, Binghamton, N. Y.: Twenty-four hours old before feeding; after that, prepared chick feed before them at all times; also grit, charcoal, fresh water, and beef meal. Chicks not allowed in wet grass or to get wet in any way. Cooped at night, not over 25 in coop. Coops cleaned every day, and watched carefully for lice; when any are discovered, I use sweet oil for head lice, Persian insect powder for body lice, and kerosene and turpentine for mites.

Louis E. Hudson, Ellisburg, N. Y.: My chicks have free range after the first week, and are fed small, prepared chick feed in hoppers, to which is added one-sixth meat scraps. Chicks that are hatched with hens have large, well-roofed coops where they may be confined during cold and rainy days. They are not let out while the grass is wet in the morning. Chicks are dusted once a week with insect powder. After 8 weeks of age they are placed in movable colony houses on range and are well fed until cold weather.

Henry R. Ingalls, Greenville, N. Y.: Chicks hatched in incubators and raised in brooders are free from lice and do not have to be eternally treated to keep them from being killed by vermin. In other respects the care of chicks with hens and in brooders is not different. For the first three weeks of the chicks' life I feed them one of the prepared chick feeds, and at the end of that time I give them free access to a self-feeding hopper filled with wheat and beef scraps. This method of feeding saves labor, grain, and worry, and the chicks make a better growth. Growing chicks should have free range after they are 6 weeks old, but before that it is better to keep them in yards, so that they will not be exposed to the raids of cats, rats, hawks, and crows. Fresh water is a prime necessity and if this is neglected disaster is sure to follow. Grit should be furnished in liberal quantities. The fact that a chick has the run of a large space does not always mean that it gets suitable grit. Fresh air is cheap; see to it that they have plenty of it, for a lack of it during the hot summer nights weakens the chick and is the chief cause of roup. Provide large, roomy coops, and never shut the birds up tight during warm weather. To provide protection against nocturnal prowlers use wire netting; this will keep them out just as well as a tight door, and it does not shut out the air.

Mrs. George E. Monroe, Dryden, N. Y.: For many years after I began the poultry business I expected to lose about 50 per cent of chicks from bowel trouble, and was never disappointed. Then I discovered that what the chick needed was heat and hovering, and that the kind of food, if clean, was of small moment for the first two weeks. My plan is this: When the chick is ready for the brooder the heat under the hover registers 100° F. The floor is covered with chaff from the haymow, and a dish of water is provided. Shells from the incubator, from which the chicks have just hatched, are crumbled and scattered over the chaff among the chicks. This is their first meal, and they pick up the tiny white pieces quickly and with great relish. The next feed, and that for some time to come, is dry grain—one of the prepared chick feeds, feeding but three times a day and scattering it through the chaff. The chicks from the first day scratch through the chaff for all the tiny seeds. During the first two weeks, and at any time when the wind is cold or damp, the chicks are confined to a yard 3 by 6 feet, built of boards 2 feet high, so no wind can strike them, but at the same time catching the sun and keeping the chicks warm. During storms this yard is covered with a sheet of unbleached muslin. When the chicks are about a week old a prepared chick meal is used for the noon feed, and some grain is also given in the litter for part of the meal. At three weeks whole wheat and cracked corn are added to the grain ration, until gradually the baby feed is entirely omitted. Oats are added as soon as the chicks can eat them. Grit, charcoal, water, and milk are always before them. So much for the feed. The temperature of the hover is continued at 100° F. for three weeks or longer, but a place should be provided so that if a chick is more comfortable outside the hover it need not go under. The chick should have a place warm enough so it can at any time run into it and warm up quickly. When the chicks are shut in the brooder for the night, few of them should be found under the hover; they should lie spread out flat all over the floor of the brooder, some with their heads sticking through the curtain. Toward morning, should you examine the brood, the chicks will be found back of the curtain, still spread out over the floor; never huddled together. Chicks sent to bed with the hover at 90° F. will at the cold time toward morning be found huddled together; the weaker are trampled and killed, and the others soon show the effects by a watery discharge from the bowels, which no manner of feed can overcome, for a chilled chick is a dead chick.

C. D. Smith, Fort Plain, N. Y.: One-third cracked corn, one-third Siberian and German millet, one-third Kafir corn, mixed; fed dry four times a day, sparingly.

W. E. Ritter, Williamsport, Pa.: For four or five weeks prepared chick feed twice each day, and oat flakes at noon. For next six weeks prepared feed for morning, wheat for noon, cracked corn at night. Grit, fresh water, and beef scraps before the chicks at all times.

Leslie W. Baker, Perryhall, Md.: Brooder first week, between 90° and 100° F. Feed first week rolled oats every two hours; grit and water always before chicks. After first week prepared chick feed, gradually reducing number of feeds to three a day. Reduce brooder temperature 5° a week until 70° F. is reached. After first week we feed beef scrap, what they will eat up clean in about three minutes, after the last feed in the evening. After tenth week equal parts wheat and cracked corn instead of chick feed; the beef scrap continued; removed to cool brooders or colony houses. Range to furnish green feed. Chicks not removed from incubator for thirty-six hours.

F. C. Louhoff, Yancey Mills, Va.: For the most part I feed chicks with prepared chick feed until they are 10 weeks old, after which they are gradually trained into feeding on same ration as laying stock. We keep them most of the time in small inclosures to have them under control in bad weather, and feed them four or five times a day, letting them have by turns a little run each day on a grass inclosure. They are housed at night in brooders until twelve weeks old, then transferred to colony coops.

E. H. Gaines, Gaffney, S. C.: Chicks are fed prepared chick feeds (small assorted grains) from the beginning. I keep the feed before them at all times in hoppers; also meat scraps, charcoal, and grit; give plenty of pure water, and allow them grass runs.

Mrs. John Starr, Atlanta, Ga.: Chicks are hatched in incubators; raised in brooders; fed cake made of 1 quart corn meal, 1 egg, ½ teaspoonful soda, mixed with sweet milk, and baked in oven. Feed five times daily after chicks are 36 hours old and use coarse sand for grit. After three weeks feed three times daily. After one month feed cracked corn in summer. Chicks have unlimited range and procure their own meat and green feed.

W. W. Turner, Lagrange, Ga.: Chicks are hatched by hens and incubators and brooded by hens and outdoor brooders. After thirty-six hours they are fed on commercial dry chick feed until 4 or 5 months old. This and fresh water, ground bone, charcoal, and fine grit are kept before them.

C. L. Daniel, Hopkinsville, Ky.: For chicks I use the prepared feeds on the market. Never feed until 48 hours old; then feed what will be consumed quickly, seven to eight times a day, always managing to keep them a little hungry. I also keep their quarters clean, spraying out with a solution of carbolic acid and water; keep charcoal, grit, and animal feed before them all the time, and feed in litter. Always compel a fowl to work for its feed and it will relish it better.

Adeline Harnden, Water Valley, Ark.: Our chicks are confined in bare yard until vegetation is dry, which is generally about 9 o'clock in the morning. They are then liberated and permitted to wander about at will until sundown. We keep cracked wheat where they can help themselves at all times and give a feed of beef scraps once a day.

Mrs. Anna L. Day, Fillmore, Ind.: I prefer the "dry-feed" system, and think some reliable brand of prepared chick feed the best. Succeed best when giving a mother hen 10 to 15 chicks, giving her unlimited range in orchard and field as soon as chicks are strong enough to follow well. Feed early in morning; give hens liberty as soon as the grass is dry enough; give light feed at noon if they come up for it; then feed again about 5 o'clock in afternoon; keep fresh, cool, clean water in a number of places for them at all times. Keep lice down by constant watching and war. I find sweet cream rubbed on heads and under wings at night one of the very best exterminators.

B. F. Hislop, Milford, Ill.: Little chicks should be hatched early in the season, but not before 1st of April, unless one has the right kind of quarters. Give no feed of any kind until they are 36 to 48 hours old. This depends upon the activity of chick and weather. We use at first the prepared feeds; they are better and handier than preparing them at home, and cost no more. Use both the mash and whole grain feeds. Feed mash three times a day and dry feed twice until chicks are a month old, quantity depending on what the chicks can find for themselves. The breeder's reason must tell him this. Brooder chicks need more feed and more care in feeding than those with the mother hens. They must be fed to bring out all the exercise possible. When prepared feeds are used most of them have grit and to spare, but it is no harm to keep a box full handy for birds at all times, so that when such feeds are not used there is no lack of it. Let chicks with hens have free range as soon as possible and encourage brooder chicks as soon as old enough and weather is not too chilly. Mix feeds with milk if you have it, sweet at first but later any kind. Also, feed meat meal with mash, quantity depending on needs of chicks. Commence with all new feeds gradually, and never gorge; always keep the chicks hungry, but do not make the mistake of starving. The close observer can soon see when chicks are not thriving and will look for the cause. Do not forget green feed.

Geo. B. Nichols, jr., Martin, Mich.: For the past two seasons I have practiced dry feeding, and find it a great improvement over cooked or soft feeds. No trouble with bowels; chicks are hardy, out in all kinds of weather, and seem to make better growth. I get prepared chick feed, and they are fed that wholly until they are at least 4 weeks old; then I commence to give them whole wheat, oats, etc. I feed chicks for first two weeks four times a day, then three times a day until cold weather. Plenty of fresh water three times a day.

Mrs. J. E. Mielke, Basco, Wis.: As I am a believer in dry feed, I feed dry oatmeal at first, also chick feed, cracked corn, and a little wheat. In the morning, early, I feed dry oatmeal (I prefer the steel-cut oatmeal), then about 10 o'clock I feed wheat, and at about 2 I feed wheat again, and at 5 o'clock I feed all the cracked corn they will eat. I give all the fresh water they want at all times.

W. Henry Smith, Monett, Mo.: I do not commence to feed little chicks until three days after hatching; then feed hard-boiled egg, mixed dry with bread crumbs, corn bread, etc., for three days four times a day, sparingly. Then feed three times a day on prepared chick feed, millet, corn bread, cracked grain, etc., with plenty of fine grit, until they are 10 days old. I then feed whole wheat. I lose a very small per cent of young chicks. They must be kept free from lice and vermin. Follow nature as closely as possible.

Harry H. Collier, Tacoma, Wash.: As a first feed after taking the hen off the nest I give a little charcoal and grit. The chick has plenty of feed absorbed from the egg for the first thirty-six hours. I give "steel-cut" oats as a steady feed, keeping this before them at all times. Give them all the green feed they will eat. Lettuce is one of the best feeds for little chicks. Green clover is fine; I dig a sod of clover and let them pick at this. I keep fresh water before them at all times, and when I can get it I feed plenty of milk. Keep the chicks dry, and give them and their mother a good, snug place to stay in at night. When the weather is rainy I never allow them to get out from under a shed. Dampness is fatal to young chicks; they catch cold and have bowel trouble.

Geo. R. Albers, Los Angeles, Cal.: For five days I give prepared chick feed of a trustworthy make, then place the following dry mixture before them in addition to the chick feed, which is left before the chicks for about five weeks: Heavy bran 80 pounds, beef scrap 8 pounds, fine-ground bone 12 pounds, salt and sulphur each a trace. Mix dry and feed in hoppers holding a month's supply. Green feed and table scraps are liberally given to the brooder chicks. They are hatched in incubators and brooded for seven weeks in flocks not exceeding 40 chicks.

BROILERS, ROASTERS, AND CAPONS.

BROILERS.

The rearing of broilers may be regarded as one of the specialties of the poultry business and does not appeal particularly to the farmer, but it can often be made a paying occupation in connection with an egg farm, or as a winter employment for those whose regular occupation gives them plenty of leisure at that season. Great skill is required to bring this work to its highest perfection, and anyone contemplating the production of broilers on an extensive scale should not depend on written directions for his guidance, but should make a careful study of the market demands and should visit one of the successful broiler producers, for the practical experience of such men is the safest guide.

Broilers are young plump chickens, weighing, when dressed, from three-quarters of a pound to 2 pounds, and are usually killed when from 6 to 12 weeks old. The name is derived from the fact that they are usually split down the middle and the halves broiled. The market demand to-day is for broilers of three sizes—squab broilers, small broilers, and large broilers. Squab broilers when dressed weigh from three-quarters of a pound to 1 pound each; small broilers, the size most in demand the greater part of the year, weigh from 1 to 1¼ pounds each, and large broilers from 1½ to 2 pounds each. In most American markets a yellow-skinned and yellow-legged bird is preferred, but this is not of as much importance as good quality of meat.

In broiler raising an incubator is a necessity in getting early-hatched chicks. After the chickens have been hatched they may be removed to the brooder, where the temperature should be kept at about 95° F. for the first two or three days, when it may be dropped to 92° F., which is about right for the remainder of the first week. From then on the temperature may be gradually reduced at the rate of about 5 degrees each week until 70° F. is reached. It is important to keep an even temperature whether raising chickens for broilers or for other purposes. The raising of broiler chickens until the finishing period is reached is practically the same as the raising of chickens for other purposes. The main point is to keep them growing rapidly.

To finish broilers for market.—A fat broiler is quite a rarity; the best that can be done, in general, is to have them plump, for the natural tendency of the chick is to use all nutriment for growth and development. When the birds are nearly large enough for the market they should be given all the fattening feed they will eat, and for this purpose corn in various forms should be fed freely. They will digest more feed if fed ground than if whole or cracked. A moistened mash consisting of about two-thirds corn meal and one-third bran by bulk is good. Cooked potatoes are good, and milk, with a little sugar added, will hasten fattening. Broilers may be sold alive or dressed according to the discretion of the grower. If dressed this should be done according to the demands of the market to which they are to be shipped.

ROASTERS.

For roasting, a young fowl about full grown, but still soft meated, is used, and to roast satisfactorily it must be moderately fat. Roasters are roughly classed as "small roasters" and "large roasters." The greatest demand is for small roasters weighing 4 or 5 pounds each, though the demand for large roasters weighing 8 or 9 pounds each is steadily increasing. Yellow skin and yellow legs are more generally demanded than a white skin and dark legs.

If the chickens have been properly grown and are in good healthy condition, about ten or twelve days' confinement in a pen and small yard, with fattening feed, will put them in as good condition as is desirable. They should then be dressed and packed according to market demands. The growing and marketing of roasters is an important business in some parts of the country, especially in the vicinity of large cities. Near Boston, in what is known as the "South Shore" district, the production of roasters engages the attention of many people, several of whom make it an exclusive business. A poultryman living near a good market or having good shipping facilities which bring a good market near him can often dispose of his surplus cockerels as roasters to good advantage.

CAPONS AND CAPONIZING.[a]

A capon is a castrated male bird. After being caponized the bird becomes more quiet, is more readily fattened, the comb and wattles cease to grow, and the plumage becomes heavy and glossy. Capons neither crow nor fight and are despised by other fowls. They often show a great fondness for little chicks, and instances are not uncommon where they have been utilized in rearing broods of chickens. In many eastern markets the prices paid for dressed capons range from 20 to 30 cents a pound. The highest prices usually prevail from January to May, and the larger the birds the more they bring a pound. For this reason the larger breeds—such as the Brahma, Cochin, Langshan, Plymouth Rock, or Wyandotte—are the most suitable. If well grown, a capon will weigh from 10 to 12 pounds at 1 year of age.

Fowls hatched early in the spring can be caponized before hot weather comes, which is an advantage, although no ill results should follow the operation at any time of the year if it is properly done. Generally speaking, the bird should be from 2 to 3 months old and weigh about 2 pounds, depending largely on its development. A good set of tools is indispensable and can be purchased for from $2 to $3. As a complete set of instructions is furnished with each set it is unnecessary to go into details here. The beginner should, however, operate on several dead cockerels before attempting to operate on a live one.

After caponizing the bird should be given plenty of soft feed and should have plenty of water to drink. The capon begins to eat almost immediately after the operation is performed, and no one would suppose that a radical change had taken place in his nature. Leave him to himself, as for the time being he is his own doctor. It is well, however, to look him over two or three days after the operation has been

[a] This subject is treated more in detail in a separate article (page 267).

performed, for sometimes air gets under the skin, causing a slight swelling or "wind puff." This can be relieved by pricking through the skin at one side of the swelling with a sharp needle and gently pressing out the air with the hands. The wounds will heal within ten days from the operation. The capons should be fed nourishing but not fattening feed, the object being to keep them growing. They should be allowed to grow until about a year old, depending of course largely on their maturity, some breeds maturing much more rapidly than others.

About three weeks before marketing place the fowls in small yards and feed them three or four times a day, giving plenty of corn and other feed, or fatten them in one of the ways indicated in the following section on fattening poultry. Corn meal and ground oats, equal parts by weight, moistened with water or milk, makes a good mash for fattening capons.

In dressing capons leave the head and hackle feathers, the feathers on the wings to the second joint, the tail feathers, including those a little way up the back, and the feathers on the legs halfway up the thigh. These feathers serve to distinguish capons from other fowls in the market. Do not cut the head off, for this is also a distinguishing feature of the capon, on account of the undeveloped comb and wattles.

FATTENING POULTRY.

Four methods of fattening poultry are practiced in this country, viz: Pen fattening, crate fattening, machine cramming, and hand cramming. The first two are probably the most common to-day, while the third is gaining rapidly as its results are becoming better known, and the fourth is used only where but few birds are fattened.

PEN FATTENING.

Pen fattening is practiced by a great many people who do not have the time and inclination to use other methods. The essentials of pen fattening are quiet, darkness, except at feeding time, and plenty of soft feed given at regular intervals, usually three times a day. Birds may be kept in flocks of 15 or 20, but the sexes should be separated.

CRATE FATTENING.

In this method a few fowls are confined in crates and fed from a trough. A crate 6 feet long, 18 inches high, and 18 or 20 inches wide is suitable and is large enough for a dozen birds. Sometimes such a crate is divided into two or three compartments, 4 to 6 birds being placed in each compartment. But little room for the birds to move about is desirable, for the less exercise a bird obtains the more readily does it fatten. The top, back, and ends of the crates should be solid if they are to be placed outdoors, but if they are to be in a building they may be built of lath or slats. These slats should be 2 inches apart in front, so as to permit the birds to eat from the troughs which are hung just outside the coop. The slats of the bottom of the coop should be about 1 inch apart to permit the droppings to fall through. In indoor feeding the crates should be placed in a dark room, and just before feeding enough light should be admitted to allow the birds to see to eat. They are usually fed three times a day, and are permitted to eat for half an hour at a time, when the room is again darkened and the uneaten feed removed.

MACHINE CRAMMING.

For the best results a machine is essential, especially for the last ten days, for otherwise the birds will not eat nearly so much as they can digest and assimilate.

Plate 22, figure 2, shows a cramming machine in operation at one of the large poultry establishments in New York State. A reservoir under which is placed a small force pump operated by means of a lever worked by the foot is placed on a tripod. A tube is fixed to one end of the pump, through which the feed passes when the lever rod is lowered. This tube is of rubber or metal. If rubber, it may have a metal point. Metal tubes are more easily kept clean. The feed is placed in the reservoir, and is made into the consistency of thick cream. There are several ways of holding the bird, but the following will be found simple and effective: Fold the wings and grip the bird firmly either between the right elbow and side of the body, as shown in the illustration, or between the left elbow and the body, whichever is the more convenient. The head is grasped in the left hand, the first finger being placed in the mouth to keep it open. The tube is placed in the mouth and the bird is gently drawn on until the end of the tube reaches the crop, the neck being elongated as much as possible. The lever bar is gently lowered by the foot and the food is thus forced into the crop. One hand is kept on the crop and as soon as it is sufficiently full the foot is removed from the lever and the bird is gently removed. The operator soon learns to know when the crop is full. No stated amount that should be fed to an individual can be given, for the quantity varies with the size of the crop. Great care should be taken in preparing the feed to see that there are no lumps, for the tube is small and easily becomes blocked.

HAND CRAMMING.

Hand cramming is a good system where but few fowls are being fattened, but would be found rather laborious where many are fattened. The feed is made into boluses, or balls, which should be about 2 inches long and one-half inch in diameter. A large number of these are prepared before commencing to feed. The operator sits on a stool or box, firmly grips the fowl between his knees, and elongates the neck, holding the head in a similar manner to that described in using the cramming machine. He then dips a bolus in skim milk or water and forces it into the bird's mouth, pressing it down the throat with his finger. The neck above the bolus is then gripped with the thumb and first finger, which are run downward along the neck, forcing the bolus into the crop. It will probably take from 14 to 18 of these boluses to fill the crop, depending on its capacity. Some feeders practice this method in connection with crate fattening. The attendant, after feeding in the crates, feels the crop of each bird, and any not having a sufficiently filled crop are crammed in the manner described.

FEED FOR FATTENING.

Fattening birds should always receive soft feed. As they have no exercise they require a feed that can be quickly and easily digested. The following mixture is fed at the New York establishment referred to under the description of the cramming machine: 100 pounds finely ground barley, 100 pounds finely ground corn, 100 pounds finely ground oats (with hulls sifted out), to which mixture is added 10 per cent of beef scraps. Buttermilk or skim milk is used for mixing, the former being preferred. A little salt is sometimes added. The birds are fed twice a day at intervals of twelve hours, and are crammed for about three weeks. It is important that the intervals between the feedings should be as nearly equal as possible.

Another ration may be made as follows: 100 pounds ground oats, 100 pounds ground corn, 50 pounds flour, 4 pounds tallow.

MARKETING POULTRY AND POULTRY PRODUCTS.

A large part of the profit in poultry keeping often depends on the marketing of the products, and the producer should study the market demands as to how, where, and when to dispose of the products to the best advantage. An attractive appearance is of prime importance, and the producer should study the details of killing, dressing, and packing in order to arrange the products in the best possible manner. The requirements for dressing and packing vary somewhat in different markets, and the producer should learn any special requirements of the market to which he intends shipping.

KILLING, DRESSING, AND PACKING POULTRY.

Killing.—The birds should be kept without feed from eighteen to twenty-four hours before killing, unless they are to be drawn, in which case they should have no feed for at least ten hours before killing. In either case they should have no water to drink for at least eight hours before killing. When ready to kill, suspend the fowl by the legs and, using a knife, cut the vein at the back of the throat through the mouth. As soon as this vein is cut run the point of the knife through the roof of the mouth into the brain, which causes the bird to lose all sense of feeling. Instead of piercing the brain the fowl can be paralyzed by a blow on the head.

Dry picking.—In most markets dry-picked birds are preferred. Immediately after killing, while the bird is still bleeding, the picker should remove the feathers, being careful not to tear the skin. If the picker waits until the bird is partially cold, the feathers will be removed with difficulty. As soon as picked the fowls should be hung in a cool place until thoroughly cold. If the weather is warm and fowls are to be packed in ice, they should be placed in a tank of ice water and left until all the animal heat has left the body.

Scalding.—When birds are scalded before removing the feathers they are immersed in hot water, which should be a little below the boiling point, as soon as they are through bleeding. The birds should be immersed three or four times and then picked clean, care being taken not to break the skin. The fowl should next be "plumped" by dipping it in nearly boiling hot water for eight or ten seconds and then placing it in cold water, where it should remain for fifteen or twenty minutes. Be careful not to overscald, as this will cause the outer surface of the skin to rub off. If the fowls are to be shipped dry they should be hung up until the skin becomes thoroughly dry. If they are to be packed in ice they may be left in the cold water for several hours or until they are to be packed.

Drawing.—When the poultry is to be drawn this should be done before the bird is cooled. A slit should be made from near the end of the keel bone toward the vent, large enough to admit the fingers. Then cut carefully around the vent and pull out the intestine, leaving in everything else unless the market requirements are otherwise.

Packing.—When the birds have been thoroughly cooled they are ready for packing. Packages for dressed poultry vary greatly, but they should be neat and clean and small enough to be easily handled. The inside of the box or barrel should be lined with clean, unprinted paper. Pack the birds solidly so that they will not shift in the package, but be careful not to bruise them. For delivery to retail customers pasteboard boxes of sufficient size to hold one or two birds are very satisfactory. When poultry is to be packed in ice, barrels are generally used, packing them with alternate layers of birds and ice, the latter forming the top and bottom layers.

SHIPPING LIVE POULTRY.

Poultry of all kinds can be shipped alive, and will often net the shipper as much as when dressed. Good live fowls will usually bring more than the same fowls poorly dressed. For shipping live poultry to market well constructed slatted crates are desirable, as these crates provide for ventilation. This is important, for in crowded express cars the crates are frequently piled on top of one another. Overcrowding is to be avoided, and if large coops are used they should be equipped with partitions to prevent the birds being thrown together at one end when the crate is tipped in handling. If possible place only one variety in a coop or in one division of a coop.

SORTING, PACKING, AND SHIPPING EGGS.

Eggs to be placed on the market should be carefully sorted and packed as to size, shape, and color. It is better not to put eggs having different colored shells in the same package, neither should eggs varying much in size be placed in the same package. Every egg should be perfectly clean, and if slightly soiled it may be wiped clean with a damp cloth. If badly soiled they should be discarded, for the washing required to clean such eggs injures their appearance. The discarded eggs can be disposed of at some of the cheaper and less exacting markets. Eggs may be placed in large shipping cases or in small pasteboard boxes, according to how they are to be marketed.

TESTING EGGS.

When supplying a fancy trade with eggs, or on receiving eggs from outside sources, it is often desirable to determine their freshness. The method generally used by commission merchants for this purpose is known as "candling," and consists in holding the egg between the eye and a light so as to note the contents. This should be done in a darkened room, using one of the egg testers on the market or the simple homemade tester described on page 241 under the heading "Testing the eggs." The air space in a perfectly fresh egg is very small, and as the egg loses part of its contents by evaporation this air space increases in size with the age of the egg. Fresh eggs should appear clear and bright, showing no dark spots. Those accustomed to "candling" soon learn to detect stale eggs with a good degree of accuracy and rapidity.

Another method employed by some who have not a great number to test is to put the eggs in a basin of water. If good they will lie on their sides; if bad they will stand on the small ends. The older the egg the more upright it stands, and if very old it will be suspended in the water or even float on the surface.

METHODS OF SELLING

There are three general ways in which poultry products may be marketed: First, selling direct to the consumer; second, selling direct to the retailer, and, third, selling to commission merchants for sale on the open market.

Selling direct to the consumer.—This is generally considered the most profitable method of disposing of high-grade goods, for the charges of middlemen are eliminated. The producer is often so situated that he can build up a retail trade among the families of a neighboring city or village, delivering his goods direct to the customer once or twice a week, or oftener if desirable. In this way he can usually secure a substantial increase over prices paid in the open market. This is especially true in the case of strictly fresh eggs. It is also often possible to secure customers in a city that is within reasonable shipping distance, expressing to them a stated amount of eggs and dressed poultry at regular intervals (once or twice a week). Hotels, restaurants, and clubs are good customers, which can be supplied in this way by contract.

Selling direct to the retailer.—There are often many grocery and provision dealers who cater to a select trade to whom the producer can sell regular supplies of fresh eggs and poultry.

Selling to commission merchants.—This is the simplest method of disposing of the produce, as it does away with the expense and trouble involved in a private trade, but the returns are usually not so great, except when dealing with certain commission houses that have built up a fine trade along certain lines.

Which of the above methods will pay him best is a question for the producer to decide for himself. It is largely a question of market conditions, personal circumstances, and the kind of business done, whether large or small.

PRESERVING EGGS.

Many people wish to preserve eggs for home consumption, and so a few methods are given which have proved sufficiently satisfactory to warrant the preservation of eggs for home use.

Eggs to be stored should be: First, from hens that have no males running with them, because an infertile egg keeps longer, even without the use of a preservative, than a fertile egg; second, perfectly fresh, for not only will they keep much better, but if an egg which has begun to decay is placed in the same vessel with fresh ones it is likely to affect all the surrounding eggs, and, third, perfectly clean, for filth of any kind adhering to the shell will taint the preserving medium and thus taint the other eggs.

In placing eggs in the preservative be careful not to crack the shells. Keep them in a moderately cool room where the temperature may be kept fairly constant. A dry, clean cellar is a suitable place.

Water-glass.—Of the many methods which have been tried for preserving eggs on a small scale none has proved more successful than the use of water-glass (sodium silicate). This is a very cheap product that can usually be procured at not to exceed 50 cents a gallon, and 1 gallon will make enough solution to preserve 50 dozen eggs; so that the cost of material would not exceed 1 cent a dozen. Pure water that has been boiled and then cooled should be used. To each 15 to 20 quarts of water 1 quart of water-glass should be added. The solution should be prepared, placed in the jar or other suitable vessel, and the fresh eggs added from time to time until the jar is filled; but be sure that there is 2 inches of the solution covering the eggs. The eggs should not be washed before packing, for washing injures the keeping quality, probably by dissolving the mucilaginous coating.

Lime water.—A good lime-water preservative may be made as follows: Thirty gallons of water, 10 pounds of salt, one-half bushel of finely slaked lime. After mixing thoroughly allow the solution to stand two or three days and then remove the clear liquid by dipping or by means of a siphon. Place the liquid in a tub or other suitable receptacle and place the eggs therein, or the eggs may be placed in the vessel first and the lime water poured over them. Have about 2 inches above the eggs. Limed eggs can be discerned by the roughness of the shell.

Before boiling eggs which have been preserved in the foregoing ways, the shell should be punctured with a needle, otherwise it is apt to crack as soon as placed in hot water, owing to the pores being closed.

Salt and bran.—Eggs can be preserved for several months in dry salt. Have at least 2 inches above the upper layer of eggs. Packing in bran has also been found satisfactory in many cases.

Cold storage.—This is undoubtedly the best and most practical method for preserving eggs in large quantities in a commercial way. As the processes by which a low temperature can be maintained for an indefinite period have become more and more improved the greater has been the number of eggs so stored, until the cold-storage business has reached such proportions that it has a considerable influence on the price of eggs, tending to lower it in winter and raise it in summer. Cold storage, however, is not usually available or practicable for preserving eggs in a small way for home use.

DISEASES, BAD HABITS, AND INSECT PESTS.

It is not the purpose of this article to go into the details of the various diseases of poultry, but simply to consider briefly some of the common ailments and to give some of the simple remedies. Prevention is better than cure, so it will be well to consider some of the more frequent causes of diseases in general. Filth, dampness, improper ventilation, improper feeding, and the introduction of infected birds into the yard may be mentioned as some of the most common causes.

IMPORTANCE OF CLEANLINESS.

Everything about a poultry house should be kept reasonably clean. As a rule droppings should be removed daily, for the accumulation of excrement harbors parasites, contaminates the air, and breeds contagion. After the dropping boards have been cleaned they should be sprinkled with road dust, coal ashes, land plaster, or air-slaked lime to absorb the liquid excrement. Nests in which straw or other similar material is used should be cleaned out and new straw put in about once every three or four weeks, or oftener if it becomes damp or dirty.

The quarters should be thoroughly whitewashed at least once a year, late in summer or early in the fall. The whitewash can be made by slaking lime in boiling water and then thinning to the proper consistency for applying. The addition of 4 ounces of carbolic acid to each gallon of whitewash will increase its disinfecting power. The runs should be plowed occasionally in order to bury the accumulated droppings and also to turn up fresh soil.

DISEASES.

When a disease has become firmly established in a flock or a single bird is badly affected the free use of the hatchet is usually the most practical method, as it does not pay to spend two dollars' worth of time in curing a one-dollar bird. Slight cases, however, can often be cured with but little trouble. In nearly every instance it is better to remove the well fowls and put them by themselves, and in the case of infectious disease the premises should be thoroughly disinfected.

Apoplexy.—This is a disease of the brain caused by the rupture of one of the blood vessels. The bird is attacked suddenly and falls down, apparently dead or nearly so. The usual cause is too high feeding, but it may also be due to some other provocation, such as sudden fright, violent exertion, or straining in laying eggs. Fowls are sometimes found dead on the nest or under the perches. There is usually no previous warning, and so in most cases treatment is impossible, as the bird usually dies almost immediately. When, however, the sufferer is still alive pierce a vein on the underside of the wing and let it bleed freely. This will reduce the pressure on the brain and often result in a cure. The bird should then be kept on a limited diet for some time in order to reduce the surplus fat. As preventive measures, regulate the diet and give plenty of exercise.

Vertigo.—This is also a disease of the brain and may be regarded as a minor kind of apoplexy. The bird shows giddiness, throwing its head upward, backward, or to one side. The gait is uncertain and staggering, the sufferer often running around in a circle. Sometimes the bird falls to the ground, fluttering and making convulsive movements with the legs. The bird can often be revived by holding its head under a stream of cold water. After this keep the bird in a cool and shady place for some time and regulate the diet.

Bronchitis.—Bronchitis is a cold accompanied by a rattle in the throat or by a cough, and may be caused by exposure to dampness or cold temperatures or by drafts of air. In the majority of cases the removal of the cause and good care will result in a cure. Inhalation of steam or vapor from boiling water has been found beneficial. Giving a teaspoonful of equal parts of cider vinegar and water has proven successful in some cases.

Catarrh.—Catarrh is a form of cold that is quite common among fowls, and may be caused by dampness, drafts of air, or exposure to cold. It is indicated by a watery discharge at the nostrils which later becomes more viscid. Remove the cause, keep the birds fairly warm, and give them plenty of easily digested feed. The injection of kerosene into the nostrils is also beneficial. This may be done with a small syringe, a medicine dropper, or a small oil can. If catarrh has become confirmed the nostrils and throat should be cleansed with hydrogen peroxide and equal parts of water several times daily, and the nostrils greased with vaseline.

Diphtheria.—The marked symptom is the appearance of a diseased growth in the throat and inside of the mouth, resembling raised patches of whitish or pale-yellowish skin, which may invade the entire throat and mouth, often also appearing like ulcers or sores on the face, comb, and about the eyes. Make a swab of cotton tied on the end of a stick and swab out the mouth with hydrogen peroxide. Remove any of the growths that come away easily. This disease is very contagious, and any birds suffering from it should be removed from the flock and the premises disinfected.

Roup, or contagious catarrh.—The first symptoms of this disease are similar to those of simple catarrh, but as the disease advances there is often swelling of the sides of the head and the nostrils become closed with thick mucus, causing the bird to breathe through the mouth. If the swellings contain pus they should be opened with a sharp instrument, the contents removed, and the wound treated with a mild antiseptic, such as a 2 per cent solution of carbolic acid. The application of kerosene mixed with an equal part of olive oil has given good results in many cases. When a fowl has a bad case of roup it is usually better to kill it unless especially valuable.

Pip.—This is a condition of the tongue caused by some such ailment as a cold, which compels the bird to breathe through the mouth. The continual passing of air over the tongue causes it to become dry, hard, and scaly, especially about the tip. The best remedy is to remove the cause, also wet the tongue two or three times a day with a mixture of glycerin and water, equal parts.

Bumble foot.—This is caused by bruises on the bottom of the foot, and is often due to the fowls having to fly from rather high perches and alighting on hard and uneven surfaces. Remove the cause by lowering the perches. If the foot is swollen and the swelling is filled with pus it should be lanced and the pus permitted to escape. The wound should then be washed out with a 2 per cent carbolic-acid solution, greased with vaseline, and wrapped with a piece of cloth.

Cholera.—This is a contagious disease caused by bacteria, and is usually brought in by the introduction of infected birds or by water or food contaminated by the excrement of sick birds. It is also possible for fowls to be infected through wounds or even by the inhalation of germs in the form of dust. The symptoms include great thirst and the voiding of feces of which the part normally white is yellow. This is not a sure indication of the disease, for the same thing may occur as the result of other disorders. Diarrhea is generally a prominent symptom, the droppings being thin and voided frequently, and in the later stages the yellow portion may change to green; the fowl becomes depressed, the feathers become ruffled, the comb becomes pale or very dark, and the bird has a poor appetite. Sometimes the disease runs rapidly through a flock, destroying the greater part of the birds in a week, or it may assume a more chronic form, extend slowly, and remain on the premises for several weeks or months. Fowls affected with this disease usually die within thirty-six hours. Most so-called cases of cholera are simply diarrhea.

In most cases medical treatment for cholera has proved unsatisfactory. The best method of combating this disease is to carry out strict sanitary precautions as regards cleanliness and disinfection, and to totally destroy the carcasses of dead birds. Droppings should be burned or thoroughly disinfected by mixing with a 10 per cent solution of carbolic acid. Disinfect the building by spraying thoroughly with a 5 per cent solution of carbolic acid, and then whitewash.

Crop bound.—The crop sometimes becomes overloaded with feed, and its thin muscular walls become distended and partially paralyzed, so that the organ can not be emptied, or the opening into the lower esophagus may becomed clogged with a feather, a straw, or some other substance which the bird has swallowed. The crop is greatly distended and the mass of feed is rather hard and firm. In both cases the symptoms are the same and treatment should be conducted on the same principles. For treatment pour one-fourth to one-half ounce of melted lard or sweet oil down the throat and manipulate the contents of the crop with the hand in such a way as to tend to break up the mass. Unless the passage is closed, the contents of the crop will usually pass away within a few hours. For a few days feed should be limited in quantity. If the foregoing method is ineffectual and an operation becomes necessary, clip away the feathers from a portion of the crop and with a very sharp knife, lancet, or razor make an incision about 1½ inches long through the skin and the wall of the crop. Then carefully remove the contents of the crop with the finger, the handle of a spoon, or some other convenient object, and wash out the crop with warm water. Pass the finger, well oiled, into the œsophagus to see there is no obstruction. Sew up the wall of the crop first and then the outer skin, using white silk or linen thread, being careful not to sew the two membranes together, and in a few days the wound will be healed. Feed sparingly on whole grains until the wound heals, and do not give any water for twenty-four hours.

Diarrhea.—This is caused by some irritation of the digestive system, and may be due to the quantity of the feed, the quality of the feed or drinking water, or to climatic conditions to which the fowl has been exposed. There is a general depression, roughness of plumage, and a loss of appetite, and usually frequent expulsion of soft, whitish, yellowish, or greenish excrement, the droppings becoming more liquid until severe diarrhea is present. When the affection is at all serious, the excrement may become mixed with mucus or blood. It is important that the cause be sought out and removed. See that the birds have comfortable quarters and that they are not exposed to drafts, cold, or dampness. If taken early diarrhea can often be checked by reducing the amount of green and animal feed and feeding largely on dry feed, eliminating the moist mash. Give a tablespoonful of sweet (olive) oil as a laxative to carry off any irritating matters that may be in the intestine. In severe cases give 5 to 10 drops of laudanum to each bird.

Gapes.—Gapes is caused by the presence of small worms, which are attached to the lining of the trachea or windpipe, where they cause much irritation and often death to young chickens. Gapes usually occur when the chicks are from 2 to 6 weeks old. Separate the well from the sick birds and clean the coops, pens, and feed and water dishes by disinfecting with a 5 per cent solution of carbolic acid. Sometimes the worms can be removed from the trachea by inserting a feather moistened with turpentine or kerosene. The oil will cause the dislodgment of the worms, and some will be drawn out with the feather while others will be expelled by coughing or sneezing. Place the chicks on a piece of paper, so that the worms may be caught and burned.

Freezing (frost bite).—If the comb or wattles of fowls become frozen, and it is discovered before they thaw out, apply snow or cold water to remove the frost, for this gradual thawing will often save them. Then apply vaseline to the affected parts twice a day.

Scaly legs.—This is caused by a mite which burrows under the scales of the feet and shanks, and is considered to be infectious, but does not spread rapidly. It is noticed most frequently in old fowls.

The scales can be removed by soaking the feet and shanks in warm, soapy water and by rubbing or brushing them off with a toothbrush or nailbrush. After the scales have been removed apply sulphur ointment or equal parts of melted lard and kerosene. The frequent application of kerosene has also been found effectual without the previous soaking in water.

BAD HABITS.

Egg eating.—This habit sometimes becomes a serious vice, fowls becoming very fond of eggs when they have learned to eat them, and it often spreads from fowl to fowl. It usually begins through accident by eggs being broken or frozen. Be careful to see that this does not happen. See that the nests are properly supplied with straw or other nesting material and have them darkened, so that if an egg is accidentally broken the fowls will not be likely to discover it. Supply plenty of lime in the form of oyster shells, bone, or similar substances to insure a firm shell. As soon as it is discovered that a fowl has formed the habit the fowl should be removed, in order to prevent the spread of the vice. Once formed, it is difficult to eradicate, and the safest remedy is the death penalty.

Feather eating.—Fowls sometimes pluck feathers from themselves and from each other, which is often caused by too close confinement, by the presence of insect pests, or by improper feeding. When some of the fowls of a flock have formed the habit slightly, a wide range with a change of diet, including a plentiful supply of animal feed, and freedom from insect pests, will usually correct the evil. Above all see that the fowls have plenty of inducement to exercise. If the habit becomes well formed it is very troublesome, and may necessitate the killing of some of the fowls in order to stop it.

INSECT PESTS.

Two classes of external parasites, popularly known as lice and mites, will be considered here. There are several varieties of lice which attack poultry. They subsist mainly on the feathers and perhaps on the epidermic scales. They are found largely on the head and neck, under the wings and about the vent, and when present in large numbers they cause the fowls much discomfort. Persian insect powder (pyrethrum), powdered sulphur, and some of the various preparations on the market, such as the louse powders, are good in combating these pests. The hens can be dusted with one of these powders after they have gone to roost. Have the powder in a box with a perforated cover, grasp the fowl by the legs, and shake the powder well among the feathers. Dust at least three times at intervals of about a week in order to catch the lice which hatch out after the first dusting.

The mites subsist on the blood of the fowls and are not usually found on the bodies of the bird except when at roost or on the nest.

During the day they inhabit cracks and crevices of the walls, roosts, and nests. Sitting hens are often so annoyed that they are compelled to leave the nests in order to relieve themselves of these parasites. The free use of kerosene about the nests and perches is useful in fighting mites. The walls of the house can be sprayed with kerosene, the operation being repeated every three or four days for two weeks. Insect powders are of little avail.

The following method has proved excellent in ridding houses of mites and lice when the weather conditions are such as to permit the birds being kept outside the house for five or six hours. Close all the doors and windows and see that there are no cracks or any other openings to admit air. Get an iron vessel and set it on gravel or sand near the center of the house; place in the vessel a handful of shavings or straw saturated with kerosene, and on these sprinkle sulphur at the rate of about 1 pound to every 90 or 100 square feet of floor space. Instead of using the shavings and kerosene the sulphur can be saturated with wood alcohol. When everything else is in readiness light the material and hastily leave the house. In case any anxiety is felt about fire, a glance through a window will show whether everything is all right. There is very little danger of fire when proper precautions have been taken to have plenty of soil beneath the vessel. Allow the house to remain closed for three or four hours, at the end of which time one can safely conclude that there are no living beings inside. Now throw all the doors and windows wide open so as to drive out the sulphur fumes thoroughly, and then the fowls may be allowed to enter. Let them in one by one, and as each enters catch it and dust it well with insect powder which will destroy the lice on the birds. Tobacco dust is also good to use instead of insect powder. The birds and house have now been freed from vermin for the present, but the eggs of the insects have not been destroyed, and in a week another swarm will be hatched out. Therefore it will be necessary to repeat the operation once or twice before the pests are exterminated. After this care should be used to see that no strange fowl is admitted to the house or yard without having been thoroughly rid of lice, for one lousy hen will contaminate all the rest.

LITERATURE.

The following are the principal works consulted by the writer in the preparation of this article, and the reader who desires more details regarding any of the various subjects treated is referred to them.

The Poultry Book, vol. 1, published by Doubleday, Page & Co.

Poultry Feeding and Fattening, by G. B. Fiske.

Broilers and Roasters, by J. H. Robinson.

The Diseases of Poultry, by D. E. Salmon.

Poultry Craft, by J. H. Robinson.

Farm Poultry, by G. C. Watson.

CAPONS AND CAPONIZING.

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It is impossible to say just how long the operation of caponizing has been performed. It seems quite certain, however, that the practice was familiar to the Chinese more than two thousand years ago. Later it was practiced by the Greeks and Romans and, through medieval times, by the people of middle and southern Europe, until in recent times it has been introduced into America. At present capons are most universally known and appreciated in France, although within the last few years the business of producing them has advanced rapidly in this country. Much the larger part of the industry is confined to that portion of the United States east of Philadelphia, though increasing numbers of capons are being raised in the North Central States. During the winter months capon is regularly quoted in the markets of the larger eastern cities. Massachusetts and New Jersey are the great centers for the growing of capons, while Boston, New York, and Philadelphia are the great markets.

DESCRIPTION AND CHARACTERISTICS OF THE CAPON.

What is a capon? A capon is an altered or castrated male chicken, bearing the same relation to a cockerel that a steer does to a bull, a barrow to a boar, or a wether to a ram. As with other male animals so altered, the disposition of the capon differs materially from that of the cockerel. He no longer shows any disposition to fight, is much more quiet and sluggish, and is more docile and easy to keep within bounds. The true capon never crows. Along with this change in disposition there is a change in appearance. The comb and wattles cease growing, which causes the head to appear small. The hackle and saddle feathers develop beautifully. Indeed, these feathers and the undeveloped comb and wattles serve to identify the capon and in consequence should never be removed when the bird is dressed.

As a result of the more peaceful disposition of the capon he continues to grow and his body develops more uniformly and to a somewhat greater size than is the case with a cockerel of the same age. For a time the cockerel and the capon make about equal development; but as soon as the reproductive organs of the cockerel begin to develop the capon begins to outstrip him in growth. Also when finishing off the capon fattens more readily and economically. As they do not interfere with or worry one another, a large flock of capons may be kept together. Coupled with the better growth is the fact that the capon brings a better price per pound. While a rooster ten months to a year old is worth 6 to 10 cents a pound, and in the case of especially fine poultry 12 to 15 cents a pound, capon in season brings 18 to 25 and sometimes 28 cents a pound. There are two reasons, then, why it is better to caponize surplus cockerels than to raise them for market as such: (1) There is an increase in weight, and (2) the price per pound is materially increased. Yet in many localities where especially fine poultry is raised, while capons usually sell for a somewhat better price, the difference is not great. In fact, for the Boston market many capons are picked clean and sold as "south shore roasters." Hence it will be seen that the profit in capons must depend to a great extent upon local conditions. The demand for capons continues good, notwithstanding the fact that more and more are raised each year.

SELECTION OF BREEDS.

In selecting the breed best suited for caponizing, several factors must be taken into consideration. Large capons bring the best prices. Yellow legs and skin, as in other classes of poultry, are most popular. Consequently the breed should be large. It does not pay to caponize small fowls. The Plymouth Rocks, Light Brahmas, Cochins, Indian Games, Langshans, and Wyandottes are all recommended by different producers, as are also various crosses of these. The Brahmas and Cochins possess good size. By some the Brahmas are claimed to be difficult to operate upon; by others this is denied. The Plymouth Rocks and Wyandottes are somewhat smaller, but sell readily and possess the advantage of yellow skin and legs. The Langshan is large and is easily operated upon. The Indian Game is probably most useful as a cross upon some one of the other breeds, thereby improving the breast meat without materially reducing the size of the fowl. In Massachusetts the Brahma is the most popular breed, because of the demand for large birds for roasters.

TIME TO CAPONIZE.

In so far as the effects of the operation and the rapidity and ease of healing are concerned, the time of year when the operation is performed is of little importance. The capons seem to recover and do well at any time. Certain other considerations, however, do influence the time. The age and size of the cockerel is very important. As soon as the cockerels weigh 1½ to 2 pounds, or when 3 to 4 months old, they should be operated upon. If smaller than this, their bodies do not give room enough to work handily. On the other hand, they should never be over 6 months old, as by this time the testicles have developed to a considerable extent, the spermatic arteries carry greater amounts of blood, and the danger of pricking these arteries and causing the fowl to bleed to death is greatly increased. The fact that capons are in greatest demand and bring the best prices from the Christmas season until the end of March, and that it takes about ten months to grow and finish them properly, makes it important to hatch the chicks in early spring so that they will be of proper size for caponizing in June, July, and August. These are by far the most popular months for the operation, though in some cases it is performed still later.

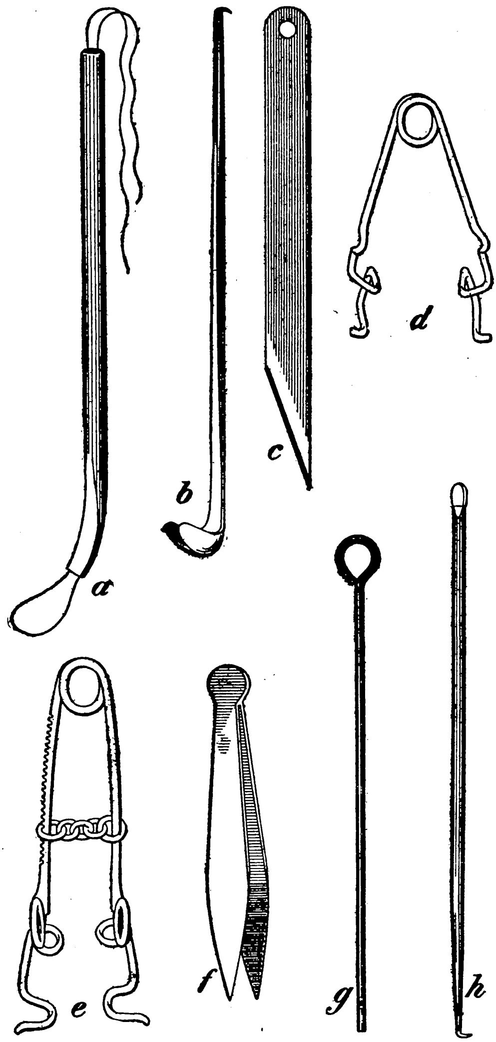


FIG. 17.—Instruments used in caponizing: *a*, canula; *b*, twisting scoop; *c*, knife for making incision; *d*, spring spreader; *e*, sliding spreader; *f*, nippers; *g*, probe for pushing aside intestines; *h*, hook for tearing membrane.

CAPONIZING INSTRUMENTS.

There are several sets of instruments for performing the operation. These differ principally in the type of instrument used in getting hold of and removing the testicle. One type is the canula (fig. 17, *a*). This consists of a hollow tube, the lower end of which is compressed and closed except for two small holes through which to run the horse hair or wire comprising the other part of the instrument. This type is very satisfactory but requires two hands to operate. Another type is the twisting scoop (fig. 17, *b*). This is a spoon-like scoop slotted in the center and mounted upon a slender rod. It is designed to slip under the testicle, allowing the spermatic cord to pass through the slot. By twisting the cord is severed. This type has the advantage of requiring only one hand to operate, but is more liable to produce slips than the canula. A third style of instrument is also in the form of a spoon or scoop, but instead of being in one piece has two jaws regulated by a slide. The testicle is caught in the scoop with the spermatic cord between the jaws, and by tightening the jaws and gently moving the instrument the cord is severed and the testicle removed. Still another type, not now in common use, is the spoon forceps. With this the testicle is simply grasped with the forceps and detached by a twisting movement. Here one hand can be used also, but the liability of slips is rather greater than with the other methods.

A knife for making the incision into the body cavity is of course necessary. Almost any sharp-pointed, thin-bladed knife will answer the purpose well (see fig. 17, *c*). Some sort of spreader, to spring apart the ribs far enough to allow the instruments to be inserted into the body, must be used. A plain spring spreader, as shown in figure 17, *d*, or a sliding spreader (fig. 17, *e*) allowing the pressure to be gauged, will answer the purpose. A sharp-pointed hook (fig. 17, *h*) for tearing away the thin membranes, and a blunt probe, of which figure 17, *g*, is one type, for pushing aside the intestines, complete the necessary equipment. A pair of small tweezers or nippers (fig.17, *f*) is also useful in removing any foreign matter from the body.

THE OPERATION OF CAPONIZING.

Before beginning the operation two conditions are absolutely essential. If these are not favorable, do not attempt to operate. The first of these is that the intestines of the fowl should be completely empty, so that they will fall away and expose the testicles to view. This can be accomplished by shutting up the fowls and withholding all food and water for twenty-four to thirty-six hours before the operation. Thirty-six hours is better than twenty-four, especially for a beginner. The second condition is a good, strong light, so that the organs of the fowl may be clearly and easily distinguished. Direct sunlight is best for this, and in consequence it is well to operate out of doors on a bright day. Some operators have substituted the physician's head reflector and artificial light with good success. It has been suggested that a probe consisting of a small electric bulb on the end of a slender rod, and operated by small dry batteries, so that it can be introduced into the body cavity, could be manufactured and used with good success.

When ready to operate, catch the bird and pass a noose of strong string about the legs. Do the same with both wings close to the shoulder joints. To the other end of the strings are attached weights of sufficient size to hold down and stretch out the bird when placed upon the head of a barrel or box of convenient height, which is to serve as operating table. These weights are allowed to hang on opposite sides of the barrel or box (see fig. 18). A table, if so desired, may be arranged by boring holes through its top at proper distances from each other, allowing the strings to pass through these, and hanging the weights underneath. Still other ways of holding the fowl in place have been devised, but these are unimportant so long as the fowl is held securely stretched out.

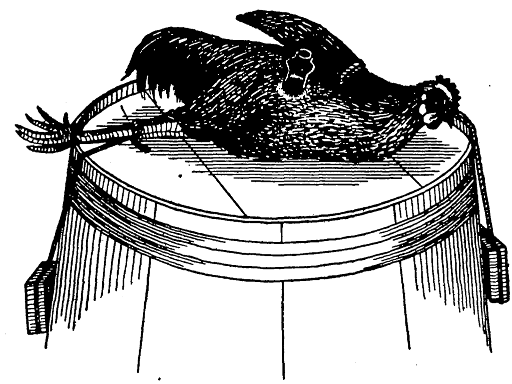


FIG. 18.—Showing method of securing fowl, also spreader in place.

Having fastened the fowl, be sure that all the instruments are at hand. It is also well, though not necessary, to have ready some absorbent cotton and a dish of water to which has been added a few drops of carbolic acid. Having once started, carry the operation through as quickly as possible. Moisten and remove the feathers from a small area over the last two ribs just in front of the thigh (see fig. 19). With the left hand slide the skin and flesh down toward the thigh. Holding it thus, make the incision between the last two ribs (fig. 20), holding the edge of the knife away from you as you stand back of the fowl. Lengthen the incision in each direction until it is 1 to 1½ inches long. Now insert the spreader into the incision, thus springing the ribs apart, as shown in figure 18. The intestines will now be visible, covered by a thin membrane called the omentum. Tear apart this membrane with the hook, and the upper testicle, yellow or sometimes rather dark-colored and about the size and shape of an ordinary bean, should be visible close up against the backbone. By pushing aside the intestines this can easily be seen, and the lower one also, in a similar position on the other side of the backbone. If both testicles are to be removed through the same incision, remove the lower first, as the bleeding from the upper might be sufficient to obscure the lower. Each testicle is enveloped in a thin membrane. This may be and probably

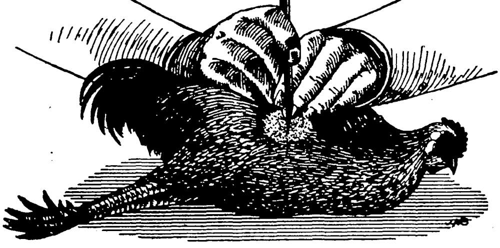


FIG. 19.—Ready to make the incision.

is best removed with the testicle, though some operators tear it open and remove the testicle only.

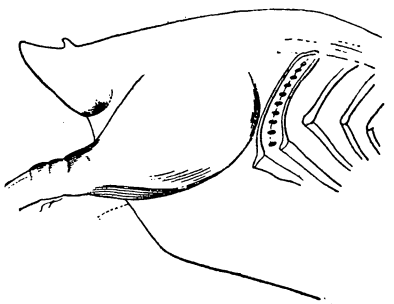


FIG. 20.—Diagram showing where incision should be made, between last two ribs.

The delicate part of the operation is now at hand, due to the close proximity of the spermatic artery, which runs just back of the testicle and to which the testicle is in part attached. If this is ruptured the fowl will bleed to death. The canula, threaded with a coarse horsehair or fine wire, or one of the other forms of instrument previously described, now comes into use. If the canula is used, allow the hair or wire protruding from the end to form a small loop just large enough to slip over the testicle, as shown in figure 21. Work this over the testicle, being careful to inclose the entire organ. Now tighten up on the free ends of the hair or wire, being careful not to catch any part of the artery. If the spermatic cord does not separate, saw lightly with the hair or wire. When the testicle is free, remove it from the body. If only the upper testicle has been removed, turn the bird over and proceed in exactly the same manner upon the other side. After removing the testicle, if the bleeding is at all profuse it is well to remove a portion of the blood by introducing small pieces of absorbent cotton into the body by means of the hook or nippers, allowing them to become saturated and then removing them. Be sure to remove all blood clots, feathers, or other foreign matter. After the testicles and all foreign matter are removed, take out the spreaders, thus allowing the skin to slip back over the incision. The method of using the twisting scoop is shown in figure 22.

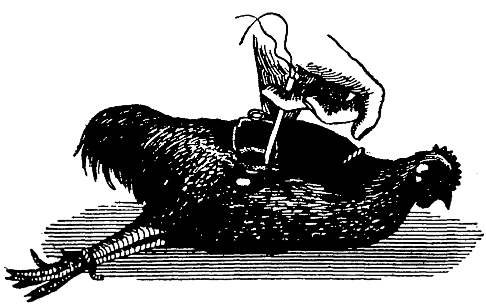


FIG. 21.—Canula in use. (The lower aperture appears in the illustration simply to show canula in operation, and of course is not made in the fowl.)

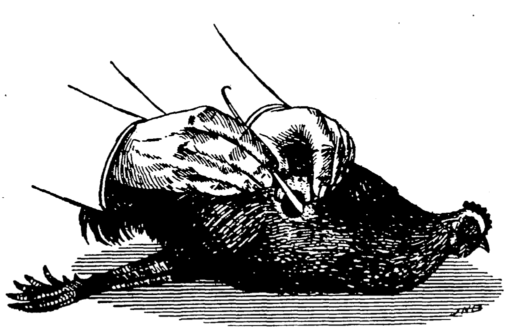
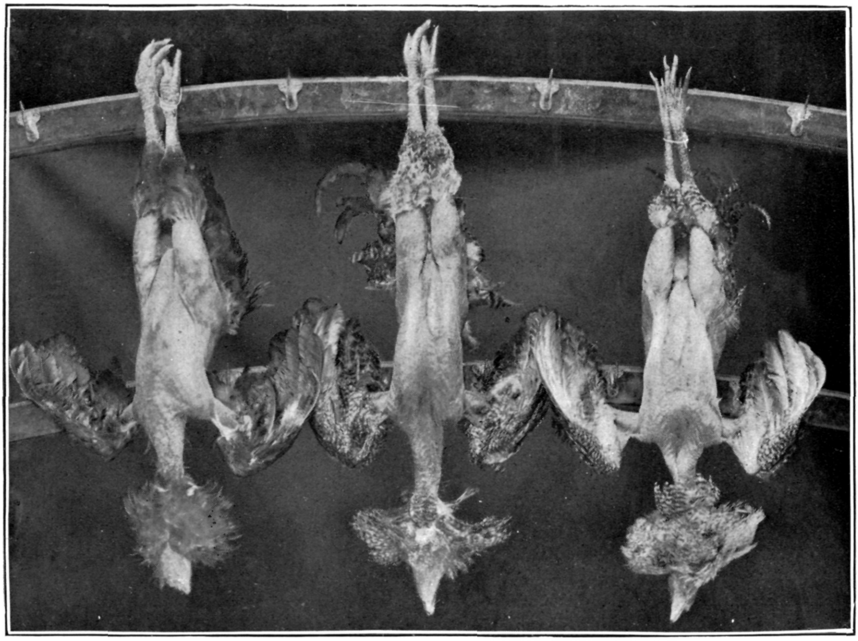


FIG. 22.—Twisting scoop in use.



CAPONS DRESSED FOR MARKET.

These illustrations show appearance after picking, but do not show fowls in perfect condition of flesh.

Some birds are sure to be killed even by experts, but the loss is small, seldom exceeding 5 per cent where any considerable number are caponized, and usually not more than 2 or 3 per cent. With beginners, of course, the percentage is much larger, but with a little practice and care this is soon overcome. Any fowls which may be killed in this way are perfectly good to eat and are therefore not wasted. A great deal of practice is required to become expert enough to operate rapidly. Consequently it is quite common in localities where many capons are grown to hire experts to do the work. These men are able to caponize a fowl every two to five minutes, and charge from 3 to 6 cents a fowl for the service. It is most humane for the beginner to make his first trials upon dead fowls.

Many times, particularly with beginners, while the operation seems to be entirely satisfactory, the bird will turn out to be what is known as a "slip." A "slip" is neither cockerel nor capon, but is between the two, possessing the mischievous disposition and the appearance of an ordinary cockerel, but, as a rule, being unable to reproduce. This condition is due to the fact that a small piece of the testicle is left in the body. This piece often grows to a considerable size. As the "slips" possess the same restless disposition as the cockerels, they grow and fatten little if any better, while they do not bring as good a price in the market as the capons. Consequently it is well to use every precaution in order to avoid "slips," as they are unprofitable as compared with capons. With the greatest care, however, "slips" are more common than are deaths due to the operation. The percentage varies all the way from 50 per cent with beginners down to 2 or 3 per cent with experts.

CARE OF FOWLS AFTER THE OPERATION.

Upon being released from the operating table the capons are usually put in a closed yard where they can find shelter, food, and water and can be kept quiet. No roosts are provided, as the less flying and jumping they do the sooner will the wound heal. The capons seem to be very little inconvenienced by the operation, and water and soft feed mixed with sweet skim milk can be given immediately. Some feeders give this in unlimited quantity, while others feed more sparingly for a time. Some growers observe no precautions whatever, giving the birds their full liberty immediately after the operation and allowing them to have any sort of feed.

For a week or ten days the newly-made capons should be carefully observed to see whether they become "wind puffed." This is a condition caused by air gathering under and puffing out the skin near the wound. When observed it can be readily relieved by pricking the skin with a needle or knife and pressing out the air. In about ten days or two weeks the incision into the body should be entirely healed, and, although no special antiseptic methods are employed in the operation, blood poisoning or any other trouble seldom results.

FEEDING CAPONS.

Capons are usually kept till they are about 10 months old. At this time the market is at its best and the birds have made their most profitable gains. The feeds used and the methods of feeding vary greatly, so much so, indeed, that it is futile to try to give specific directions. For several months after the operation a good growing ration and not a fattening ration is required. It may consist of whole grains, ground grains, or a combination of the two, as each feeder finds most profitable and best suited to his locality. As with other poultry, variety must be given for best results. Late in the fall, when the capons have no pasture, green feed, such as cut clover or vegetables, should be provided. A somewhat more fattening ration than that required for laying hens seems to give good results.

As capons are not usually marketed before Christmas or the first of January they have to be housed during the late fall and early winter. Because of their quiet disposition they stand crowding quite well and have been successfully housed with only 2 or 3 square feet of floor space to a fowl. It is better, however, to allow 4 to 5 feet if possible.

During the last month or month and a half before marketing the corn in the ration should be gradually increased until the fowls are on a full fattening ration. For the last two or three weeks it is desirable to shut them up and feed them in crates, for every possible ounce at this stage adds to the appearance and profit. Machine cramming is sometimes practiced the last week with excellent results. (See pl. 22, fig. 2.)

KILLING AND DRESSING CAPONS FOR MARKET.

The capons selected for killing should be confined for twenty-four hours without feed or water to completely empty their crops. The usual method of killing is known as the sticking method. The fowl is hung up by the feet, the head held in the left hand, and the whole body stretched to full length. The mouth is forced open, and by means of a sharp, narrow-bladed knife held in the right hand the blood vessels at the back of the throat are severed with a single sweep. The knife is then turned and the point plunged through the roof of the mouth to a point just behind and between the eyes. The brain is here reached, and if properly stuck all feeling is then lost. Convulsions ensue, the muscles are relaxed, and the feathers come out easily.

Capons should always be dry picked, as they look much better and as some of the feathers should be left on. The feathers of the neck and head, the tail feathers, those a short way up the back, the feathers of the last two joints of the wing, and those of the leg, about one-third of the way from knee to hip joint, should be left on. These feathers, together with the head of the capon, serve to distinguish it from other classes of poultry on the market, and consequently should never be removed. Plate 23 shows several capons dressed for market. Their condition, however, is rather poor and is capable of improvement. In picking be careful not to tear the skin. If bad tears are made sew them up. Capons scalded and picked bare bring very little, if any, better prices than other poultry in the same condition.

Most markets require capons to be undrawn and the head and feet left on. If drawing is required the vent should be cut around and the intestine pulled out until the gizzard is reached, where it is broken off. Nothing else is removed. Care should be used to cleanse the head and feet of all signs of blood or filth.

After picking, the carcasses are hung in a cool place until the animal heat has entirely left the body, when they are ready to be packed. Like other poultry they should be packed in boxes of convenient size, holding about a dozen carcasses. Every attention should be given to neatness and attractiveness, as this helps the sale and the price. During the time of year when most capons are marketed—January, February, and March—no ice is necessary, but if for any reason they are shipped in warm weather they should be packed in ice.

PROFITS.

It is extremely difficult to make any general statement concerning the profits yielded by capons. That they do yield a profit in practically all cases is undoubtedly true, but whether the profit is sufficient to give up to them the time and room they require is a question which must be settled by each man's experience and by local conditions. Many poultrymen think that they can do better to turn off their surplus cockerels as broilers as long as the market holds up and rely upon caponizing only for later-hatched chicks. The house room thus saved they use for pullets or other laying stock, feeling that they make more money in this way. It is certain, however, that many poultrymen find capon raising profitable enough to induce them to continue in the business. On several farms in Massachusetts 500 to 1,000 capons are raised annually, while this year (1906) on one farm alone 5,000 cockerels were held for caponizing. Although the industry is growing rapidly year by year, the supply does not yet equal the demand. The best prices are commanded by capons produced near to the market, and consequently perfectly fresh. The markets of the West do not quote as good prices as the eastern ones, 13 and 14 cents being about the highest; hence most of the western-grown capons are shipped East, in which case the express rates cut down the profit materially. On the whole, the profit is probably rather greater for eastern producers than for those of the North Central States.

ANNUAL PRODUCTION OF ANIMALS FOR FOOD AND PER CAPITA CONSUMPTION OF MEAT IN THE UNITED STATES.

By John Roberts,

Of the Editorial Office, Bureau of Animal Industry.

Some time ago this Bureau was requested to furnish information relating to the first of the above subjects, and certain data were then collated and compiled by the writer for that purpose. Since, however, nothing of this nature has, so far as is known, hitherto been published in complete form, it has been considered advisable to revise and elaborate the data previously used and present them in the following article.

No actual count of domestic animals in the United States is taken except at the decennial censuses, the last one of which occurred in 1900, and unfortunately we have no precise data of any sort bearing upon the total slaughter of food animals in the country. Such statistics as we have refer only to the wholesale commercial slaughter, and this is later on shown to have amounted in 1900 to little more than one-half the total slaughter. Under these circumstances it is impossible to present as complete information as could be desired. Our Federal meat-inspection service is about to be very greatly extended, and when this is in full operation we shall have a larger basis to work upon. For the present purpose, however, although the range of error is admittedly great, some useful information may be obtained by using the facts ascertained by the census of 1900 as a basis and adding thereto the valuable statistical information found (1) in the Report of the Commissioner of Corporations on the Beef Industry—on cattle and beef; (2) in the Cincinnati Price Current—on hogs and hog products; and (3) in the Bulletin of the National Association of Wool Manufacturers—regarding sheep. It is believed that a careful study of these authorities, together with others less important, and also of some European data, makes it possible to present a rough estimate of our total annual production and output of live stock, and of our annual consumption of meat.

Having ascertained the total numbers of the different animals slaughtered for food, we shall endeavor to estimate the per capita consumption by providing average dressed weights for the several classes of live stock, thus turning the live animals into dead meat. It will be necessary also to make such additions and deductions as are caused by the imports and exports of meats and animals.

The main facts having been taken from the census reports, the results shown will be for the year 1900. It may also be stated that, generally speaking, the estimates are conservative and would therefore be rather below than above the actual figures.

We shall deal first with the total output and slaughter of animals, and later with the per capita consumption of meat.

TOTAL ANNUAL OUTPUT AND SLAUGHTER OF ANIMALS FOR FOOD.

Estimated slaughter and consumption of live stock in the United States, 1900.

	Cattle.	Calves.	Hogs, all ages.	Sheep and lambs.
Number in United States, June 1, 1900 (census)	53,843,513	15,595,245	64,694,222	61,837,112
Estimated number, Jan. 1, 1900	59,000,000	4,500,000	51,755,400	41,883,000
Estimated slaughter in 1900:				
Total number	11,531,000	3,000,000	56,654,000	15,190,000
Wholesale and packing[a]	5,531,000		30,654,000	9,190,000
Other slaughtering (excluding farms)	4,500,000		10,000,000	5,000,000
Farm slaughter	1,500,000		16,000,000	1,000,000
Consumed in United States	10,880,900	3,000,000	49,705,000	15,177,700
Exported:				
As meat, etc. (calculated)	650,100		6,949,000	12,300
Alive	423,181		33,915	148,391

[a] The figures for this item are, in round numbers, those of the census, the latter being for the year 1899. They are taken as approximately correct for 1900.

CATTLE.

The number of cattle (excluding calves) on hand January 1, 1900, would, of course, be greater than that taken by the census in the following June, this excess being the number slaughtered and lost by exposure and disease in the meantime. Inasmuch as the slaughter for twelve months is estimated to be 11,531,000, the slaughter and loss for the five months in question is reckoned at a little over 5,000,000. Thus the number of cattle in the country on January 1 is estimated at 59,000,000, as against 53,843,513 taken by the census five months later. On the other hand, the number of calves on January 1 would be very much less than the number taken by the census on June 1, as the great majority of calves are born in the spring.

In regard to the slaughter columns, it will be seen that there are three main classes. The largest of these—wholesale and packing—is, perhaps, sufficiently self-explanatory. It embraces all the large packing establishments, as well as the smaller abattoirs doing a wholesale business throughout the country. All the officially inspected cattle are in this class, and it may here be stated that the number of the latter for the year in question was 5,064,243. The other two classes of slaughter—that in the small towns, etc., and on farms—are the difficult ones to estimate. We have no definite information regarding either for 1900, but the farm consumption of cattle given in the previous census (for 1890) was 1,294,237, and since the number of persons engaged in farming has increased in the meantime from 9,148,448 to 10,438,219 we have placed the farm consumption in 1900 at 1,500,000, this increase being proportionate to that of the population. Fortunately a fair estimate of the number slaughtered by butchers in the smaller towns can be made from the data collected by Commissioner Garfield in his report on the beef industry. This information was obtained by special agents throughout the country and from reports by retail butchers in over 800 towns. The figures placed in the column representing the small-butcher slaughter are therefore based upon the details presented in the report mentioned.

Of course the number exported as meat must be added to the total slaughter. In order to do this, the totals of the various classes of beef—fresh, canned, etc.—are taken from the official returns of the Department of Commerce and Labor, and these quantities are turned into cattle by allowing a dressed weight of 720 pounds for the animals supplying the fresh beef and 550 pounds for those representing the canned and cured beef. This assumes an average live weight of about 1,200 pounds for the export class of cattle and of about 950 pounds for the others.

In connection with the total slaughter for the year, the following paragraph from page 57 of the Report of the Commissioner of Corporations on the Beef Industry is quoted as bearing upon the general question:

> The National Provisioner, in the editorial columns of its issue for July 4, 1903, expressed the opinion that 11,000,000 cattle are killed in the United States each year. Mr. Edward F. Swift, in a statement to this Bureau, says that he has seen an estimate of the number of cattle slaughtered in this country for the year 1899, which placed it at 14,142,000. The National Provisioner estimates that 35 per cent of the dressed beef trade of the country is in the hands of the six largest packers. As the packers slaughter about 5,500,000 head of adult cattle annually, the above estimate would indicate that over 15,500,000 animals are slaughtered each year. It would appear that such an estimate must include the slaughter of calves with that of larger animals and that it is accordingly erroneous.

CALVES.

Little is definitely known about the annual slaughter of calves. The number given by the last census as handled in a year by the wholesale slaughter and packing trade was 899,748. The number officially inspected at slaughter in 1900 by the Bureau of Animal Industry was 365,457. Inasmuch, however, as the last census showed a total of 18,112,767 dairy cows in the country, and it is the practice of a large number of dairy farmers in certain parts to get rid of their male calves at an early age, it seems wholly probable that about 3,000,000 are annually consumed as food.

HOGS.

The estimated number of hogs on hand January 1, 1900, is arrived at by deducting 20 per cent from the census total, which was taken five months later, after the main farrowing season. Expert opinion agrees upon this as a reasonable deduction. It is well understood that the average life of a hog in recent times is well under a year, so that the number consumed during 1900 should be greater than the number on hand on January 1. The agricultural statistician of the last census estimates (Agriculture, Pt. I, p. CCXXIII) that the number of hogs sold or slaughtered in 1899 probably exceeded 63,000,000. This seems rather high; it should at any rate include the number lost by disease and exposure during the year.

In this connection is quoted Mr. Charles B. Murray, of the Cincinnati Price Current, the well-known authority on hog statistics. After estimating, in the Cincinnati Price Current Statistical Annual for 1901, the visible marketing of hogs in the United States for the year ended March 1, 1901, to be 28,980,000, Mr. Murray adds:

> It is difficult to estimate satisfactorily the number of hogs slaughtered in the country during the year not indicated in the commercial reports, but it is likely this number has been 10,000,000 or more in late years, bringing the aggregate slaughtering up to approximately 40,000,000 for the entire country, in years of larger operations, in periods of most plentiful supplies.

It is evident Mr. Murray did not consider farm slaughter in the above estimates, as he later on, in the Statistical Annual for 1905, adds at the end of the above quotation "as commercial and butcher slaughtering, to which may be added several millions for farm killings."

As before hinted, the farm slaughter of hogs can not be ascertained from the census of 1900, but the previous census gives us this information. The number slaughtered by the farmers in 1889, thus stated, was 15,426,329, and as the farm population has increased in the meantime, also the number of hogs, it would seem that 16,000,000 might be a fair estimate for the farm consumption in 1900.

It will be seen that the exports of hog products are very large, this being particularly true of lard, of which alone 609,473,372 pounds were sent abroad in 1900. The factor used in converting the export products back into hogs was 190. This assumes an average live weight of 238 pounds with a dressed percentage of 80.

The number of hogs officially inspected at slaughter in 1900 was 24,113,134.

SHEEP.

The lamb crop in 1900 was, according to the census, about 22,000,000, and the estimated number of sheep on hand January 1, as given by the Department of Agriculture, was 41,883,065. Regarding the total slaughter for the year, the estimate in the table is corroborated by the agricultural statistician of the Twelfth Census, who makes the statement (Agriculture, Pt. I, p. CCXXIII) that probably about 15,000,000 sheep and lambs were sold or slaughtered in 1899. After subtracting the wholesale and packing—9,190,000—there remain some 6,000,000 sheep and lambs that were disposed of by the small butchers and on the farms. The farm slaughter as given in the Eleventh Census (1890) was 596,372. It should be considered, however, that the national flock has in the meantime considerably increased, as has also the taste for mutton and lamb, so that 1,000,000 allowed in the table is probably somewhere near the mark.

The number of sheep and lambs officially inspected at slaughter in 1900 was 6,399,950.

PERCENTAGE OF ANIMALS SLAUGHTERED TO NUMBER ON HAND JANUARY 1.

It is reasonable to suppose that under normal conditions the number of the various classes of live stock slaughtered during any year will bear a more or less fixed relation to the total on hand on the 1st day of January in that year. The totals for the United States, as given in the previous table, enable a comparison to be made in this respect with similar figures for Germany. This comparison is shown in the statement below.

The German Government took a census of all live stock on hand December 1, 1904, also of the total slaughter, commercial and farm, for a period of twelve months. The exigencies of the work required the farm slaughter to range from December 1, 1903, to November 30, 1904, and the commercial slaughter from July 1, 1904, to June 30, 1905; but this does not materially affect the accuracy of the comparison. The resulting percentages are of interest and show a singularly close correspondence with those for the United States.

The three main classes of animals only are placed in comparison. Calves are omitted, partly because of the abnormally high consumption of veal in Germany, and while the Germans slaughtered comparatively small numbers of horses, goats, and dogs for food, we have of course nothing to compare with these.

Percentage of slaughter to animals on hand, United States and Germany.

[Figures for Germany taken from Vierteljahrshefte zur Statistik des Deutschen Reichs, Supplement to 1905, IV.]

	Cattle.		Hogs.		Sheep and lambs.	
	United States.	Germany.	United States.	Germany.	United States.	Germany.
Number on hand [a]	59,000,000	17,988,610	51,755,400	18,920,666	41,883,000	7,907,173
Number disposed of in twelve months [b]	11,954,181	3,627,204	56,687,915	20,893,525	15,338,391	2,942,143
Per cent of output to number on hand	20.3	20.2	109.5	110.4	36.6	37.2

[a] The United States figures are for Jan. 1, 1900; the German for Dec. 1, 1904.
[b] The United States slaughter is for the year 1900; the totals include also all animals exported alive. The German farm slaughter is from Dec. 1, 1903, to Nov. 30, 1904; commercial slaughter, from July 1, 1904, to June 30, 1905.

In order to exactly correspond with the figures for the United States, the German totals in the above table should include the exports. These, however, were so small as to make little or no change in the percentages. After adding the exports, the cattle percentage remains the same—20.2; that for hogs becomes 110.6, which is practically the same as before, and only with the sheep is the change worth noting, there being an increase from 37.2 to 38.8.

In this connection we may quote from the Journal of the Royal Statistical Society (England), Volume LXVII, 1904, wherein the findings of a special committee to investigate the meat and milk consumption of the United Kingdom are published. Among other data are given the percentage of output of meat animals to the number on hand at the commencement of the year—annual average of the five-year period 1899 to 1903—as follows: Cattle and calves, 26.6; sheep, 37.9; swine, 121.3. These figures are considerably higher than those for the United States and Germany, excepting the sheep, but it may be remarked that cattle and calves are combined in the one case and not in the other, and that the year covered in the British returns commences in the summer (the number on hand being taken on June 4), whereas for the United States and Germany it commenced, respectively, on January 1 and December 1.

PER CAPITA CONSUMPTION OF MEAT IN THE UNITED STATES, 1900.[a]

There are a number of things which point to the certainty of the United States ranking high in the scale of meat-consuming nations of the world. Some of the most prominent of these are: The presence in the country of enormous herds of animals intended for food; the vastness of the highly developed industries which handle and market these animals; the comparative cheapness of our meat-food products, and, lastly, the increasingly prosperous condition of all classes of our people.

The statement which follows shows the details of the estimated per capita consumption of meat in the United States in 1900. The total numbers of the various animals consumed have previously been estimated on page 278, so it is only necessary now to provide factors for turning these animals into dressed meat. The details given in the census of 1900 in connection with the slaughtering and meat-packing industry (Manufactures, Pt. III) provide a satisfactory basis for this purpose. These details include, among others, total number and total dressed weight of the different classes of animals used in combined wholesale slaughter and packing for the entire country. The number of cattle (beeves) thus stated was 5,530,911, and the dressed weight of the same was 3,225,610,438 pounds. This gives an average dressed weight per animal of 583 pounds. We must con-

[a] Strictly speaking, meat is the flesh of vertebrate animals intended for food, and as such would include poultry, game, rabbits, fish, etc.; but it is practically impossible to get accurate data on the amount consumed of these minor classes. Statistics of per capita consumption of meat are therefore usually confined to the flesh of mammals, or what is known as "butchers' meat."

sider, however, that the slaughter on farms and by small butchers has to be taken in as well, and, as the animals handled by these would probably average slightly inferior to those used in the wholesale trade, the average for the entire kill should be somewhat lower. The factor for cattle has therefore been fixed at 550. Similar consideration places the factor for calves at 85, that for hogs at 135 (this excludes lard), and that for sheep and lambs at 43. Regarding the factor for hogs, it may be stated that the total mumber given by the census as having been consumed in the slaughtering and meat-packing trade was 30,595,522, with a gross weight of 6,676,709,331 pounds, and a net, or dressed, weight of 5,203,280,487 pounds. These figures yield an average of 218 pounds alive and 170 pounds dressed for the wholesale trade. The farm and small-butcher kill would probably average about the same on the whole, because, although in the East and South the hogs used for this class of slaughter would run smaller than the above, this does not apply to the Central West or corn belt. In this region it is quite customary for the farmer to kill a 300-pound, or heavier, hog for his own use. With these considerations in view, and after allowing for the lard, the hog factor has been placed, as before stated, at 135 pounds.

The imports of foreign meats must also be taken into consideration in calculating the per capita consumption, but these are so small in our case that they practically have no effect upon the total. They are, however, included for greater accuracy. The imports of meats for consumption during the fiscal year 1900 were as follows: Beef, 100,192 pounds; veal, 236,313 pounds; pork (including bacon and hams), 311,900 pounds; mutton, 85,839 pounds. The entire total of these amounts to less than one-tenth of a pound per capita.

Per capita consumption of meat in the United States, 1900.

Population in 1900 (continental United States)		76, 149, 386
Per capita consumption in 1900 of—		
Beef	pounds	78.71
Veal	do	3.35
Pork (including hams and bacon)	do	88.12
Mutton and lamb	do	8.57
Total per capita consumption of meat in 1900	do	178.75

Some previous estimates for the United States have been as follows: Norman J. Colman, Commissioner of Agriculture of the United States, in an address delivered at Chicago in 1885, estimated the per capita consumption of meat in this country at that time at 150 pounds. Mulhall, in his Dictionary of Statistics, estimates the consumption in 1840 at 260 pounds per inhabitant; in 1850, 224 pounds; in 1860, 202 pounds; in 1870, 140 pounds; in 1880, 157 pounds, and in 1887, 155 pounds.

PER CAPITA CONSUMPTION OF MEAT IN OTHER COUNTRIES.

It will be interesting to see how the per capita meat consumption of the United States compares with that of other countries. A number of instances of the latter have come to the writer's notice and are given below.

First is a comprehensive statement covering the annual per capita meat consumption in various countries at different times, as follows:

Annual per capita consumption of meat in various countries.

Courtry.	1885.[a]	1890.[b]	1895.[c]	1900.[d]
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Australia	....	246	208	262
United States	150	120	....	[e] 150
Argentina	....	....	140	....
United Kingdom	109	105	108	122
Germany	66	70	74	99
France	70	74	75	80
Sweden and Norway	....	87	74	62
Denmark	76	....	65	76
Belgium	74	69	69	70
Holland	48	....	55	....
Austria-Hungary	53	64	....	....
Switzerland	....	....	75	....
Danubian States	....	....	75	....
Greece	50	....	64	....
Poland	....	....	62	....
Russia	47	48	50	....
Spain	48	49	....	....
Italy	18	23	27	....

[a] Estimate by Norman J. Colman, Commissioner of Agriculture of the United States, in 1885.
[b] Estimated by the English Bureau of Statistics.
[c] From Mulhall's Dictionary of Statistics, published in 1898.
[d] Presented by Mr. Rew, of special committee of Royal Statistical Society, England, in 1904.
[e] This figure is 29 pounds below our estimate. Mr. Rew probably quoted Mr. Colman's figure for 1885.

Assuming the approximate correctness of the above estimates, the abnormally high figures for Australia may be accounted for by the proportionately large number of animals in that country as compared with its very sparse population and the consequent abundance and cheapness of meat as an article of diet.

The report of the special committee of the Royal Statistical Society before mentioned enables us to present the consumption for the United Kingdom in detail. The period covered was the five years from June, 1898, to June, 1903, and the figures show the annual average for this period.

Average annual per capita consumption of meat in United Kingdom for five-year period 1899–1903.

Kind of meat.	Home product.	Imported.	Total.
	Pounds.	*Pounds.*	*Pounds.*
Beef	33.82	20.94	54.76
Veal	2.08	....	2.08
Mutton	14.74	10.47	25.21
Lamb	2.27	....	2.27
Bacon and pork	[a] 14.61	22.24	36.85
Total	67.52	53.65	121.17

[a] Apparently the lard is included in this item.

Per capita consumption of meat in Germany, 1894.

Region.	Cattle.	Calves.	Sheep.	Hogs.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Prussia	38.80	2.65	6.17	34.61	82.23
Brandenburg	25.13	4.85	5.07	48.28	83.33
Pomerania	29.54	4.41	9.48	45.64	89.07
Posen	31.75	3.75	5.29	46.74	87.53
Silesia	28.66	5.07	1.98	36.60	72.31
Saxony	24.47	5.07	3.09	55.12	87.75
Schleswig-Holstein	45.19	5.73	3.97	51.59	106.48
Hanover	24.03	3.75	2.87	47.62	78.27
Westphalia	25.35	5.07	0.88	42.33	73.63
Hessen-Nassau	42.99	3.09	2.65	43.43	92.16
Rheinland	41.01	3.75	1.10	37.04	82.90
Bavaria	44.53	8.60	2.20	54.01	109.34
Kingdom of Saxony	25.57	5.73	1.98	38.14	71.42
Wurtemburg	31.97	2.43	1.32	51.37	87.09
Baden	50.04	6.61	1.10	67.90	125.65
Alsace-Lorraine	29.98	5.73	2.87	35.05	73.63

The above table is compiled from Ostertag's "Handbuch der Fleischbeschau" (English translation by Wilcox), and shows the meat consumption in different parts of Germany for the year 1894. It will be seen that the above totals average much higher than Mulhall's estimate for the whole of Germany for 1895—74 pounds—shown in the table on page 284. The totals point to the probable greater accuracy of Mr. Rew's estimate for Germany for 1900, viz, 99 pounds.

The per capita consumption of meat in a number of cities in France is given in "Abattoirs Publics" (Loverdo). According to these statistics the meat was provided by the following classes of animals: Cattle, calves, sheep and goats, hogs, and horses, mules, and asses. In order to give an idea of the proportion consumed of each class, the following figures, showing the average annual number slaughtered in Paris for the ten-year period 1895–1904, are quoted: Cattle, 240,033; calves 229,520; sheep and goats, 1,749,449; hogs, 224,237; horses, mules, and asses, 21,815. The average annual population of Paris for this period was 2,741,068.

Below is the per capita consumption of meat in five large cities of France for the years 1887 and 1896 and the annual average for the ten-year period 1895–1904:

Per capita consumption of meat in five cities in France for 1887 and 1896 and decennial period 1895–1904.

City.	Per capita consumption in—		
	1887.	1896.	Ten-year period 1895–1904.
	Pounds.	*Pounds.*	*Pounds.*
Paris	170.64	156.09	156.70
Lyon	128.09	110.34	132.39
Marseille	123.90	102.73	95.24
Bordeaux	146.61	134.92	179.01
Havre	100.75	100.09	108.69

NOTE.—It is well known that meat consumption in European cities averages much higher per head of population than it does in the rural districts. M. A. de Foville, in an article in L'Economiste Francais, December 3, 1904, states that the latest meat per capita for the whole of France, according to the census, was 36.8 kilos, which equals 81.13 pounds.

It may be noticed that the two seaports, Marseille and Havre, average much lower than the inland cities.

MARKET PRICES OF LIVE STOCK.

The prices of various classes of live stock at Chicago and Omaha during the year 1905 are shown in the following tables. These figures are compiled from official reports of the stock-yard companies at Chicago and Omaha (excepting the first table, which is from the Weekly Live Stock Report, and gives the average prices of stock at Chicago only). It is regretted that the stock-yard companies do not show average prices in their reports as well as the high and low range, it being understood, of course, that the mean between the high and low range does not necessarily give the true average. The range of prices as well as the average prices is given for Chicago for the sake of comparison with similar figures for previous years and with those for Omaha.

Average prices per hundredweight of live stock at Chicago in 1905, by months, and annual average, 1894–1905.

[From the Weekly Live Stock Report.]

Month and year.	Cattle.			Hogs.	Sheep.	Native lambs.
	Natives.	Texans.	Westerns.			
January	$4.65	$4.20		$4.65	$5.10	$7.10
February	4.75	4.35		4.85	5.50	7.30
March	5.00			5.15	5.50	7.00
April	5.75			5.45	4.95	6.20
May	5.45	4.60		5.40	4.60	6.00
June	5.25	4.50		5.35	4.70	5.75
July	4.95	4.40	$4.20	5.65	5.10	6.00
August	5.00	4.30	4.05	5.95	5.00	7.10
September	5.05	3.90	3.90	5.50	4.75	7.00
October	4.80	3.75	3.70	5.25	5.20	7.25
November	4.65	3.95	3.55	4.85	5.20	7.00
December	4.75	4.05	3.75	4.95	5.15	7.25
Annual average:						
1905	5.05	4.20	3.80	5.25	5.00	6.75
1904	5.10	4.10	3.65	5.15	4.10	5.45
1903	4.80	3.95	3.65	6.00	3.85	5.40
1902	6.75	4.80	4.95	6.85	4.05	5.45
1901	5.25	4.20	4.55	5.85	3.80	4.80
1900	5.15	4.20	4.35	5.05	4.55	5.90
1899	5.30	4.35	4.60	4.05	4.35	5.50
1898	4.65	4.05	4.20	3.85	4.25	5.35
1897	4.50	3.75	3.90	3.70	3.85	4.95
1896	4.05	3.35	3.50	3.50	3.20	4.50
1895	4.50	3.65	3.75	4.30	3.30	4.55
1894	4.25	3.20	3.60	5.05	2.80	4.35

Range of prices, per hundredweight, of cattle at Chicago and Omaha in 1905, by months, and annual range at Chicago, 1892–1905.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month and year.	Native steers (1,500–1,800 pounds).	Native steers (1,200–1,500 pounds).	Poor to best cows and heifers.	Native stockers and feeders.	Texas and western steers.
January	$4.60– $6.25	$3.40– $6.35	$2.35–$5.15	$1.60–$4.35	$4.15–$4.25
February	4.75– 6.25	3.65– 6.45	2.65– 5.00	1.75– 4.50	4.25– 4.40
March	4.85– 6.25	3.75– 6.35	3.00– 5.50	2.00– 5.10	....
April	5.60– 7.00	4.70– 7.00	2.75– 6.25	2.00– 5.45	....
May	5.40– 6.80	4.40– 6.85	2.60– 5.75	2.00– 5.25	4.10– 4.75
June	4.90– 6.30	3.90– 6.35	2.40– 5.75	2.25– 5.00	3.30– 5.25
July	4.85– 6.25	3.75– 6.25	2.30– 5.35	2.00– 4.45	3.00– 5.15
August	5.00– 6.45	4.00– 6.50	2.30– 5.40	2.00– 4.50	2.75– 5.15
September	4.90– 6.50	3.65– 6.40	2.25– 5.65	2.10– 4.45	2.70– 5.15
October	4.60– 6.40	3.20– 6.40	2.30– 5.50	1.75– 4.30	2.75– 5.10
November	4.40– 6.75	3.00– 6.65	2.35– 5.50	1.50– 4.25	2.60– 4.85
December	4.65– 8.65	3.35– 8.45	2.50– 6.80	1.75– 4.85	3.00– 4.75
Annual range:					
1905	4.40–[a]8.65	3.00–[a]8.45	2.25– 6.80	1.50– 5.45	2.60– 5.25
1904	4.35–[b]10.50	3.35–[c]12.25	2.00– 7.50	1.50– 5.50	2.40– 5.65
1903	4.10– 7.55	3.35–[d]8.35	2.50– 5.50	1.50– 5.20	2.55– 5.10
1902	4.25–[e]14.50	3.60– 9.00	3.35– 8.25	1.90– 6.00	2.55– 7.65
1901	4.75– 9.30	3.60– 12.00	2.00– 8.00	1.65– 5.15	2.75– 5.75
1900	4.70–[f]15.50	3.90– 11.00	1.75– 6.00	2.10– 5.25	3.00– 5.95
1899	4.60– 8.50	4.00– 8.25	2.00– 6.85	2.50– 5.40	3.10– 6.70
1898	4.10– 6.25	3.80– 6.15	2.00– 5.40	2.50– 5.40	3.15– 5.40
1897	4.00– 6.00	3.35– 6.00	1.75– 5.40	2.40– 4.75	2.75– 4.90
1896	3.40– 6.50	2.90– 6.25	1.75– 4.40	2.20– 4.10	2.10– 5.50
1895	3.60– 6.60	2.90– 6.40	2.00– 5.75	2.25– 5.15	2.25– 5.75
1894	3.00– 6.60	2.90– 6.00	1.75– 4.40	2.00– 4.15	2.50– 5.00
1893	4.00– 6.75	2.90– 6.50	2.00– 5.00	2.25– 4.90	3.50– 6.00
1892	3.75– 7.00	2.86– 6.35	1.85– 4.00	2.00– 4.10	1.50– 5.25

[a] International show cattle.
[b] $10.50 represents the price paid for the grand championship load of the international of 1904.
[c] $12.25 represents the price paid for the champion load of Angus yearlings at the international of 1904.
[d] The top price, $8.35, was attained by one load of yearling Hereford steers, averaging 1,099 pounds.
[e] One load of Aberdeen-Angus steers, averaging 1,510 pounds, sold at $14.50.
[f] Fifteen Aberdeen-Angus steers, averaging 1,492 pounds, sold at $15.50.

OMAHA.

Month.	Native beeves.	Native cows.	Stockers and feeders.	Western steers.	Western cows.
January	$3.05–$5.35	$1.80–$4.30	$2.75–$4.00	$3.50–$4.00	$2.00–$3.20
February	3.15– 5.25	2.05– 4.10	2.40– 4.20	3.00– 3.70	....
March	3.20– 5.65	2.00– 4.65	2.80– 4.85	3.60– 4.70	3.00– 4.25
April	3.25– 6.50	2.15– 5.65	3.00– 5.00	4.00– 5.10	3.50– 4.80
May	3.75– 6.30	2.25– 5.25	3.00– 5.00	4.00– 5.10	2.25– 4.55
June	3.70– 5.95	2.00– 4.60	2.85– 4.95	4.00– 5.00	....
July	3.50– 5.40	1.75– 4.90	2.35– 4.50	3.10– 4.40	1.75– 3.85
August	3.25– 6.15	1.75– 4.65	2.50– 4.30	2.65– 5.00	1.75– 3.65
September	3.40– 5.90	1.65– 3.60	2.75– 4.35	2.60– 4.75	1.60– 3.65
October	3.10– 5.75	1.50– 4.55	2.70– 4.10	3.00– 4.80	1.25– 3.45
November	3.50– 6.50	1.75– 4.00	2.75– 4.10	2.60– 4.60	1.75– 3.20
December	3.05– 5.60	1.75– 4.25	2.25– 4.25	2.70– 4.25	1.60– 3.25

Range of prices, per hundredweight, of hogs at Chicago and Omaha in 1905, by months, and annual range at Chicago, 1892–1905.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month and year.	Heavy packing (250–500 pounds).	Mixed packing (200–250 pounds).	Light bacon (150–200 pounds).
January	\$4.35–\$5.00	\$4.25–\$4.95	\$4.10–\$4.90
February	4.60– 5.12½	4.55– 5.12½	4.40– 5.05
March	4.70– 5.55	4.60– 5.52½	4.50– 5.45
April	4.65– 5.72½	5.00– 5.72½	4.90– 5.65
May	4.40– 5.65	5.05– 5.65	5.00– 5.65
June	4.50– 5.70	5.05– 5.65	5.05– 5.62½
July	4.15– 6.10	5.25– 6.15	5.25– 6.17½
August	4.35– 6.40	5.45– 6.42½	5.65– 6.45
September	4.85– 6.20	5.00– 6.20	5.00– 6.20
October	4.40– 5.80	4.70– 5.77½	4.70– 5.70
November	4.35– 5.25	4.55– 5.25	4.50– 5.20
December	4.65– 5.35	4.60– 6.15	4.60– 5.30
Annual range:			
1905	4.35– 6.40	4.25– 6.42½	4.10– 6.45
1904	4.10– 6.30	4.15– 6.37½	4.00– 6.30
1903	3.85– 7.87½	3.90– 7.80	3.90– 7.70
1902	5.70– 8.25	5.65– 8.20	5.40– 7.95
1901	4.80– 7.37½	4.85– 7.30	4.75– 7.20
1900	4.15– 5.85	4.15– 5.82½	4.10– 5.75
1899	3.35– 4.95	3.40– 5.00	3.30– 5.00
1898	3.10– 4.80	3.10– 4.70	3.10– 4.65
1897	3.00– 4.45	3.20– 4.50	3.20– 4.65
1896	2.40– 4.45	2.75– 4.45	2.80– 4.45
1895	3.20– 5.45	3.25– 5.55	3.25– 5.70
1894	3.90– 6.75	3.90– 6.55	3.50– 6.45
1893	3.80– 8.75	4.25– 8.65	4.40– 8.59
1892	3.70– 7.90	3.60– 6.85	3.60– 6.85

OMAHA.

Month.	Heavy packing (275–500 pounds).	Mixed packing (230–270 pounds).	Light bacon (150–225 pounds).
January	\$4.35–\$4.85	\$4.35 –\$4.75	\$4.30–\$4.75
February	4.65– 5.00	4.62½– 4.87½	4.40– 4.87½
March	4.75– 5.25	4.72½– 5.17½	4.50– 5.15
April	5.15– 5.40	5.15 – 5.37½	5.10– 5.37½
May	5.10– 5.37½	5.05 – 5.32½	5.00– 5.32½
June	4.90– 5.32½	5.07½– 5.32½	5.05– 5.35
July	5.05– 5.62½	5.20 – 5.65	5.20– 5.70
August	5.50– 6.00	5.55 – 6.00	5.60– 6.10
September	4.85– 5.70	5.00 – 5.65	5.10– 5.75
October	4.75– 5.25	4.90 – 5.20	5.00– 5.37½
November	4.50– 4.90	4.60 – 4.95	4.60– 5.00
December	4.75– 5.00	4.70 – 4.95	4.65– 5.00

Range of prices, per hundredweight, of sheep at Chicago and Omaha in 1905, by months, and annual range at Chicago, 1892–1905.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month and year.	Native sheep (60–140 pounds).	Native yearlings and lambs.	Western sheep (70–140 pounds).	Western and Mexican lambs.
January	$3.50–$5.85	$4.25–$7.75	$3.75–$5.85	$6.00–$7.75
February	3.75– 6.25	5.00– 8.25	4.10– 6.00	6.25– 8.20
March	4.00– 6.35	4.50– 7.85	4.00– 6.30	5.00– 7.85
April	3.50– 6.10	4.75– 7.25	4.25– 6.25	5.50– 7.85
May	3.00– 5.50	4.00– 6.70	3.00– 6.35	4.90– 7.60
June	2.75– 5.35	4.00– 6.65	3.00– 5.60	4.50– 7.25
July	3.50– 5.75	4.75– 6.60	3.50– 5.50	5.00– 7.10
August	3.25– 5.60	5.75– 8.00	3.50– 5.65	5.75– 7.85
September	3.25– 5.50	5.75– 8.00	3.50– 5.35	6.25– 7.75
October	3.00– 6.00	5.50– 8.00	3.25– 5.75	6.25– 7.65
November	3.50– 6.10	5.50– 7.80	3.15– 6.15	5.75– 7.50
December	3.50– 6.15	4.50– 8.00	3.25– 6.25	6.50– 7.90
Annual range:				
1905	2.75– 6.35	4.00– 8.25	3.15– 6.35	4.50– 8.20
1904	1.50– 6.00	2.50– 7.75	2.00– 5.80	3.00– 7.50
1903	1.25– 7.00	2.50– 8.00	2.00– 7.00	2.50– 7.90
1902	1.25– 6.50	2.00– 7.25	1.25– 6.30	2.50– 7.60
1901	1.40– 5.25	2.00– 6.25	1.50– 5.25	2.75– 5.90
1900	2.00– 6.50	3.00– 7.60	3.00– 6.50	4.00– 7.60
1899	2.25– 5.65	3.50– 7.45	2.50– 5.55	4.00– 7.00
1898	2.00– 5.25	3.50– 7.10	3.00– 5.25	3.75– 6.75
1897	1.25– 5.25	3.00– 6.40	2.15– 5.35	3.50– 7.25
1896	1.00– 4.60	2.75– 6.50	2.15– 4.30	3.50– 6.25
1895	1.25– 5.50	2.25– 6.35	2.50– 5.35	3.00– 6.00
1894	1.00– 5.40	2.00– 6.00	2.00– 5.40	2.50– 5.80
1893	1.50– 6.25	2.25– 7.55	2.50– 6.45	2.25– 6.75
1892	2.25– 6.90	3.00– 8.25	3.00– 6.75	3.50– 7.25

NOTE.—Spring lambs sold during 1905 as high as $13, with a good many at $7 to $11.

OMAHA.

Month.	Native sheep.	Native lambs.	Western sheep.	Western lambs.
January	$3.25–$6.25	$4.25–$7.50		
February	3.00– 6.90	5.25– 7.85		
March	3.00– 6.75	5.00– 7.40		
April	2.75– 6.75	3.50– 7.50		
May	2.50– 6.00	4.00– 7.45		
June	2.50– 5.70	4.00– 6.35		
July	4.75– 6.00	5.00– 7.00	$3.00–$6.00	$4.10–$7.35
August	4.00– 5.30	5.25– 7.25	3.50– 5.55	4.75– 7.40
September	3.75– 5.25	5.50– 7.10	3.00– 5.50	4.40– 7.00
October	4.00– 6.00	5.25– 7.10	4.00– 5.75	5.50– 7.40
November	4.25– 6.00	5.00– 7.40	4.50– 6.05	5.00– 7.00
December	4.50– 6.25	5.25– 7.75	3.75– 5.25	4.40– 6.25

NOTE.—Spring lambs (March and April), $12.

Average prices of horses at Chicago and range of prices at Omaha in 1905, by months, and annual average at Chicago, 1900–1905.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month and year.	Draft horses.	Carriage teams.	Drivers.	General use.	Bussers and trammers.	Saddlers.	Southern chunks.
January	$175	$435	$155	$130	$140	$165	$72½
February	180	500	160	135	150	170	77½
March	190	505	165	140	155	180	77½
April	190	510	165	140	155	180	77½
May	185	500	165	140	155	185	72½
June	185	495	160	135	150	180	70
July	180	490	155	130	140	170	67½
August	180	485	155	130	140	170	67½
September	180	480	150	130	140	170	67½
October	180	480	150	130	140	170	67½
November	185	480	150	125	140	165	67½
December	180	475	150	120	140	165	65
Annual average:							
1905	186	486	156	132	145	172	70½
1904	177	475	150	140	140	160	64
1903	171	455	150	122	140	156	62
1902	166	450	145	117	135	151	57
1901	157	400	137	102	121	147	52
1900	155	410	140	105	115	150	50

OMAHA.

Month.	Draft horses.	Carriage teams.	Drivers.	General use.	Chunks.	Western.	Southern.
January	$150–$200	$300–$400	$75–$150	$75–$110	$85–$110	$10–$50	$40–$90
February	150– 200	300– 400	75– 150	85– 125	90– 115	10– 50	40– 90
March	150– 200	300– 400	75– 150	90– 135	90– 120	10– 50	35– 90
April	150– 225	300– 400	90– 175	75– 120	90– 125	10– 50	35– 80
May	150– 295	300– 750	90– 300	60– 90	110– 170	15– 40	30– 80
June	135– 225	300– 750	90– 300	60– 90	90– 160	15– 50	30– 75
July	125– 200	300– 400	100– 150	60– 100	85—140	15– 75	30– 70
August	130– 200	300– 400	100– 150	60– 100	80– 130	15–117	30– 70
September	130– 200	300– 400	100– 150	65– 100	75– 125	15–110	35– 75
October	140– 200	300– 450	100– 175	70– 110	85– 120	15– 95	45– 85
November	150– 250	300– 450	125– 200	80– 125	85– 125	15– 70	30–100
December	150– 250	300– 400	125– 200	80– 120	85– 125	10– 65	50– 95

THE MOVEMENT OF LIVE STOCK.

The commercial movement of our live stock is shown in the following tables, the first of which compares the total annual receipts and shipments of the various classes of animals for the past three years, while the next table shows the extent of the movement at each stock center for the year 1905.

The receipts and shipments at the various stock centers are compiled partly from the annual reports of stock-yard companies and partly from reports of inspectors of this Bureau stationed at the different abattoirs and stock centers. There are necessarily many duplications in these figures, because animals arriving at a stock center may be passed on to one or more additional centers before they are finally disposed of. However, the difference between the receipts and shipments will show, in a general way, the packing and local consumption. But it must not be inferred that the totals in the first table would show the consumption for the entire country. The latter would be considerably greater, because it would be necessary to add the local slaughtering in the smaller towns, also the farm consumption, and each of these items is quite large. On the other hand it must be remembered that the large quantities of animals and meat which go into the export trade figure in the arrivals at Chicago and other places.

Total commercial movement of live stock in United States, 1903–1905.

Animals.	1903		1904		1905	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Number.	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
Cattle	12,170,273	5,109,409	12,136,135	5,633,703	13,777,196	6,187,004
Calves	1,552,535	352,210	1,516,934	399,204	1,826,554	421,570
Hogs	31,132,634	7,773,795	38,769,524	10,433,224	40,889,462	10,631,775
Sheep	19,199,680	8,333,438	19,637,182	9,340,147	19,313,259	8,810,271
Horses and mules	615,749	494,044	733,197	626,474	820,400	689,350
Total	64,670,871	22,062,896	73,392,972	26,432,752	76,626,871	26,739,970

Summary of receipts and shipments of live stock at stock centers during the calendar year 1905.

Stock center.	Cattle.		Calves.		Hogs.		Sheep.		Horses and mules.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Number.	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
Austin, Minn	688	....	344	....	136,287	....	113	....	....	....
Baltimore, Md	171,006	113,082	25,447	6,287	866,648	160,549	328,580	179,628	9,075	8,410
Bloomington, Ill	....	....	....	....	88,066	1,240	....	....	....	....
Boston, Mass	211,801	136,352	89,233	....	1,223,325	....	312,830	48,061	(a)	(a)
Brightwood, Mass	....	....	....	....	155,233	....	....	....	....	....
Buffalo, N. Y	482,724	403,194	144,097	93,663	5,228,160	4,272,000	1,901,400	1,561,600	59,720	53,466
Cedar Rapids, Iowa	8,807	....	292	....	527,686	....	2,872	....	....	....
Chicago, Ill	3,410,469	1,410,213	380,835	26,827	7,725,738	2,028,106	4,736,558	1,355,865	127,250	108,633
Cincinnati, Ohio	235,836	65,529	69,431	10,852	1,036,099	404,433	328,950	235,082	26,116	11,242
Cleveland, Ohio	42,131	(a)	49,982	(a)	957,858	354,858	171,312	(a)	(a)	(a)
Cudahy, Wis	24,178	50	9,706	208	568,829	....	17,346	241	....	....
Davenport, Iowa	1,480	....	608	....	47,317	....	70	....	....	....
Denver, Colo	294,044	244,004	....	....	190,520	6,973	737,905	646,652	16,046	14,348
Des Moines, Iowa	21,746	....	305	....	222,722	....	95	....	....	....
Detroit, Mich	76,511	27,974	40,852	16,468	424,456	80,433	120,386	44,949	432	432
Eau Claire, Wis	502	123	....	....	41,350	....	835	155	110	25
Fort Worth, Tex	812,087	281,671	....	....	462,766	19,574	125,272	62,655	18,033	15,315
Indianapolis, Ind	299,784	126,314	....	....	1,975,816	632,245	61,561	42,019	35,970	29,215
Jersey City, N. J	305,335	257,078	108,028	58,615	700,011	....	1,103,450	751,464	4,437	919
Kansas City, Kans	2,180,491	931,522	242,091	106,123	2,507,548	52,685	1,318,968	371,540	65,582	63,500
Knoxville, Tenn [b]	14,630	....	....	....	1,586	....	4,205	131	....	....
Los Angeles, Cal	69,805	1,998	1,440	....	83,640	4,845	159,976	2,250	7,284	1,660
Louisville, Ky	126,864	64,600	26,178	7,146	819,422	371,154	245,629	208,932	6,634	6,331
Marshalltown, Iowa	....	....	....	....	104,542	69	....	....	....	....
Mason City, Iowa	405	....	....	....	27,230	....	18	....	....	....
Milwaukee, Wis	53,494	14,013	42,353	1,794	490,887	7,624	43,568	3,506	2,545	1,248
Nashville, Tenn	23,252	4,416	....	....	159,818	79,157	28,119	9,429	81,198	80,657
National Stock Yards, Ill	1,124,003	358,841	....	....	2,026,403	487,137	645,104	90,136	178,257	158,708
Nebraska City, Nebr	1,294	1,186	44	....	290,598	....	656	591	162	162
New Brighton, Minn	137,169	138,009	....	....	921	921	498,720	478,522	5,668	5,524
New Haven, Conn	....	....	....	....	168,260	....	....	....	....	....
Newport News, Va	16,963	[c] 16,613	....	....	....	....	....	....	....	....
New York, N. Y	87,853	16,840	276,618	24,374	875,916	....	398,563	102,941	37,385	8,445
Norfolk, Va	5,436	[c] 3,489	....	....	4,784	4,300	1,725	....	17,326	12,570
Omaha, Nebr	1,026,392	314,978	....	....	2,293,956	172,235	1,970,502	1,015,754	45,422	43,272
Ottumwa, Iowa	9,196	....	2,346	....	601,109	1,039	1,899	....	....	....
Philadelphia, Pa	210,104	111,869	50,808	2,494	321,931	12,794	448,316	36,100	15,646	8,947
Pittsburg, Pa	458,225	301,137	121,946	30,388	1,911,260	920,029	755,752	389,985	....	....
Portland, Me [c]	43,061	43,021	....	....	....	....	28,242	28,218	....	....
Portland, Oreg	36,951	23,079	....	....	30,729	12,485	150,885	93,810	2,534	2,145
Quincy, Ill	2,930	....	738	....	46,939	....	625	....	....	....
Richmond, Va	21,402	3,087	....	....	59,146	488	18,282	2,234	....	....
St. Joseph, Mo	501,200	133,221	45,488	9,450	1,900,433	71,376	980,834	301,186	31,565	31,023

St. Louis, Mo	122,880	24,569	12,776	....	510,886	89,465	54,109	4,408	....	....
St. Paul, Minn	435,028	329,316	53,537	22,339	855,187	33,198	818,437	612,341	5,561	5,561
San Diego, Cal	5,374	....	60	....	3,938	....	13,769	....	520	....
San Francisco, Cal	165,034	360	19,615	2	235,147	1,281	543,704	5	3	165
Seattle, Wash	31,235	1,312	....	....	49,300	....	169,069	48,972	[d] 2,500	[d] 400
Sioux City, Iowa	394,267	256,888	8,688	4,517	1,298,685	278,785	56,582	39,108	14,983	14,692
Tacoma, Wash	22,137	727	1,103	23	27,758	326	1,640			
Topeka, Kans	6,566	6	1,365	....	111,875	....	[e] 241	....	....	....
Waterloo, Iowa	510	....	200	....	47,594	682	25	....	....	....
Wichita, Kans	43,916	26,323	....	....	293,491	69,289	7,590	1,801	2,436	2,335
Worcester, Mass	....	....	....	....	149,656	....	....	....	....	....
Total	13,777,196	6,187,004	1,826,554	421,570	40,889,462	10,631,775	19,313,259	8,810,271	820,400	689,350

[a] No record kept. [b] Inspection discontinued November 20, 1905. [c] Exports. [d] Estimated. [e] Includes 37 goats.

REGISTERED LIVE STOCK IN THE UNITED STATES DECEMBER 31, 1905.

The Bureau continues to publish the estimates of secretaries of American pedigree-record associations of the number of registered animals living on December 31 of each year, which was a feature of the Twentieth and Twenty-first Annual Reports. Using these estimates as a basis, the probable percentages of purebred and registered animals to the total number were calculated. For 1903 the figures of the Twelfth Census for total number of animals were used, but for later years those of the Bureau of Statistics of this Department were used. In each year an estimate had to be made for the probable number of animals living and recorded with associations whose secretaries failed to report or whose reports gave no accurate data on this point. For 1905 the allowances were as follows: Horses, 140,000; dairy cattle, 145,000; sheep, 70,000; hogs, 6,000. These estimates were made by taking the sum of registered animals for which estimates were not furnished, and calculating the number of living animals as approximately one-half the total number registered with horses and beef cattle, and one-fourth with sheep and hogs. It will be noticed that this is rather smaller than the estimates generally furnished by the secretaries. In estimating the number of dairy cattle the figures for Ayrshire, Dutch Belted, Guernsey, Holstein-Friesian, and Jersey were used, all others being classed as beef cattle.

On this basis the number of registered animals in the country living on December 31, 1905, was approximately as follows:

Horses	190,000
Dairy cattle	218,000
Beef ("other") cattle	486,000
Sheep	230,000
Hogs	230,000

Using the estimates of the Bureau of Statistics and making an allowance of 650,000 as the probable number of dairy bulls in the country (about 1 bull to 30 cows), we find the relative proportion of registered animals to total animals living on December 31, 1905, to be as follows:

	Per cent.
Horses	1.02
Dairy cattle	1.07
Beef ("other") cattle	1.05
Sheep	.46
Hogs	.45

This gives in round numbers about 1 per cent of the horses and cattle in the country as purebred and registered and one-half of 1 per cent of the hogs and sheep.

A comparison with the estimates for previous years is interesting:

Per cent of total number of animals registered and living December 31 for three years.

Class.	1903.	1904.	1905.
Horses	0.94	1.08	1.02
Dairy cattle	[a] 2.00	1.27	1.07
Beef ("other") cattle	.84	1.04	1.05
Sheep	.47	.49	.46
Hogs	.29	.38	.45

[a] Estimate of Maj. Henry E. Alvord, late Chief of the Dairy Division. See Bureau of Animal Industry Bulletin No. 55, p. 13.

These figures are principally interesting as showing the small number of animals which are suitable for breeding purposes. They are not absolutely accurate and it is doubtful whether they could be made so, on account of the difficulty of obtaining full reports of deaths of animals from breeders.

The thanks of the Bureau are due those secretaries who furnished estimates. Estimates are shown only for associations certified by the Department under the provisions of Bureau of Animal Industry Order No. 136. The detailed reports follow.

Registered live stock in the United States on December 31, 1905.

[Compiled from estimates and statements furnished by the secretaries of the pedigree-record associations.]

Breed.	Book of record.	Animals registered Dec. 31, 1905.			Registered animals living Dec. 31, 1905.		
		Male.	Female.	Total.	Male.	Female.	Total.
HORSES.		*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
American Trotter	American Trotting Register	42,597	152,700	195,297	No accurate data.		
Belgian Draft	American Register of Belgian Draft Horses	2,056	266	2,322	2,055	265	2,320
Cleveland Bay	American Cleveland Bay Studbook	1,236	502	1,738	1,050	400	1,450
Clydesdale	American Clydesdale Studbook			12,370	No accurate data.		
French Draft	National Register of French Draft Horses	9,000	5,000	14,000	No accurate data.		
French Coach	French Coach Horse Register	130	4	134	125	4	129
German Coach	German, Hanoverian, and Oldenburg Coach Horse Studbook	1,656	246	1,902	1,500	225	1,725
Hackney	American Hackney Studbook	810	1,595	2,405	700	1,450	2,150
Morgan	American Morgan Register	[a] 5,021	2,800	7,821	3,765	2,100	5,865
Oldenburg	Oldenburg Coach Horse Register	260	23	283	190	14	204
Percheron	Percheron Studbook of America	1,640	1,460	3,100	[b] 19,000	[b] 12,000	[b] 31,000
Do	Percheron Register	928	102	1,030	913	94	1,007
Saddle Horse	American Saddle Horse Register	[c] 2,529	3,549	6,078	No accurate data.		
Shetland Pony	American Shetland Pony Club Studbook	2,300	3,500	5,800	2,000	2,500	4,500
Shire	American Shire Horse Studbook	6,062	2,148	8,210	No accurate data.		
Suffolk	American Suffolk Horse Studbook	159	88	247			150
Thoroughbred	American Studbook			45,309	No accurate data.		
ASSES.							
Jacks and jennets	American Jack Stock Studbook	1,000	750	1,750	750	500	1,250
CATTLE.							
Aberdeen-Angus	American Aberdeen-Angus Herdbook	38,188	48,604	86,792	27,496	34,994	62,490
Ayrshire	Ayrshire Record	9,689	20,883	30,572	No accurate data.		
Devon	American Devon Record	8,084	13,717	21,801	3,500	10,000	13,500
Dutch Belted	Dutch Belted Cattle Herdbook	573	1,265	1,838	No accurate data.		
Galloway	American Galloway Herdbook	16,620	11,080	27,700	8,370	6,480	14,850
Guernsey	Herd Register of the American Guernsey Cattle Club	10,683	19,889	30,572	6,000	12,000	18,000
Hereford	American Hereford Record	112,780	115,620	228,400	45,000	60,000	105,000
Holstein-Friesian	Holstein-Friesian Herdbook	46,031	95,037	141,068	14,199	31,756	45,955
Jersey	Herd Register of the American Jersey Cattle Club	71,907	193,978	265,885	No accurate data.		
Polled Durham	American Polled Durham Herdbook	5,403	6,460	11,863	3,935	4,845	8,780
Red Polled	Red Polled Herdbook	14,601	25,006	39,607	5,500	10,500	16,000
Shorthorn	American Shorthorn Herdbook	249,800	391,600	641,400	87,430	176,220	263,650
Sussex	American Sussex Register	78	185	263	50	100	150
Brown Swiss	Swiss Record	2,159	3,150	5,309	300	1,500	1,800

[a] Estimate for 1904. [b] These numbers include animals in the old American Percheron Studbook. [c] Includes geldings.

Registered live stock in the United States on December 31, 1905—Continued.

Breed.	Book of record.	Animals registered Dec. 31, 1905.			Registered animals living Dec. 31, 1905.		
		Male.	Female.	Total.	Male.	Female.	Total.
SHEEP.		*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
Cheviot	American Cheviot Sheep Flock Book			10,700	575	2,650	3,225
Cotswold	American Cotswold Record			36,610			14,000
Dorset Horn	Continental Dorset Club Record	1,395	3,703	5,098	1,000	2,800	3,800
Hampshire Down	Hampshire Down Flock Record	5,573	12,844	18,417	3,000	9,000	12,000
Leicester	American Leicester Record	3,538	5,437	8,975	2,972	4,567	7,539
Lincoln	National Lincoln Sheep Breeders' Record	5,754	8,246	14,000	4,100	5,900	10,000
Merino (Delaine)	Dickinson Spanish Merino Sheep Register			9,401			6,900
Do	Improved Delaine Merino Register	8,000	14,300	22,300	2,500	8,000	10,500
Do	National Delaine Merino Register	6,805	11,599	18,404	1,500	5,000	6,500
Merino (French)	American Rambouillet Record			34,075	No accurate data.		
Merino (German)	International Von Homeyer Rambouillet Club Record	162	191	353	105	175	280
Merino (Spanish)	Register of the Michigan Merino Sheep Breeders' Association	12,550	37,700	50,250	400	4,300	4,700
Do	Register of the New York State American Merino Sheep Breeders' Association	7,916	11,912	19,828	280	1,875	2,155
Do	Register of the Ohio Spanish Merino Sheep Breeders' Association	16,691	33,384	50,075	2,842	8,035	10,877
Do	Register of the Standard American Merino Sheep Breeders' Association	1,275	1,500	2,775	100	200	300
Do	Register of the Vermont Merino Sheep Breeders' Association			217,850	No accurate data.		
Oxford Down	American Oxford Down Record			[a] 32,798	No accurate data.		
Shropshire	American Shropshire Sheep Record	100,000	134,000	234,000	20,000	40,000	60,000
Southdown	American Southdown Record			19,933			10,200
Suffolk	American Suffolk Flock Record			1,013			550
HOGS.							
Berkshire	American Berkshire Record			88,080			33,000
Cheshire	Cheshire Herdbook	1,225	2,115	3,340	275	575	850
Chester, Ohio Improved	Ohio Improved Chester Record	3,403	9,000	12,403	1,800	6,200	8,000
Duroc-Jersey	American Duroc-Jersey Record	8,026	18,450	26,476	No accurate data.		
Do	National Duroc-Jersey Record	21,800	55,000	76,800			30,000
Hampshire (Thin Rind)	American Hampshire Record	294	540	834	155	387	542
Poland-China	American Poland-China Record	52,331	130,620	182,951	27,000	68,000	95,000
Do	National Poland-China Record	32,000	72,000	104,000	10,000	23,000	33,000
Do	Southwestern Poland-China Record	691	1,030	1,721	400	600	1,000
Do	Standard Poland-China Record	39,008	93,234	132,242	2,000	18,000	20,000
Tamworth	American Tamworth Swine Record	671	2,013	2,684	200	1,400	1,600
Yorkshire	American Yorkshire Record	2,860	3,640	6,500	2,000	3,200	5,200

[a] Estimate for 1904.

CONTAGIOUS DISEASES OF ANIMALS IN FOREIGN COUNTRIES.

The status of contagious diseases of domestic animals in a number of foreign countries is shown in the tables which follow. The figures are compiled from official reports of the countries in question, and, with three exceptions, in which annual totals for a series of years are given, show the condition each month during the year 1905.

A cursory review of the tables, taken in connection with those of the previous year, shows that the most salient feature is the very marked increase in the cases of foot-and-mouth disease and of swine diseases in Italy. The table shows the total of the former for 1905 to have been 75,908, whereas the total for the previous year was but 5,648. The infectious diseases of swine increased 100 per cent, going from 13,107 in 1904 to 26,307 in 1905. The Italians were, however, successful in combating anthrax, the total cases of this disease having considerably decreased.

The Belgian reports indicate an increase of 50 per cent in the cases of anthrax. This country issues a separate statement in regard to tuberculosis. The yearly summary of cases of tuberculosis in Belgium shows that there were 19,225 cases during 1905, of which 14,314 were passed at slaughter as fit for consumption, while 4,911 were condemned as unfit.

The German reports show an increase in hog cholera and swine plague and a decrease in foot-and-mouth disease.

The table shows the situation in Great Britain to be very encouraging to the authorities, there being a substantial decrease all along the line. In Ireland the condition is improved as compared with the previous year.

Complete reports from Canada for the entire year 1905 are not yet available, but from a report of the veterinary director-general covering the fiscal year ended October 31, 1905, it appears that the most serious matter dealt with by his department during the year has been the suppression of glanders, but the hope is expressed that it will soon be possible to have this disease under control. Satisfactory progress is reported in regard to other diseases, the efforts to bring about the eradication of hog cholera having met with much success, as shown by the total number of outbreaks for the year, which were only 47, as compared with 151 for the year before and 360 and 313, respectively, for 1903 and 1902.

Regarding the recent outbreak of cattle plague in Egypt, it appears from a report received from Consul-General Iddings, of Cairo, Egypt, that the outbreak of cattle plague which broke out in that country in 1903 ceased in August, 1905. A detailed account of the beginnings of this outbreak will be found in the Twentieth Annual Report of this Bureau (1903) on pages 449–451. The total number of deaths from the plague is reported as 147,437, of which 689 occurred in 1905.

AUSTRIA.

Number of premises infected with contagious diseases of animals in Austria at monthly periods during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	1	3	7	5	7	10
Blackleg	3		1			1
Rabies	15	31	37	46	49	44
Glanders and farcy	19	16	11	14	14	14
Foot-and-mouth disease	181	164	94	42	17	16
Scab	33	34	76	114	133	134
Erysipelas of swine	307	245	204	163	43	150
Hog cholera and swine plague	462	372	215	158	183	179
Blisters upon genitals	21	31	49	210	301	310

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Anthrax	6	37	25	58	23	11
Blackleg	5	14	15	5	4	5
Rabies	31	20	19	21	24	31
Glanders and farcy	11	15	18	21	23	23
Foot-and-mouth disease	512	420	116	167	193	26
Scab	150	109	82	80	39	23
Erysipelas of swine	361	815	660	348	310	143
Hog cholera and swine plague	291	348	314	226	167	143
Blisters upon genitals	118	46	27	36	17	25

BELGIUM.

Cases of contagious diseases of animals in Belgium during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy	2		2		4	6
Rabies	6	7	14	15	9	15
Anthrax	50	74	91	62	59	61
Blackleg	20	22	20	17	33	37
Foot rot		50	24			
Sheep scab			9			
Foot-and-mouth disease	5	24	4			

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Glanders and farcy	5	4	11	4	1	8	47
Rabies	13	34	21	14	4	14	166
Anthrax	68	54	71	50	61	53	754
Blackleg	16	36	39	26	16	20	302
Foot rot		26					100
Sheep scab							9
Foot-and-mouth disease							33

BULGARIA.

Annual status of contagious diseases of domestic animals in Bulgaria for the years 1894–1903.

Diseases.	1894.	1895.	1896.	1897.	1898.
Sheep pox:					
Cases	57,272	103,448	75,166	300,098	187,744
Deaths	2,866	5,554	4,674	20,510	13,356
Angina infectiosa (barbone):					
Cases	93	698	685	573	335
Deaths	61	562	472	239	264
Anthrax:					
Cases	219	558	1,103	849	886
Deaths	175	503	822	737	663
Blackleg:					
Cases	....	38	12	4	9
Deaths	....	36	12	....	9
Glanders and farcy:					
Died	3	8	1	14	1
Slaughtered	14	36	91	115	164
Rabies:					
Cases	82	26	192	348	703
Died and killed	70	26	171	211	660
Scab:					
Cases	3,650	2,931	2,500	23,489	29,124
Deaths	13	16	98	27	500
Foot-and-mouth disease:					
Cases	50,603	286	37,274	792,520	291,942
Deaths	99	1	84	8,468	772
Erysipelas of swine:					
Cases	....	476	4,468	1,049	393
Deaths	....	310	2,305	415	228
Infectious pneumo-enteritis of swine:					
Cases	....	....	1,975	4,819	728
Deaths	....	....	1,206	3,142	306

Diseases.	1899.	1900.	1901.	1902.	1903.
Sheep pox:					
Cases	102,618	26,226	32,937	125,818	419,873
Deaths	6,186	1,203	1,190	2,566	4,422
Angina infectiosa (barbone):					
Cases	1,622	1,112	1,411	2,395	1,994
Deaths	973	795	1,030	1,644	1,342
Anthrax:					
Cases	7,315	2,299	246	1,489	551
Deaths	1,664	1,790	230	1,406	539
Blackleg:					
Cases	49	106	73	25	44
Deaths	33	50	61	21	42
Glanders and farcy:					
Died	3	12	12	33	23
Slaughtered	81	179	197	419	347
Rabies:					
Cases	217	275	628	894	625
Died and killed	206	253	624	888	625
Scab:					
Cases	21,264	18,638	45,447	36,799	27,540
Deaths	66	139	292	167	915
Foot-and-mouth disease:					
Cases	364	76	281,577	1,708	....
Deaths	....	....	40	1	....
Erysipelas of swine:					
Cases	407	170	130	1,772	708
Deaths	176	65	60	1,159	444
Infectious pneumo-enteritis of swine:					
Cases	3,220	906	959	5,310	19,506
Deaths	1,778	586	456	2,901	6,991

DENMARK.

Outbreaks of contagious diseases of animals in Denmark during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	16	17	23	23	21	10	6	5	9	15	15	18	178
Cerebro-spinal fever	4	1	5	1	2	....	....	1	6	4	3	6	33
Glanders and farcy	....	....	....	....	4	8	1	2	1	....	....	....	16
Malignant catarrhal fever	9	6	10	6	14	5	11	4	9	2	3	5	84
Erysipelas of swine (acute)	6	5	2	4	6	9	14	29	22	37	21	11	166
Hog cholera	....	....	3	2	4	2	3	1	3	3	1	2	24

FRANCE.

Status of contagious diseases of domestic animals in France during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Pleuro-pneumonia:													
Number of outbreaks	1	3	....	1	....	....	....	....	2	....	....	....	7
Number slaughtered	14	13	....	4	....	....	....	....	25	....	....	....	56
Foot-and-mouth disease (outbreaks)	4	1	2	3	....	....	1	1	1	....	3	3	18
Sheep scab (outbreaks)	15	24	45	10	22	38	4	7	3	3	25	16	212
Sheep pox (outbreaks)	2	3	....	1	....	4	....	3	2	13	2	2	32
Anthrax (outbreaks)	25	28	38	41	55	42	40	40	61	57	32	27	486
Blackleg (outbreaks)	79	47	71	53	73	64	61	76	70	105	116	96	911
Glanders and farcy:													
Number of outbreaks	45	56	64	64	58	85	52	71	50	53	69	47	714
Horses slaughtered	73	68	64	90	73	96	122	103	45	64	63	62	923
Erysipelas of swine (outbreaks)	17	11	16	21	33	31	38	56	54	51	49	35	412
Rabies (cases)	173	199	235	260	227	274	216	161	177	149	161	136	2,368
Infectious pneumo-enteritis (of swine)	19	10	12	7	10	20	9	6	7	10	13	9	132

GERMANY.

Number of localities and farms infected with diseases of domestic animals in Germany on the first day of each month during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy:						
Localities	59	52	49	36	32	29
Farms	65	54	49	40	42	44
Foot-and-mouth disease:						
Localities	191	86	41	38	28	12
Farms	478	214	49	70	38	19
Swine plague (including hog cholera):						
Localities	2,946	3,133	3,389	3,483	3,514	3,431
Farms	4,169	4,305	4,583	4,511	4,513	4,512

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Glanders and farcy:						
Localities	40	37	41	51	52	47
Farms	57	61	70	83	82	75
Pleuro-pneumonia:						
Localities						2
Farms						2
Foot-and-mouth disease:						
Localities	9	10	9	5	2	5
Farms	48	33	10	9	2	5
Swine plague (including hog cholera):						
Localities	3,102	3,016	3,120	2,960	3,134	3,186
Farms	4,234	4,015	4,019	3,977	4,197	4,289

GREAT BRITAIN.

Annual status of animal diseases in Great Britain, 1901–1905.

Diseases.	1901.	1902.	1903.	1904.	1905.
Foot-and-mouth disease:					
Outbreaks	12				
Cases	669				
Glanders and farcy:					
Outbreaks	1,347	1,155	1,456	1,529	1,214
Cases	2,370	2,040	2,499	2,658	2,068
Sheep scab:					
Outbreaks	1,537	1,632	1,792	1,418	918
Cases	22,674	21,523	24,431		
Anthrax:					
Outbreaks	651	678	767	1,049	970
Cases	971	1,032	1,143	1,589	1,317
Rabies (cases)	1				
Swine fever:					
Outbreaks	3,140	1,688	1,478	1,196	817
Swine slaughtered (diseased or exposed)	15,237	8,263	7,933	5,603	3,876

HUNGARY.

Number of premises infected with diseases of domestic animals in Hungary at monthly periods during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	9	7	9	16	15	52
Rabies	36	60	86	77	77	88
Glanders and farcy	19	18	23	34	63	54
Foot-and-mouth disease	288	120	45	30	19	44
Sheep pox	68	65	44	39	35	33
Blisters upon genitals	45	29	37	57	154	246
Scab	127	498	564	793	1,178	1,288
Erysipelas of swine	476	285	132	294	194	849
Swine plague	523	409	290	247	313	636

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Anthrax	19	65	52	55	48	23
Rabies	83	76	78	36	33	39
Glanders and farcy	52	49	59	49	30	25
Foot-and-mouth disease	148	532	783	837	707	429
Sheep pox	28	39	58	90	98	100
Blisters upon genitals	365	288	201	41	29	20
Scab	1,106	805	679	396	294	260
Erysipelas of swine	1,715	1,809	1,445	770	451	347
Swine plague	1,058	1,373	1,270	904	667	568

IRELAND.

Number of outbreaks and cases of contagious diseases of animals in Ireland, annually, 1901–1905.

Diseases.	1901.	1902.	1903.	1904.	1905.
Anthrax:					
Outbreaks	2	....	4	4	4
Cases	4	....	11	7	4
Glanders and farcy:					
Outbreaks	5	10	5	11	30
Cases	6	43	7	34	106
Rabies:					
Cases	2	....	2	....	....
Sheep scab:					
Outbreaks	545	613	655	486	389
Cases	7,564	7,818	8,306	6,433	4,253
Swine fever:					
Outbreaks	220	166	175	181	46
Cases	1,325	993	1,079	931	318
Epizootic lymphangitis:					
Outbreaks	....	....	....	1	10
Cases	....	....	....	1	25
Parasitic mange:					
Outbreaks	174	161	195	162	169
Cases	331	221	295	252	322

ITALY.

Number of cases of contagious diseases of animals in Italy during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	102	54	166	102	99	105
Blackleg	39	7	17	34	12	12
Foot-and-mouth disease	6,857	7,184	5,833	4,466	3,672	2,526
Tuberculosis	50	53	66	27	38	81
Glanders and farcy	33	21	28	15	18	69
Sheep pox	5	12	17	....	9	7
Rabies	3	23	31	18	69	51
Scab	931	1,947	4,232	8,196	343	3,912
Contagious mammitis of sheep and goats	332	1,800	945	322	547	3,190
Infectious disease of swine	1,056	1,351	1,405	1,878	2,589	5,526

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.[a]	Total.
Anthrax	330	805	457	202	272	71	2,765
Blackleg	65	68	24	52	40	10	380
Foot-and-mouth disease	3,424	4,709	4,196	5,361	14,013	13,667	75,908
Tuberculosis	4	20	51	72	46	64	572
Glanders and farcy	48	50	58	34	31	34	439
Sheep pox	3	....	....	....	....	....	53
Rabies	23	14	16	20	35	7	310
Scab	12,057	2,200	4,530	28	6,006	497	44,879
Barbone of buffalo	4	....	....	2	6	....	12
Contagious mammitis of sheep and goats	5,788	4,016	5,223	....	....	....	22,163
Infectious disease of swine	3,202	3,729	1,645	1,261	1,762	903	26,307

[a] Returns not received for one week in December.

THE NETHERLANDS.

Cases of contagious diseases of domestic animals in the Netherlands during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.[a]
Glanders and farcy	4	2	3	3	3	....
Sheep scab	104	20	40	50	42	....
Foot rot of sheep	36	2	18	10	4	....
Anthrax	77	60	70	50	62	....
Erysipelas of swine	19	4	15	19	11	....

Diseases.	July.[a]	Aug.	Sept.[a]	Oct.	Nov.	Dec.	Total.[b]
Glanders and farcy	....	3	....	2	3	8	31
Sheep scab	....	11	....	50	29	54	400
Foot rot of sheep	....	28	....	10	42	85	235
Anthrax	....	32	....	33	30	54	468
Erysipelas of swine	....	502	....	29	15	7	621

[a] No returns received for June, July, and September.
[b] For nine months.

NORWAY.

Cases of contagious diseases of animals in Norway during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	50	53	77	42	62	37
Blackleg	1	6	1	3	1	5
Braxy of sheep	11	14	9	7	13	....
Malignant catarrhal fever	28	29	38	42	44	43
Infectious pneumo-enteritis of swine	....	....	....	....	....	3

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	18	33	20	40	40	36	508
Blackleg	....	8	4	5	2	4	40
Braxy of sheep	....	....	3	11	6	4	76
Malignant catarrhal fever	32	35	32	23	24	33	403
Infectious pneumo-enteritis of swine	....	....	....	....	....	....	3

SWEDEN.

Outbreaks of contagious diseases of animals in Sweden during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	19	23	26	34	33	42
Blackleg	3	1	5	4	2	6
Hog cholera	....	....	....	....	2	2
Swine plague	2	2	11	1	3	....

Diseases.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	109	35	10	14	16	14	375
Blackleg	8	7	6	7	2	4	55
Hog cholera	2	....	....	....	....	....	6
Swine plague	3	1	2	....	3	1	29

SWITZERLAND.

Number of cases of contagious diseases of animals in Switzerland during 1905.

Diseases.	Jan.	Feb.	Mar.	Apr.	May.	June.
Blackleg	14	13	18	15	34	100
Anthrax	20	31	28	23	12	24
Foot-and-mouth disease	900	237	22	28	818	1,092
Swine erysipelas and swine plague	582	370	672	340	377	661
Sheep scab	66	....	2	452	....	9
Rabies	....	....	....	....	1	....
Glanders and farcy	....	....	2	1	....	6

Diseases.	July.	Aug.	Sept.	Oct.	Nov.-Dec.	Total.
Blackleg	173	216	175	48	39	845
Anthrax	18	28	32	18	39	273
Foot-and-mouth disease	709	767	142	....	65	4,780
Swine erysipelas and swine plague	565	842	786	543	990	6,728
Sheep scab	....	....	410	....	9	948
Rabies	....	....	....	....	....	1
Glanders and farcy	2	1	....	....	3	15

PUBLICATIONS OF THE BUREAU DURING 1905.

For several years it has been the practice to reprint in the annual report some of the more important bulletins and circulars issued by the Bureau during the year. It has been decided, however, to omit from the present volume practically all material which has been printed in another form, with the exception of the report of the chief and the regulations. In order that the reader may be informed of the Bureau's publications issued during 1905 the following list is presented.

Applications for publications for which a price is affixed should be addressed, and the amount inclosed, to the Superintendent of Documents, Government Printing Office, Washington, D. C. Remittances should be made by postal money order, express order, or New York draft, payable to the Superintendent of Documents. Currency may be sent at the sender's risk. Postage stamps and personal checks will not be accepted.

Publications for which no price is shown will be sent free of charge, if still available, on application to the Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

REPORTS.

Twenty-first Annual Report of the Bureau of Animal Industry for the year 1904. Pp. 632, pls. 48, figs. 50. Price 55 cents.

Report of the Chief of the Bureau of Animal Industry for [the fiscal year ended June 30] 1904. By D. E. Salmon. Pp. iii, 43–67.

BULLETINS.

Bulletin No. 39. Index-Catalogue of Medical and Veterinary Zoology. By Ch. Wardell Stiles, consulting zoologist, and Albert Hassall, veterinary inspector. Part 9. [Authors: H to Heim.] Pp. 661–706. Price 5 cents.

Same, Part 10. [Authors: Heim to Hyrtl.] Pp. 707–782. Price 5 cents.

Same, Part 11. [Authors: I to a Juvattis.] Pp. 783–838. Price 5 cents.

Same, Part 12. [Authors: K to Kohl.] Pp. 839–902. Price 5 cents.

Same, Part 13. [Authors: Kohl to Kynsey.] Pp. 903–950. Price 5 cents.

Bulletin No. 52. Experiments Concerning Tuberculosis under the Supervision of the Biochemic Division. Part II. The Comparative Virulence of Human and Bovine Tubercle Bacilli for Some Large Animals. By E. A. de Schweinitz and Marion Dorset, Biochemic Division, and E. C. Schroeder, Superintendent of Experiment Station. Pp. vi, 31–100, pls. 26. Price 65 cents.

Same, Part III. Studies in Immunity from Tuberculosis. By E. C. Schroeder, Superintendent of Experiment Station. The Persistence of Tubercle Bacilli in Tissues of Animals after Injection. By E. C. Schroeder and W. E. Cotton, Experiment Station. Pp. v, 101–125. Price 5 cents.

Bulletin No. 66. The Gid Parasite (*Cœnurus cerebralis*): Its Presence in American Sheep. By B. H. Ransom, Scientific Assistant in Charge of the Zoological Laboratory. Pp. 23, figs. 12. Price 5 cents.

Bulletin No. 67. Necrotic Stomatitis. With Special Reference to its Occurrence in Calves (Calf Diphtheria) and Pigs (Sore Mouth). By John R. Mohler, Chief of Pathological Division, and George Byron Morse, Assistant in Pathological Division. Pp. 48, pls. 5. Price 10 cents.

Bulletin No. 68. Information Concerning the Milch Goats. By George Fayette Thompson, Editor, Bureau of Animal Industry. Pp. 87, pls. 16, figs. 7. Price 15 cents.

Bulletin No. 69. The External Parasites of Hogs, being Articles on the Hog Louse (*Hæmatopinus suis*) and Mange, or Scabies, of Hogs. By Earle C. Stevenson, Zoological Laboratory. Pp. 44, figs. 29. Price 5 cents.

Bulletin No. 70. The Milk Supply of Twenty-nine Southern Cities. By C. F. Doane, Special Agent of Dairy Division. Pp. 40. Price 5 cents.

Bulletin No. 71. The Camembert Type of Soft Cheese in the United States. By H. W. Conn, Charles Thom, A. W. Bosworth, W. A. Stocking, jr., and T. W. Issajeff. Pp. 29, pls. 2. Price 5 cents.

Bulletin No. 72. The Etiology of Hog Cholera. By M. Dorset, B. M. Bolton, and C. N. McBryde, Biochemic Division. Pp. 101, pls. 6. Price 10 cents.

Bulletin No. 73. The Bacteria of Pasteurized and Unpasteurized Milk under Laboratory Conditions. By Lore A. Rogers, Expert in Dairy Bacteriology. Pp. 32. Price 5 cents.

Bulletin No. 74. Energy Values of Red Clover Hay and Maize Meal. Investigations with the Respiration Calorimeter, in Cooperation with the Pennsylvania State College Agricultural Experiment Station. By Henry Prentiss Armsby and J. August Fries. Pp. 64, diagrams 3. Price 5 cents.

Bulletin No. 75. Records of Dairy Cows in the United States. By Clarence B. Lane, Assistant Chief of Dairy Division. Pp. 184, pls. 17, figs. 6. Price 15 cents.

Bulletin No. 76. The Score Card in Stock Breeding. By George M. Rommel, Animal Husbandman. Pp. 54, figs. 7. Price 5 cents.

Bulletin No. 77. Cattle, Sheep, and Hog Feeding in Europe. By Willard John Kennedy, Professor of Animal Husbandry, Iowa State College of Agriculture, and Vice-Director Iowa Experiment Station. Pp. 98. Price 5 cents.

Bulletin No. 78. Texas Fever (otherwise known as Tick Fever, Splenetic Fever, or Southern Cattle Fever), with Methods for its Prevention. By John R. Mohler, Chief of Pathological Division. Pp. 48, pls. 3, figs. 3. Price 10 cents.

Bulletin No. 79. The Determination of Generic Types, and a List of Roundworm Genera, with their Original and Type Species. By Ch. Wardell Stiles, Consulting Zoologist, and Albert Hassall, Assistant in Zoology. Pp. 150. (Out of print.)

Bulletin No. 80. The Synonymy of Tænia, *T. crassicollis*, *T. marginata*, *T. serrata*, *T. cœnurus*, *T. serialis*, and Echinococcus. By Ch. Wardell Stiles, Consulting Zoologist, and Earle C. Stevenson, Assistant, Division of Zoology. Pp. 14. Price 5 cents.

Bulletin No. 81. The Milk Supply of Boston, New York, and Philadelphia. By George M. Whitaker, Dairy Inspector. Pp. 62, figs. 4. Price 5 cents.

CIRCULARS.

Circular No. 5, revised. Blackhead, or Infectious Entero-hepatitis, in Turkeys. Pp. 8, figs. 7.

Circular No. 65. Ophthalmia in Cattle. By M. R. Trumbower; revised by Leonard Pearson. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 2.

Circular No. 66. Osteomalacia, or Creeps, in Cattle. By V. T. Atkinson; revised by John R. Mohler. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 2.

Circular No. 67. Abortion, or Slinking the Calf. By James Law, Professor of Veterinary Science, etc., in Cornell University. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 11.

Circular No. 68. Diseases of the Stomach and Bowels of Cattle. By A. J. Murray; revised by Leonard Pearson. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 10.

Circular No. 69. Texas Fever, or Southern Cattle Fever. By D. E. Salmon and Theobald Smith; revised by D. E. Salmon and John R. Mohler. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 13.

Circular No. 70. Tuberculosis of Cattle. By D. E. Salmon and Theobald Smith; revised by D. E. Salmon and John R. Mohler. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 28.

Circular No. 71. Anthrax in Cattle, Horses, and Men. By D. E. Salmon and Theobald Smith; revised by D. E. Salmon and John R. Mohler. (Reprint from Special Report on Diseases of Cattle, 1904, and Special Report on Diseases of the Horse, 1903.) Pp. 10.

Circular No. 72. New Facts Concerning the Etiology of Hog Cholera. By E. A. de Schweinitz and M. Dorset, Biochemic Division. (Reprint from Twentieth Annual Report, Bureau of Animal Industry, 1903.) Pp. 8. (Out of print.)

Circular No. 73. Distribution and Magnitude of the Poultry and Egg Industry. By George F. Thompson, Editor, Bureau of Animal Industry. (Condensed from Nineteenth Annual Report, Bureau of Animal Industry, 1902.) Pp. 22, fig. 1.

Circular No. 74. United States and State Standards for Dairy Products, 1905. Pp. 2.

Same, revised. Pp. 2.

Circular No. 75. Feeding Fat into Milk; or the Effect of the Food upon the Quality and Quantity of Milk Produced. (1) Recent Experimental Inquiry upon Milk Secretion. By Charles D. Woods, Director Maine Agricultural Experiment Station. (2) The Physiology of Milk Secretion. By A. W. Bitting, Indiana Agricultural Experiment Station. (Reprint from Nineteenth Annual Report, Bureau of Animal Industry, 1902.) Pp. 43.

Circular No. 76. Dairy Methods in Great Britain, Ireland, Denmark, Holland, Channel Islands, France, Austria-Hungary, Germany, and Switzerland. By Willard John Kennedy, Professor of Animal Husbandry, Iowa State College of Agriculture, and Vice-Director Iowa Experiment Station. (Reprint from Bulletin No. 77, Bureau of Animal Industry.) Pp. 32.

Circular No. 77. Animal Breeding and Feeding Investigations by the Bureau of Animal Industry. By D. E. Salmon. (Reprint from Yearbook of Department of Agriculture, 1904.) Pp. 14, pl. 1, fig. 1.

Circular No. 78. Glanders and Farcy. By Rush Shippen Huidekoper; revised by Leonard Pearson. (Reprint from Special Report on Diseases of the Horse, 1903.) Pp. 12.

Circular No. 79. The Tuberculin Test for Tuberculosis. By D. E. Salmon. (Reprint from Yearbook of Department of Agriculture, 1901.) Pp. 14.

Circular No. 80. Officials, Associations, and Educational Institutions connected with the Dairy Interests of the United States for 1905. Pp. 12.

Circular No. 81. The Sheep Industry of England, Scotland, Ireland, and France. By Willard John Kennedy, Professor of Animal Husbandry, Iowa State College of Agriculture, and Vice-Director Iowa Experiment Station. (Reprint from Bulletin No. 77, Bureau of Animal Industry.) Pp. 19.

Circular No. 82. Hints to Poultry Raisers. By G. Arthur Bell, Assistant Animal Husbandman. Pp. 3.

Circular No. 83. Danger of Infection with Tuberculosis by Different Kinds of Exposure. By E. C. Schroeder and W. E. Cotton, Experiment Station. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 23.

Circular No. 84. Enzymes in Cornstalks and their Relation to Cornstalk Disease. By T. M. Price, Biochemic Division. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 11.

Circular No. 85. The Tapeworms of American Chickens and Turkeys. By B. H. Ransom, Acting Zoologist. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 19, figs. 31.

Circular No. 86. Alfalfa for the Growing and Fattening of Animals in the Great Plains Region. By I. D. Graham. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 27.

Circular No. 87. Hunter-Horse Production in Ireland. By Willard John Kennedy, Professor of Animal Husbandry, Iowa State College of Agriculture, and Vice-Director Iowa Experiment Station. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 41, pls. 8.

Circular No. 88. Highland Cattle. By John Roberts, Editorial Clerk. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 17. (Out of print.)

FARMERS' BULLETINS.

Farmers' Bulletin No. 236. Incubation and Incubators. By Richard H. Wood. Pp. 32, figs. 11.

Farmers' Bulletin No. 241. Butter Making on the Farm. By Edwin H. Webster, Chief of Dairy Division. Pp. 31.

APPENDIX.

RULES AND REGULATIONS OF THE BUREAU OF ANIMAL INDUSTRY ISSUED IN 1905.

(B. A. I. ORDER No. 131.)

Regulations to Prevent the Spread of Splenetic Fever of Cattle.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 16, 1905.

To Managers and agents of railroads and Transportation Companies of the United States, Stockmen, and others:

In furtherance of the regulations for the suppression and extirpation of contagious and infectious diseases among domestic animals in the United States, dated March 10, 1903 (B. A. I. Order No. 106), notice is hereby given that a contagious and infectious disease known as splenetic, southern, or Texas, fever exists among cattle in the district described below:

1. All that country lying south of, or below, a line beginning at the northwest corner of the State of California; thence east, south, and southeasterly along the boundary line of said State of California to the southeastern corner of said State; thence southerly along the western boundary line of Arizona to the southwest corner of Arizona; thence along the southern boundary lines of Arizona and New Mexico to the southeastern corner of New Mexico; thence northerly along the eastern boundary of New Mexico to the southern line of the State of Colorado; thence along the southern boundary lines of Colorado and Kansas to the southeastern corner of Kansas; thence southerly along the western boundary line of Missouri to the southwestern corner of Missouri; thence easterly along the southern boundary line of Missouri to the western boundary line of Dunklin County; thence southerly along the said western boundary to the southwestern corner of Dunklin County; thence easterly along the southern boundary line of Missouri to the Mississippi River; thence northerly along the Mississippi River to the northern boundary line of Tennessee at the northwest corner of Lake County; thence easterly along said boundary line to the northeast corner of Henry County; thence in a northerly direction along the boundary of Tennessee to the northwest corner of Stewart County; thence in an easterly direction along the northern boundary of Tennessee to the southwestern corner of Virginia; thence northeasterly along the western boundary line of Virginia to the northernmost point of Virginia; thence southerly along the eastern boundary line of Virginia to the northeast corner of Virginia, where it joins the southeastern corner of Maryland, at the Atlantic Ocean.

2. Whenever any State or Territory located above or below said quarantine line, as above designated shall duly establish a different quarantine line, and obtain the necessary legislation to enforce said last-mentioned line strictly and completely within the boundaries of said State or Territory, and said last-above-mentioned line and the measures taken to enforce it are satisfactory to the Secretary of Agriculture, he may, by a special order, temporarily adopt said State or Territorial line. Said adoption will apply only to that portion of said line specified, and may cease at any time the Secretary may deem it best for the interests involved, and in no instance shall said modification exist longer than the period specified in said special order; and at the expiration of such time said quarantine line shall revert without further order to the line first above described.

Whenever any State or Territory shall establish a quarantine line, for above purposes, differently located from the first above-described line, and shall obtain by legislation the necessary laws to enforce the same completely and strictly, and shall desire a modification of the Federal quarantine line to agree with such State or Territorial line, the proper authorities of such State or Territory shall forward to the Secretary of Agriculture a true map or description of such line and a copy of the laws for enforcement of same, duly authenticated and certified.

3. From the 1st day of February, 1905, no cattle shall be transported from said area south of, or below, said Federal quarantine line above described to any portion of the United States above—north, east, or west of—the above-described line, except as hereinafter provided.

4. Cattle from said area may be transported by rail or boat for slaughter, and when so transported they shall be immediately slaughtered on arrival at destination and the following regulations regarding their movement must be observed:

(*a*) When any cattle in course of transportation from said area are unloaded above—north, east, or west of—said line to be fed or watered, or for other purposes, said cattle shall be placed in pens or yards set apart for infected cattle, and a sign shall be placed on all such pens or yards with the words "Quarantine pens," or yards, with letters not less than 10 inches in height. No other cattle shall be admitted into said pens or yards, and when noninfected cattle are placed therein by mistake or otherwise these cattle shall be handled thereafter as infected cattle.

(*b*) On unloading said cattle at their points of destination, chutes, alleyways, and pens, sufficiently isolated and marked with a sign as above, shall be set apart to receive them, and no other cattle shall be admitted to said chutes, pens, and alleyways; and the regulations relating to the movement of cattle from said area, prescribed by the cattle sanitary officers of the State where unloaded, shall be carefully observed. The cars or boats that have carried said stock shall be cleansed and disinfected as soon as possible after unloading and before they are again used to transport, store, or shelter animals or merchandise.

(*c*) Where southern cattle and cattle originating outside of the quarantined district are yarded in adjacent pens, there shall be left a space between them not less than 10 feet wide, and there shall be on each side of this space, which shall not be used for cattle, a tight board fence not less than 5 feet high.

(*d*) All cars carrying cattle from the quarantined area shall bear on both sides printed manila placards not less than 5½ by 8 inches in size, the letters of which shall be plain and not less than 1½ inches in height, to be affixed by the railroad company hauling the same, stating that said cars contain southern cattle; and each of the waybills, conductor's manifests, and bills of lading of said shipments by cars or boats shall have a note plainly written or stamped upon its face with a similar statement. The placards shall state the name of the place from which the shipment was made, with the date, and the name of the place of destination; said date must correspond with the date of the waybill and other papers. Whenever any cattle have come from said area and shall be reshipped from any point at which they have been unloaded to other points of destination, or are transferred to another transportation company, the cars carrying said animals shall bear on both sides similar placards with like statements, and the waybills, conductor's manifests, or bills of lading of said shipments by cars or boats shall be so marked. At whatever point these cattle are unloaded they must be placed in separate pens, to which no other cattle shall be admitted.

(*e*) No car or boat having on board cattle from said district shall receive on board cattle from outside of said district. Cattle from said district shall not be forwarded when destined to points outside of said district where proper facilities have not been provided for transferring the said cattle from the cars or landing to the stock yards and slaughter-houses without passing over public highways, unless proper permission for such passing is first obtained from the local authorities.

(*f*) The cars and boats used to transport such animals, the chutes, alleyways, and pens used during transportation and at points of destination shall be disinfected in the following manner:

(1) Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a 5-per-cent solution of 100 per cent carbolic acid; or, if not disinfected, it shall be stored where no cattle can come in contact with it during the period from February 1 to November 1 of each year.

(2) Wash the cars and the watering and feeding troughs with water until clean.

(3) Saturate the entire interior surface of the cars, including the inner surface of the car doors, and the fencing, troughs, chutes, and floors of the pens with a mixture made of 1½ pounds of lime and one-quarter pound of 100 per cent carbolic acid to each gallon of water, or a solution made by dissolving 4 ounces of chloride of lime to each gallon of water may be used.

(*g*) If the facilities for cleaning and disinfecting cars as above described can not be provided at the point of destination, the railroad company shall seal, bill, and forward the infected cars to a point to be agreed upon between their agent and a representative of the Bureau of Animal Industry, and shall there clean and disinfect them in the presence of a Bureau employee.

(*h*) Cars which have carried cattle within the quarantined district shall be cleaned and disinfected before being taken out of said district, except when loaded with cattle in course of transportation in accordance with these regulations.

5. Notice is hereby given that cattle infested with the *Boophilus annulatus*, or southern cattle ticks, disseminate the contagion of splenetic, Southern, or Texas fever; therefore, cattle originating outside of the district described by this order or amendments thereof, and which are infested with the *Boophilus annulatus* ticks, shall be considered as infectious cattle and shall be subject to the rules and regulations governing the movement of southern cattle.

6. Stock-yard companies receiving cattle infested with said ticks shall place such cattle in the pens set aside for the use of southern cattle; and transportation companies are required to clean and disinfect all cars and boats which have contained the infested cattle, according to the requirements of this order.

7. Cattle in said district may be shipped after having been properly dipped in Beaumont crude petroleum, under the supervision of an inspector of the Bureau of Animal Industry, without further restrictions, excepting such as may be enforced by local authorities at point of destination, provided that application be first made to this Department, and permission granted to establish dipping stations,

and that after being dipped the cattle are examined and certified by an inspector of the Bureau of Animal Industry; and further provided that the cattle when dipped be shipped in clean cars and not driven through the infected district or unloaded therein, except at such point as may be duly designated in regulations of this Department.

8. Inspectors are instructed to see that disinfection is properly done and to report instances of improper disinfection and other violations of this order.

9. Violation of these regulations is punishable by a fine of not less than $100 nor more than $1,000, or by imprisonment not more than one year, or by both such fine and imprisonment.

10. These regulations supersede B. A. I. Order No. 121, dated January 14, 1904, and amendments thereto.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of California (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle the State of California has agreed to establish and cooperate in the enforcement of a quarantine line located as follows:

Beginning on the Pacific Coast where the northern boundary line of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary line of San Luis Obispo County to its junction with the western boundary of Kings County; thence northwesterly along the western boundary of Kings and Fresno counties to the western corner of Fresno County; thence northerly, easterly, and southerly along the western, northern, and eastern boundary line of Merced County to the southeast corner thereof; thence northeasterly along the northern boundary of Madera County to the northeast corner thereof; thence southerly and easterly along the eastern boundary lines of Madera, Fresno, and Tulare counties to the southeast corner of Tulare County; thence easterly along the southern boundary line of Inyo County to its intersection with the eastern boundary line of the State of California.

And whereas said quarantine line as above set forth is satisfactory to this Department, and legislation has been enacted by the State of California to enforce said quarantine line, therefore the above quarantine line is adopted for the State of California by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

It is hereby ordered, That during the continuance of the above line no cattle originating in the quarantined area as described in B. A. I. Order No. 131, as amended, shall be moved or allowed to move into the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, Madera, and Merced.

And it is further ordered, That no cattle shall be moved or allowed to move (for purposes other than immediate slaughter) from the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, Madera, and Merced to any of that territory in the State of California outside of the quarantined district except after having been inspected and found free of infection by a duly authorized inspector of this Department or of the State of California and upon written permission by such officer. No cattle from said counties shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which said cattle are destined.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of Texas (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the State of Texas has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning at the intersection of the southern boundary of New Mexico with the international boundary line at the Rio Grande River; thence southeasterly, along the said international boundary line, to the southwest corner of the county of Pecos; thence following the western boundary of Pecos County to the southeast corner of Reeves County; thence following the boundary line between the counties of Pecos and Reeves to the Pecos River; thence southeasterly, following the Pecos River, to the northwest corner of Crockett County; thence east, along the northern boundary of Crockett and Schleicher counties, to the southeastern corner of Irion County; thence north, along the eastern boundary of Irion County, to the northeast corner of said county; thence continuing due north to the southern boundary line of Coke County; thence west, with the southern boundary of Coke County, to the southwest corner of Coke County; thence north, along the western boundary of Coke County, to the southern boundary of Mitchell County; thence east to the southeast corner of Mitchell County; thence north, along the eastern boundary of Mitchell County, to the northeast corner of said county; thence east, along the southern boundaries of Fisher and Jones counties, to the southeast corner of Jones County; thence north, along the eastern boundary of Jones County, to the northeast corner of said county; thence east, along the southern boundary of Haskell County, to the southeast corner of said county; thence north, along the western boundary lines of Throckmorton and Baylor counties, to the northwest corner of Baylor County; thence east, along the southern boundary of Wilbarger County, to the southeast corner of said county; thence north, along the eastern boundary of Wilbarger County, to the Red River; thence continuing in a northwesterly direction, along the course of said river and the northern boundary of Texas, to the southwest corner of Greer County, Okla.; thence north, following the eastern boundary line of Texas, to the northwest corner of said Greer County.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the State of Texas to enforce said quarantine line, therefore the above quarantine line is adopted for the State of Texas by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

It is hereby ordered, That during the continuance of the above line no cattle originating in the quarantined area as described in B. A. I. Order No. 131, as amended, shall be moved or allowed to move into the counties of Baylor and Throckmorton, and that portion of the county of Pecos lying north and west of the line described as follows: Beginning at the west line of Pecos County, at the point where the roadbed of the G. H. & S. A. Railroad crosses said line; thence in an easterly direction with the center of said roadbed to a point on Section No. 36, Block A2, G. H. & S. A. Railroad Company; thence north with the pasture fence running in a northerly direction through the eastern part of Sections Nos. 13 and 12 of said Block A2, and across Section 1, G. C. & S. F. Railroad Company; thence continuing north with said pasture fence through the eastern part of Sections Nos. 16, 17, 46, 47, 76, 77, 106, 107, 136, 137, 142, 143, and 194, Block D, M. K. & T. E. Railroad Company; thence continuing in a northerly direction to a point on the north line of Section No. 6, Block 160, G. C. & S. F. Railroad Company, same being corner of pasture fence; thence east with the north line of Sections Nos. 6, 9, 10, 11, 12, 15, 16, Block 160, G. C. & S. F. Railroad Company, to the northeast corner of said Section No. 16, same being corner of pasture fence; thence in a northerly direction with the east boundary line of Sections Nos. 22, 21, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said Section 32; thence west with the north boundary line of Sections Nos. 32 and 33, same block, to the northwest corner of Section No. 33, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, corner of fence; thence north with the east boundary line of Sections Nos. 1, 12, 13, 24, 25, 36, 37, 48, 49, 60, 61, and 72, Block 2, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said Section No. 72; thence in an easterly direction with the pasture fence to the southeast corner of Section No. 9, patented to James E. Evans; thence north with the east line of said Section No. 9 to the northwest corner of Section No. 100, Block A2, T. C. Railroad Company; thence east with north boundary line of said Sections Nos. 100 and 89, same block, to the northeast corner of said Section No. 89, Block A2, T. C. Railroad Company; thence north with the east boundary line of Sections Nos. 90, 91, 92, and 93, to the southeast corner of Section No. 94, Block A2, T. C. Railroad Company; thence northwest diagonally across Section No. 94 to the northwest corner of said section; thence continuing in a northwesterly direction, diagonally across Sections Nos. 14, 18, and 28, to the northeast corner of Section No. 29, Block C4, G. C. & S. F. Railroad Company; thence west with the north boundary line of said Section No. 29 to the northwest corner of said section; thence northwest diagonally across Section No. 1, T. C. Railroad Company, Section No. 97, Block No. 194, G. C. & S. F. Railroad Company, to the northeast corner of said Section No. 96; thence in a northerly direction across Section No. 94 to a point on its north boundary line 600 varas west of its northeast corner; thence continuing north through Sections Nos. 93, 90, 89, 86, 85, and 58, Block 194, G. C. & S. F. Railroad Company, to a point on the north boundary line of said Section No. 58; thence northwesterly with the pasture fence, through Section No. 59, to the northeast corner of Section No. 82 and the southeast corner of Section No. 81, same block; thence continuing northwesterly to Section No. 17, H. & G. N. Railroad Company; thence north with the east line of said Section 17 to the Pecos River; thence northwesterly with said Pecos River to the northwest corner of Crockett County.

And it is further ordered, That no cattle shall be moved or allowed to move from the counties of Childress, Cottle, Hardeman, Foard, Wilbarger, King, Knox, Haskell, Stonewall, Jones, Fisher, Scurry, Borden, Howard, Mitchell, Glasscock, Sterling, Irion, Reagan (formerly West Tom Green), Upton, Crane, Throckmorton, and Baylor, and that portion of the county of Pecos as described above, to any of that territory in the State of Texas outside of the quarantined district, except after having been inspected and found free of infection by a duly authorized inspector of this Department or of the State of Texas, and upon written permission by such officer. No cattle from said counties shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which said cattle are destined.

JAMES WILSON, *Secretary*.

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the Territory of Oklahoma (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the Territory of Oklahoma has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning on the Red River at the northwestern corner of Wichita County, Tex.; thence northwesterly along the course of said river to the southwest corner of Greer County; thence north along the western boundary of Greer County to the northwest corner thereof; thence easterly and southerly along the southern boundary of Roger Mills County to the southeast corner of said county; thence east along the southern boundary line of Washita County to the southeast corner of said county; thence north along the eastern boundary lines of Washita and Custer counties to the Canadian River; thence in a southeasterly direction along the course of said river to the southeast corner of Canadian County; thence north along the eastern boundary line of Canadian County to the northwest corner of Cleveland County; thence east along the northern line of Cleveland County to the middle of the right of way of the Atchison, Topeka and Santa Fe Railway; thence northerly following the middle of said right of way through Oklahoma, Logan, Noble, and Payne counties, and the Otoe and Missouria and Ponca Indian reservations to the northern boundary of the Ponca Indian Reservation; thence east along the northern boundary of the Ponca Indian Reservation to the Arkansas River; thence in a northerly direction following the course of the said river to its intersection with the thirty-seventh parallel of north latitude at the southern boundary line of Kansas.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the Territory of Oklahoma to enforce said quarantine line, therefore the above quarantine line is adopted for the Territory of Oklahoma by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

It is hereby ordered, That during the continuance of the above line no cattle originating in the quarantined area as described in B. A. I. Order No. 131, as amended, shall be moved or allowed to move into that portion of Noble County bounded on the north by the Otoe and Missouria Indian Reservation, on the east by Pawnee County, on the south by Payne County, and on the west by the right of way of the Atchison, Topeka and Santa Fe Railway, and that portion of the Ponca Indian Reservation, Noble County, east of the right of way of the Atchison, Topeka and Santa Fe Railway, and bounded on the east and north by the Arkansas River and the Salt Fork of the Arkansas River.

And it is further ordered, That no cattle shall be moved or allowed to move from the counties of Roger Mills, Washita, Canadian, that part of the counties of Oklahoma, Logan, and Payne, and of the Otoe and Missouria and Ponca Indian reservations lying west of the right of way of the Atchison, Topeka and Santa Fe Railway and that part of Noble County bounded on the north by the Otoe and Missouria Indian Reservation, on the east by Pawnee County, on the south by Payne County, on the west by the right of way of the Atchison, Topeka and Santa Fe Railway and that portion of the Ponca Indian Reservation, Noble County, east of the right of way of the Atchison, Topeka and Santa Fe Railway, and bounded on the east and north by the Arkansas River and the Salt Fork of the Arkansas River, to any of that territory in the Territory of Oklahoma outside of the quarantined district, except after having been inspected and found free of infection by a duly authorized inspector of this Department or of the Territory of Oklahoma and by written permission by such officer. No cattle from said counties and localities shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which said cattle are destined.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 4 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of Tennessee (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the State of Tennessee has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning on the Mississippi River at the southeast corner of the State of Missouri at the western boundary of Tennessee; thence southerly along the western boundaries of the counties of Dyer and Lauderdale; thence following the main channel of the Mississippi River (leaving Island No. 37 to the north and west) to the northwestern corner of Shelby County on the Mississippi River; thence easterly along the northern boundary lines of Shelby and Fayette counties to the southwestern corner of Haywood County; thence northerly along the western boundary line of Haywood County to the Big

Hatchie River; thence southeasterly along said river to its intersection with the southern boundary line of Haywood County; thence east and north along the southern and eastern boundary lines of Haywood County to the northeastern corner of said county; thence following the northern boundary line of Madison County to the southwest corner of Carroll County; thence northerly and easterly along the western and northern boundary lines of Carroll County to the northeast corner of said county; thence southerly along the eastern boundary of said county to its intersection with the Nashville, Chattanooga and St. Louis Railway; thence easterly along the middle of the roadbed of said railway through Benton County to the intersection of said Nashville, Chattanooga and St. Louis Railway with the Tennessee River at the eastern boundary of Benton County; thence southerly along the eastern boundaries of Benton and Decatur counties to the northwest corner of Wayne County; thence easterly along the northern boundary line of Wayne County to the southeast corner of Perry County; thence northerly, easterly, and southerly along the western, northern, and eastern boundaries of Lewis County to the northern boundary line of Lawrence County; thence easterly along the northern boundary of Lawrence County to the northeast corner thereof; thence southerly along the eastern boundary of Lawrence County to the southeast corner thereof; thence east along the southern boundary of Giles County to the Elk River; thence northeasterly along said river through Giles and Lincoln counties to the eastern boundary of Lincoln County; thence northerly and easterly along the western and northern boundaries of Moore County to the northeast corner of Moore County; thence northerly along the western boundary lines of Coffee and Cannon counties to the northwest corner of Cannon County; thence northeasterly and southeasterly along the northern and eastern boundaries of Cannon County to the boundary of Warren County; thence easterly along the northern boundary of Warren County to the western boundary of White County; thence northeasterly and southeasterly along the western and northern boundaries of White County to the western boundary of Cumberland County; thence southerly, easterly, and northeasterly along the western, southern, and eastern boundaries of Cumberland County to the northern corner of Rhea County; thence southerly along the eastern boundary lines of Rhea and James counties to the boundary line of Bradley County; thence northerly and southeasterly along the northern boundary lines of Bradley and Polk counties to the northeast corner of Polk County; thence southerly along the eastern boundary line of Polk County to the southeast corner thereof at the southwestern corner of North Carolina.

That portion of the quarantine line of the State of Virginia, described in the order of January 17, 1905 (Amendment No. 7 to B. A. I. Order No. 131), beginning at the southwestern corner of Virginia (Lee County) and extending east along the southern boundary line of Virginia to the southwestern corner of Grayson County, is hereby suspended during the enforcement of the above line for the State of Tennessee.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the State of Tennessee to enforce said quarantine line, therefore the above line is adopted for the State of Tennessee by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

It is hereby ordered, That during the continuance of the above line no cattle originating in the quarantined area as described in B. A. I. Order No. 131, as amended, shall be moved or allowed to move into the counties of Cannon and Moore and the western and northern parts of Carroll County.

And it is further ordered, That no cattle shall be moved or allowed to move from the counties of Pickett, Overton, Fentress, Putnam, De Kalb, Cumberland, Cannon, Moore, those portions of the counties of Clay and Jackson lying south and east of the Cumberland River, that portion of Roane County lying north of the Tennessee and Clinch rivers, and the western and northern parts of Carroll County, to any of that territory in the State of Tennessee outside of the quarantined district except after having been inspected and found free of infection by a duly authorized inspector of this Department or of the State of Tennessee and upon written permission by such officer. No cattle from said counties and parts of counties shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which said cattle are destined.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 5 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of Georgia (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the State of Georgia has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning at the intersection of the western boundary line of Union County with the boundary line between the States of Georgia and North Carolina; thence southerly along the western boundary of Union County to the southwest corner thereof; thence northeasterly and easterly along the southern boundary lines of Union and Towns counties to the western corner of Rabun County; thence easterly, southeasterly, and northeasterly along the western, southern, and eastern boundaries of Rabun County to the northeast corner of said county on the boundary between Georgia and North Carolina.

That portion of the quarantine line for the State of North Carolina, described in the order of January 17, 1905 (Amendment No. 6 to B. A. I. Order No. 131), beginning at the intersection of the northwest corner of Union County, Ga., with the State line, extending east along the southern boundary line of North Carolina to the northeast corner of Rabun County, is hereby suspended during the enforcement of the above line for the State of Georgia.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the State of Georgia to enforce said quarantine line, therefore the above quarantine line is adopted for the State of Georgia by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 6 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of North Carolina (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January, 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the State of North Carolina has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning at the southwest corner of the county of Cherokee; thence east along the southern boundary lines of the counties of Cherokee, Clay, Macon, Jackson, Transylvania, and Henderson to the southwest corner of the county of Polk; thence northerly along the western boundaries of Polk and Rutherford counties to the southern boundary of McDowell County; thence westerly, northerly, and northeasterly along the southern, western, and northern boundaries of McDowell County to the North Fork of the Catawba River; thence southerly along the course of said North Fork to the Catawba River; thence easterly along the course of said river to its intersection with the western boundary line of Burke County; thence southerly and easterly along the western and southern boundaries of said county to the northeastern corner of Cleveland County; thence southerly along the eastern boundary of Cleveland County to the boundary line between North Carolina and South Carolina; thence easterly along said State boundary line to the Catawba River; thence northerly and westerly following the course of the Catawba River to the southwest corner of Alexander County; thence northerly along the western boundary line of Alexander County to the Southern boundary of Wilkes County; thence easterly and northerly along the southern and eastern boundaries of Wilkes County to the Yadkin River; thence easterly following the course of the Yadkin River to the mouth of Mitchell River; thence northerly following the course of Mitchell River to the eastern boundary of Alleghany County; thence northeasterly along the eastern boundary of Alleghany County to its intersection with the northern boundary line of the State of North Carolina.

That portion of the quarantine line for the State of Virginia, described in the order of January 17, 1905 (Amendment No. 7 to B. A. I. Order No. 131), beginning at the southwestern corner of Grayson County and extending east along the southern boundary line of Virginia to the southeastern corner of said county, is hereby suspended during the enforcement of the above line for the State of North Carolina. And that portion of the quarantine line above described, beginning at the intersection of the northwest corner of Union County, Ga., with the State line, extending east along the southern boundary line of North Carolina to the northeast corner of Rabun County, Ga., is hereby suspended during the enforcement of the line described in the order of January 17, 1905 (Amendment No. 5 to B. A. I. Order No. 131), for the State of Georgia.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the State of North Carolina to enforce said quarantine line, therefore the above quarantine line is adopted for the State of North Carolina by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

It is hereby ordered, That during the continuance of the above line no cattle originating in the quarantined area as described in B. A. I. Order No. 131, as amended, shall be moved or allowed to move into the counties of Alexander, Yadkin, Iredell, Davie, Rowan, Cabarrus, Mecklenburg, Cleveland, Rutherford, Polk, that part of McDowell south of the Catawba River and west of the North Fork of said river, and that part of Surry east of Mitchell River.

And it is further ordered, That no cattle shall be moved or allowed to move from the counties of Yadkin, Davie, Rowan, Iredell, Alexander, Mecklenburg, Cabarrus, Cleveland, Polk, Rutherford, that part of McDowell lying south of the Catawba River and west of the North Fork of said river, and that part of Surry east of Mitchell River, to any of that territory in the State of North Carolina outside of the quarantined district, except after having been inspected and found free of infection by a duly authorized inspector of this Department or of the State of North Carolina, and upon written permission by such officer. No cattle from said counties and parts of counties shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which destined.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 7 TO B. A. I. ORDER NO. 131.)

Special Order Modifying Quarantine Line for the State of Virginia (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

In accordance with the regulations to prevent the spread of splenetic fever of cattle, the State of Virginia has agreed to establish and to cooperate in the enforcement of a quarantine line located as follows:

Beginning at the boundary line of Virginia at its southwestern corner (Lee County); thence east along the southern boundary of Virginia to the southwestern corner of Patrick County; thence northerly along the western boundaries of Patrick and Franklin counties to Daniels Run; thence easterly along Daniels Run and the Blackwater River to the Staunton River; thence in a southeasterly and northeasterly direction along the southern and eastern boundaries of Bedford County to the James River; thence following the James River to the southeastern corner of Charles City County; thence northerly and easterly along the western and northern boundaries of James City County to the western boundary of Gloucester County at the York River; thence southerly and northerly along the southern and eastern boundaries of Gloucester County to the northeastern corner of said county; thence easterly and southerly along the northern and eastern boundaries of Mathews County to the southeastern point of said county; thence south to the northern boundary of Elizabeth City County; thence westerly and northerly along the boundaries of Elizabeth City and Warwick counties to the James River; thence southeasterly along the course of the said river to the northwest corner of Norfolk County; thence south along the western boundary of said county to its intersection with the northern boundary of North Carolina; thence east along the southern boundaries of Norfolk and Princess Anne counties to the Atlantic Ocean.

That portion of the quarantined line above described, beginning at the boundary line of Virginia at its southwest corner (Lee County); thence easterly along the southern boundary of Virginia to the southwestern corner of Grayson County is hereby suspended during the enforcement of the line described in the order of January 17, 1905 (Amendment No. 4 to B. A. I. Order No. 131), for the State of Tennessee. And that portion of the quarantine line above described, beginning at the southwest corner of Grayson County and extending east along the southern boundary line of Virginia to the southeast corner of Grayson County is hereby suspended during the enforcement of the line described in the order of January 17, 1905 (Amendment No. 6 to B. A. I. Order No. 131), for the State of North Carolina.

And whereas said quarantine line, as above set forth, is satisfactory to this Department, and legislation has been enacted by the State of Virginia to enforce said quarantine line, therefore the above quarantine line is adopted for the State of Virginia by this Department for the period beginning with February 1, 1905, and ending January 31, 1906, in lieu of the quarantine line described in the order of January 16, 1905, for said area, unless otherwise ordered.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 8 TO B. A. I. ORDER NO. 131.)

Special Order Regarding Quarantine of Cattle in Certain Counties in Kentucky (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

It is hereby ordered, That, as the infection of Texas fever exists in the counties of Clinton, Wayne, and Pulaski, in the State of Kentucky, no cattle shall be moved or allowed to move from said counties, except as provided for southern cattle for immediate slaughter, to any portion of the uninfected area as described in B. A. I. Order No. 131, as amended, unless after inspection such cattle are found free of infection. This inspection must be made by duly authorized inspectors of this Department, and movement will be allowed for purposes other than immediate slaughter only upon written permission by such inspectors.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 9 TO B. A. I. ORDER NO. 131.)

Special Order Permitting Movement of Cattle from two Northern Tiers of Counties in Arkansas (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

It is hereby ordered, That B. A. I. Order No. 131, dated January 16, 1905, be amended so as to permit the shipment of cattle for purposes other than immediate slaughter from the two northern tiers of counties in the State of Arkansas into the noninfected area:

Provided, That said cattle have remained in the above-described counties since January 1 of this year and have been inspected by officers of the Bureau of Animal Industry of this Department and found to be free of splenetic, or Texas, fever and not to have been exposed to the contagion thereof; that proper facilities have been afforded for making such inspection, and that after inspection said cattle shall be moved without delay and without exposure to the infection of splenetic, or Texas, fever direct to pastures or feed lots without dividing the shipment.

Provided further, That no cattle shall be allowed to move under this order unless accompanied by a permit issued by an inspector of the Bureau of Animal Industry, nor shall such cattle be taken into any State or Territory contrary to the local regulations; and said permission will be granted only for cattle which are to remain within the State to which destined for three months after arrival.

This order to remain in force until April 1, 1905.

JAMES WILSON, *Secretary*.

(AMENDMENT NO. 10 TO B. A. I. ORDER NO. 131.)

Feeding Stations in the Quarantined District for Uninfected Cattle (1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1905.

It is hereby ordered, That cattle originating outside—north, east, and west of—the quarantined district, as defined in the order of January 16, 1905 (B. A. I. Order No. 131), and amendments thereto, and which are to be transported by rail through the quarantined district, may be unloaded for rest, feed, and water into uninfected pens set apart for such cattle at Polk Stock Yards and Union Stock Yards, Fort Worth, Tex.; Baird, Tex.; Southern Pacific Railway Stock Yards, Los Angeles, Cal.; Colton, Cal.; Bakersfield, Cal.; Salisbury, N. C., and at the Sapulpa Stock Yards of the St. Louis and San Francisco Railroad, Sapulpa, Ind. T.: *Provided*, That the cattle are free from southern cattle ticks and have not been unloaded at any other place within the quarantined district. They may, after unloading into said pens, be reloaded into the same cars from which unloaded, or into other cleaned and disinfected cars, and reshipped as uninfected cattle.

JAMES WILSON, *Secretary*.

(AMENDMENT NO. 11 TO B. A. I. ORDER NO. 131.)

Regulations Concerning Cattle Transportation—Movement of Southern Cattle in Virginia.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 31, 1905.

It is hereby ordered, That section 3 of B. A. I. Order No. 131, dated January 16, 1905, providing for the movement of cattle from the quarantined district described by said order and amendments thereto, be amended by suspending the provisions of amendment No. 7 of said order and that the enforcement of the quarantine line for the State of Virginia as therein described begin with March 1, 1905, instead of February 1, 1905. Cattle within the State of Virginia may therefore be moved from the infected area within the State to other portions of the State upon written permission of an inspector of the Bureau of Animal Industry or a duly authorized inspector of the State of Virginia.

JAMES WILSON, *Secretary*.

(B. A. I. ORDER NO. 132.)

Special Order Regarding Exhibit of Cattle at Oklahoma Stock Show, Guthrie, Okla.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 1, 1905.

It is hereby ordered, That cattle from the area quarantined on account of southern cattle fever by B. A. I. Order No. 131, dated January 16, 1905, and amendments thereto, may be shipped for exhibition and sale at the Oklahoma Stock Show, to be held at Guthrie, Okla., on February 14, 15, and 16, 1905, provided they are shipped direct from point of origin to the exhibition grounds in clean and disinfected cars and accompanied by a certificate issued by an inspector of the Bureau of Animal Industry stating that he has inspected the cattle before shipment and found them to be free from infection.

It is further ordered, That cattle from the nonquarantined area may be shipped to this show with the privilege of return to the said area, provided that facilities for properly handling such cattle satisfactory to the inspector in charge shall be furnished and that the movement of cattle to and from the show shall be allowed only after inspection and certification by inspectors of the Bureau of Animal Industry.

JAMES WILSON, *Secretary*.

(AMENDMENT NO. 12 TO B. A. I. ORDER NO. 131.)

Special Order Regulating Movement of Cattle into Certain Portions of Oklahoma.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 28, 1905.

It is hereby ordered, That during the continuance of the quarantine line as described in B. A. I. Order No. 131, dated January 16, 1905, as amended, no cattle originating in the infected area shall be moved or allowed to move into the counties of Cleveland, Pottawatomie, Lincoln, Pawnee, in the Territory of Oklahoma, or into the Kansas Nation and Osage Nation of the same Territory, or into those portions of the counties of Oklahoma, Logan, Payne, and Noble lying east of the right of way of the Atchison, Topeka and Santa Fe Railway, of that Territory, unless said cattle shall have been dipped once in Beaumont crude petroleum under the supervision of an inspector of the Bureau of Animal Industry at a dipping station established by permission of this Department, and that the cattle after being dipped are shipped in clean and disinfected cars and are accompanied by a certificate of dipping issued by the inspector supervising the dipping. This movement of cattle after one dipping shall be permitted between March 15, 1905, and May 15, 1905. After the latter date the provisions of section 7 of B. A. I. Order No. 131 will apply.

It is further ordered, That no cattle shall be moved or allowed to move from the above-described region to any part of the Territory of Oklahoma outside of the quarantined district unless after having been inspected and found free of infection by a duly authorized inspector of this Department or of the Territory of Oklahoma, and by written permission of such officer. No cattle from this region shall be moved or allowed to move to any State or Territory outside of the quarantined district (except as provided for immediate slaughter) unless they shall have been duly inspected, passed, permit issued by an inspector of this Department, and permission has been obtained from the proper officials of the State or Territory to which said cattle are destined.

The special order modifying the regulations for the Territory of Oklahoma (Amendment No. 3 to B. A. I. Order No. 131) is modified in accordance herewith.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 126.)

Regulations to Prevent the Spread of Maladie du Coït of Horses.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., March 23, 1905.

It is hereby ordered, That B. A. I. Order No. 126, dated June 28, 1904, be and is so amended as to permit on and after April 1, 1905, the shipment of horses, without inspection by an inspector of the Bureau of Animal Industry of this Department, from that portion of Custer and Fall River counties lying west of the Chicago and Northwestern Railway in South Dakota, also that portion of Dawes County, Nebr., lying west of the northern branch and north of the western branch of the Chicago and Northwestern Railway. This amendment shall not apply to stallions and mares which have been east of the above railway in the counties of Custer and Fall River, S. Dak., or that portion of Dawes County, Nebr., lying east of the northern branch of the Chicago and Northwestern Railway, or in any portions of the counties of Sheridan and Cherry, in the State of Nebraska, lying north of the Chicago and Northwestern Railway, or in the Pine Ridge or Rosebud Indian reservations, since January 1, 1905.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 13 TO B. A. I. ORDER NO. 131.)

Regulations Concerning Cattle Transportation—Movement of Southern Cattle from Greer County, Okla.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., March 30, 1905.

It is hereby ordered, That B. A. I. Order No. 131, dated January 16, 1905, be and is so amended as to permit the shipment of cattle for purposes other than immediate slaughter from Greer County, Territory of Oklahoma, into that portion of the United States above the quarantine line fixed by above-named order: *Provided,* That said cattle have remained continuously in Greer County since January 1, 1905, and have been inspected by an inspector of the Bureau of Animal Industry, and have been found free of splenetic, or Texas, fever, and not to have been exposed to the contagion thereof. No cattle shall be allowed to move under this amendment unless accompanied by a written permit for the shipment, issued by an inspector of the Bureau of Animal Industry, nor shall such cattle be taken into a State or

Territory contrary to the local regulations. The special order modifying the regulations for the Territory of Oklahoma (Amendment No. 3 to B. A. I. Order No. 131) is modified in accordance herewith. This order shall remain in force until April 30, 1905, unless revoked before that date.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., April 5, 1905.

On account of failure to comply with the provisions of B. A. I. Order No. 130, the withdrawal of the certification of the following associations and books of record has this day been recommended to the Secretary of the Treasury:

American books of record.

SHEEP.

Name of breed.	Book of record.	By whom published.
Merino (Delaine)	Standard Delaine Spanish Merino Sheep Breeders' Register.	Standard Delaine Spanish Merino Sheep Breeders' Association, S. M. Cleaver, secretary, West Brownsville, Pa.
Merino (French)	American Rambouillet Record.	American Rambouillet Sheep Breeders' Association, Dwight Lincoln, secretary, Milford Center, Ohio.

HOGS.

Chester White	Chester White Record	Standard Chester White Record Association, W. H. Morris, secretary, 939-941 South Illinois street, Indianapolis, Ind.
Essex	American Essex Record	American Essex Association, F. M. Srout, secretary, McLean, Ill.
Poland-China	Central Poland-China Record.	Central Poland-China Record Association, W. H. Morris, secretary, 939-941 South Illinois street, Indianapolis, Ind.
Victoria	Record of the Victoria Swine Breeders' Association.	Victoria Swine Breeders' Association, H. Davis, secretary, Dyer, Ind.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and their Products.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., April 6, 1905.

It is hereby ordered, That subsection (*k*) of section 7 of the rules and regulations for the inspection of live stock and their products, issued under date of June 27, 1904 (B. A. I. Order No. 125), be and is hereby revoked and superseded by the following:

(*k*) *Tuberculosis.*—"Generalized" tuberculosis refers to that form of the disease in which the bacilli have been disseminated through the blood and lymph and in which a number of organs are affected. "Extensive" tuberculosis refers entirely to the amount of tuberculous matter and the number of tubercles, and may apply to a case which is confined to one of the body cavities.

CARCASSES THAT SHALL BE PASSED.

The carcass shall be passed when the lesions of tuberculosis are slight, calcified, or encapsulated, and are confined to—

(1) One group of lymphatic glands.

(2) One organ, such as the lung, liver, tongue, kidney.

(3) One group of lymphatic glands and one other organ in a single body cavity.

(4) The cervical lymphatic glands and not more than two groups of visceral lymphatic glands in a single body cavity, such as the cervical, bronchial, and mediastinal glands, or cervical, hepatic, and mesenteric glands.

(5) Two visceral organs in a single body cavity, such as the liver and spleen.

(6) The cervical lymphatic glands and not more than one group of visceral lymphatic glands and one organ in a single body cavity, such as the cervical and bronchial glands and lung, or the cervical and hepatic glands and liver.

NOTE.—The pleura or peritoneum may be substituted for the group of visceral lymphatic glands in paragraph 6—for example, the cervical glands, pleura, and lung, or the cervical glands, liver, and peritoneum.

(7) Two groups of visceral lymphatic glands and one organ in a single body cavity, such as the bronchial and mediastinal glands and lung, or the hepatic and mesenteric glands and liver.

CARCASSES THAT SHALL BE CONDEMNED.

The carcass shall be condemned—

(8) When the lesions are so widely distributed or so extensive as to be classed as "generalized" or "extensive," as above defined.

(9) When the lesions are located as described in any one of the paragraphs 3, 4, 5, 6, or 7, but are in a state of advanced caseation or liquefaction necrosis or surrounded by hyperemic zones.

(10) When there is evidence of acute reinfection.

(11) When slight, calcified, or encapsulated lesions are found in more organs or more groups of visceral lymphatic glands than above described for carcasses that shall be passed.

(12) When in connection with any of the conditions described for carcasses that shall be passed, additional lesions are found in one or more groups of body lymphatic glands, such as the prescapular, sublumbar, inguinal, suprasternal, precrural.

(13) When numerous lesions are found on the peritoneum or pleura.

CARCASSES THAT MAY BE RENDERED INTO LARD.

Hog carcasses indicated by paragraphs (14) and (15) may be rendered into lard after the diseased parts are removed, provided that they are cooked by steam for not less than four hours at a temperature not lower than 220° F. Said carcasses are—

(14) Those condemned under paragraph (9) of this amendment.

(15) Those condemned under paragraph (11) of this amendment, provided that the lesions are confined to one body cavity, and provided, further, that the visceral lesions are not extensive or do not generally show caseation or liquefaction necrosis.

DISPOSITION OF PARTS.

(16) The entire viscera of all tuberculous animals shall be condemned.

(17) All diseased parts of carcasses showing lesions of tuberculosis shall be condemned, but under no conditions shall they be thrown upon the floor or scattered about the premises. In order to avoid this they shall, when removed, be deposited in receptacles provided for that purpose, and either be tanked at once or locked in the retaining room until such a time as a Bureau employee shall be able to see that they are placed in the offal tank.

(18) When a carcass is held for tuberculosis and afterward passed for food or tanked for lard, the head should be allowed to accompany the carcass, provided that the diseased parts are wholly removed.

JAMES WILSON, *Secretary.*

Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., May 1, 1905.

The following regulations governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce are issued for the guidance of all persons and corporations concerned in the handling or movement of live stock. The regulations heretofore issued by the Secretary of Agriculture on this subject shall cease to be effective on and after June 1, 1905, on and after which date the regulations herein published shall become and be effective, until otherwise ordered.

JAMES WILSON, *Secretary of Agriculture.*

GENERAL REGULATIONS.

Regulation 1.—When the Secretary of Agriculture shall determine the fact that cattle or other live stock in a State or Territory or the District of Columbia are affected with any contagious, infectious, or communicable disease, notice will be given of that fact. A rule will be issued placing in quarantine all or a portion of the State or Territory or the District of Columbia in which the disease exists, and this rule will either absolutely forbid the movement of live stock from the quarantined area or will indicate the regulations under which live stock may be moved therefrom.

Regulation 2.—Before offering cattle or other live stock for transportation, or transporting them, or introducing them into any public stock yards or upon public highways or lines of interstate traffic, all persons or corporations owning, managing, or transporting cattle or other live stock are required to exercise reasonable diligence to ascertain that such animals are not affected with any contagious or infectious disease and have not been exposed to the contagion or infection of disease by contact with other animals so diseased or by location in or upon pens, premises, cars, or other vehicles contaminated by diseased animals. All persons having charge of diseased or exposed cattle or other live stock are required to keep them confined and to permit no other animals to come in contact with them. Premises or vehicles which have contained diseased or exposed cattle or other live stock shall not be occupied by healthy animals until the said premises or vehicles shall have been disinfected as hereinafter provided.

Regulation 3.—Cars, boats, and other vehicles that have been used for the interstate transportation of diseased or exposed cattle or other live stock shall be cleaned and disinfected, as hereinafter provided. If the facilities for cleaning and disinfecting cars can not be provided at the point of destination, the railroad company shall seal, bill, and forward the infected cars to a point to be agreed upon between an agent of the company and a representative of the Bureau of Animal Industry, and shall there clean and disinfect the said cars in the presence of an employee of the Bureau of Animal Industry.

Regulation 4.—Cars, boats, and other vehicles intended for use in interstate transportation of healthy and nonexposed cattle or other live stock within or from a quarantined area shall be cleaned and disinfected as hereinafter provided, unless it shall be shown to the satisfaction of the inspector of the Bureau of Animal Industry either that said cars have been cleaned and disinfected according to Regulation 3, and have not carried or contained animals since that cleaning and disinfection, or that the cars have never been used for the transportation of diseased or exposed animals.

Regulation 5.—Public stock yards, feeding stations and approaches, chutes, alleys, and pens thereof which have contained diseased or exposed animals shall, before healthy or nonexposed animals are placed therein, be cleaned and disinfected as hereinafter provided. Failure to clean and disinfect will subject the said places to quarantine.

Regulation 6.—When, in the opinion of the Secretary of Agriculture, the shipment or removal of hay, straw, forage, or similar material from a quarantined area is liable to spread the contagion or infection of any disease affecting live stock, said shipment or removal will either be absolutely prohibited or permitted under restrictions which will be indicated in each particular case.

Regulation 7.—When deemed necessary, shipments of live stock and of the articles named in Regulation 6 will be stopped in transit for inspection and disposition, and all persons and corporations having control of the transportation of such live stock or articles shall cease the carriage or transit of the same upon receipt of an order from an inspector of the Bureau of Animal Industry, shall submit the live stock to inspection, and shall disinfect the said articles if required.

Regulation 8.—Where, in order to prevent the spread of a disease, it becomes necessary to slaughter any diseased or exposed live stock, the value of the live stock shall be ascertained and compensation made therefor, either by agreement with the owner or by appraisement in the manner provided by the law of the State or Territory wherein the owner of the live stock has his legal residence.

Regulation 9.—Where inspection and certification are required by the regulations of the Secretary of Agriculture, inspection and certification by an inspector of the Bureau of Animal Industry are meant, and such inspection and certification will be furnished without the payment of fees or charges of any nature.

Regulation 10.—All live stock moved under authority of a certificate shall be accompanied to destination by the said certificate, and said live stock shall be moved to the destination named in said certificate unless reinspected and recertified by an inspector of the Bureau of Animal Industry.

REGULATIONS TO PREVENT THE SPREAD OF SPLENETIC FEVER OF CATTLE.

Regulation 11.—Whenever any State or Territory located within an area quarantined by the Secretary of Agriculture for splenetic, southern, or Texas fever shall duly establish a State or Territorial quarantine line different from the line established by the Secretary of Agriculture and shall obtain the legislation requisite to enforce said State or Territorial quarantine line strictly and completely within the boundaries of said State or Territory, the Secretary of Agriculture will, if the said State or Territorial quarantine line be satisfactory, adopt by a rule said State or Territorial quarantine line, and the State or Territorial quarantine line as adopted shall define the limits of that portion of the quarantined area. The expiration of the time fixed in the rule, the revocation of the rule, or a failure upon the part of the State officers to enforce the adopted line shall restore the quarantined area to the territory fixed by the Secretary of Agriculture before the adoption of the State or Territorial quarantined line.

Regulation 12.—Whenever any State or Territory under authority of law shall establish a State or Territorial quarantine line for splenetic fever which differs from the quarantine line established by the Secretary of Agriculture for the said disease, and shall desire a modification of the line established by the Secretary of Agriculture, the proper officer of the said State or Territory shall forward to the Secretary of Agriculture a true map or description of such line and a duly authenticated copy of the laws and regulations relating to the establishment and enforcement of said line.

Regulation 13.—From the 1st day of February to the 31st day of October, inclusive, of each year, no cattle shall be transported or driven or allowed to drift from the area quarantined by the Secretary of Agriculture for splenetic fever into any State or Territory or the District of Columbia or portion thereof outside of the said quarantined area, except as hereinafter provided. During the months of January, November, and December of each year cattle from the area quarantined by the Secretary of Agriculture for splenetic fever may be shipped without restrictions other than those imposed by State or Territorial officers at point of destination.

Regulation 14.—Cattle from the said quarantined area may be transported at any time, by rail or boat, to a recognized slaughtering center outside the quarantined area for immediate slaughter, but cattle shall not be trailed or driven or hauled therefrom in private conveyance. When transported for immediate slaughter the said cattle shall be slaughtered within two weeks after arrival at destination, and the following rules regarding their movement shall be observed:

(*a*) When any cattle in course of transportation from the quarantined area are unloaded at a point outside of the quarantined area to be fed or watered, or for other purposes, said cattle shall be placed in pens or yards reserved for cattle originating in the quarantined area, and a sign shall be conspicuously placed on all such pens or yards with the words "QUARANTINE PENS" or "QUARANTINE YARDS" in letters not less than 10 inches in height. Cattle which have not originated in the quarantined area shall not be admitted into said pens or yards, and if cattle not originating in the quarantined area shall be placed in the said pens or yards said cattle shall thereafter be treated in all respects as if they had actually originated in the quarantined area.

(*b*) On unloading said cattle at their points of destination, chutes, alleyways, and pens, sufficiently isolated and marked with a sign as above, shall be set apart to receive them, and no other cattle shall be admitted to said chutes, pens, and alleyways; and the regulations relating to the movement of cattle from said area, as prescribed by the proper State officers at destination, shall be carefully observed. The cars or boats which have carried said cattle shall be cleaned and disinfected as hereinafter provided as soon as possible after unloading and before the said cars or boats are again used to transport, store, or shelter live stock or merchandise.

(*c*) Where cattle originating in the quarantined area and cattle originating outside of the quarantined area are yarded in adjacent pens, there shall be left a space between the said pens not occupied by cattle, and not less than 10 feet wide, and there shall be on each side of this space a tight-board fence not less than 5 feet high.

(*d*) The proper officers of the railroad companies shall affix on both sides of all cars carrying cattle from the quarantined area, except as hereinafter provided, durable printed placards not less than 5½ by 8 inches in size, the letters of which shall be boldface and not less than 1½ inches in height. The placard shall state that said cars contain "SOUTHERN CATTLE;" and each of the waybills, conductors' manifests, memoranda, and bills of lading of said shipments by cars or boats shall have a statement of similar import plainly written or stamped upon its face. The placards shall state the name of the place from which the shipment was made, with the date and the name of the place of destination; said date must correspond with the date of the waybills and other papers. Whenever any cattle have come from said quarantined area and are reshipped from any point at which they have been unloaded to a point other than the original destination, or are transferred to another transportation company, the cars carrying said animals shall bear, on both sides, similar placards bearing the same information, which shall be affixed by the officers of the said transportation company, and the waybills, conductors' manifests, memoranda, and bills of lading of said shipments by cars or boats shall be so marked. At whatever point these cattle are unloaded they shall be placed in separate pens, as hereinbefore provided.

(*e*) No car or boat containing cattle from the quarantined area shall receive on board cattle which have originated or which are, at the time of loading, outside of said quarantined area. Cattle from the quarantined area shall not be shipped or transported when consigned to a point outside of said quarantined area where proper facilities have not been provided for transferring the said cattle from the cars or landing to the stock yards and slaughterhouses without passing them over public highways, unless proper permission for such passing is first had and obtained from the proper authorities at point of destination.

(*f*) The cars and boats used to transport cattle from the quarantined area, and also the chutes, alleyways, and pens not reserved for the exclusive use of such cattle used en route and at points of destination, shall be disinfected in the following manner: Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a 5 per cent solution of 100 per cent carbolic acid; or, if not disinfected, it shall be stored where no cattle can come in contact with it during the period from February 1 to October 31, inclusive, of each year. Wash the cars and the watering and feeding troughs with water until clean. Saturate the entire interior surface of the cars, including the inner surface of the car doors, and the fencing, troughs, chutes, and floors of the pens with a mixture made of 1½ pounds of lime and ¼ pound of 100 per cent carbolic acid to each gallon of water, or with a solution made by dissolving 4 ounces of chloride of lime to each gallon of water.

(*g*) Cars which have carried cattle within the quarantined area shall be cleaned and disinfected before being taken out of the said area, except when loaded with cattle in the course of transportation for immediate slaughter, in accordance with these regulations.

Regulation 15.—Cattle infested with the *Boophilus annulatus*, or southern cattle tick, disseminate the contagion of splenetic, southern, or Texas fever; therefore cattle originating outside of the quarantined area which are infested with the *Boophilus annulatus* ticks shall be considered as infected cattle and shall be subject to the regulations governing the movement of cattle originating in the quarantined area.

Regulation 16.—Stock-yard companies receiving cattle infested with the said ticks shall place the said cattle in the pens set aside for the use of cattle originating in the quarantined area, and transportation companies are required to clean and disinfect all cars and boats which have contained the infected cattle in accordance with the requirements of these regulations.

Regulation 17.—Cattle which have been properly dipped in Beaumont crude petroleum, or in other petroleum approved by the Secretary of Agriculture, under the supervision of an inspector of the Bureau of Animal Industry, at a dipping station approved by the Secretary of Agriculture, and which have been examined and certified free of infection by the said inspector, may be shipped from the quarantined area to any point outside the said area at any time, subject only to such restrictions as may be imposed by State or Territorial officers at points of destination; but such cattle shall be shipped in clean, disinfected cars, and shall not be driven through the quarantined area or be unloaded therein except at such points as may be designated in the rules of the Secretary of Agriculture.

Regulation 18.—Before accepting or moving a shipment of cattle from that portion of the quarantined area from which, under the rules of the Secretary of Agriculture, cattle may be shipped after inspection, for purposes other than immediate slaughter, to a point outside the quarantined area, transportation companies shall secure a signed statement from each owner or consignor of said cattle, showing the purpose for which the cattle are shipped. In every case this statement shall accompany the waybills.

REGULATIONS TO PREVENT THE SPREAD OF SCABIES IN CATTLE.

Regulation 19.—No cattle which are diseased with scabies shall be shipped or trailed from one State or Territory into another State or Territory or the District of Columbia, except as hereinafter provided; and no cattle shall be trailed, shipped, otherwise removed, or allowed to drift from a State or Territory or portion thereof quarantined for the disease of scabies in cattle into another State or Territory or the District of Columbia, except as hereinafter provided, unless the cattle have been inspected by an inspector of the Bureau of Animal Industry, found free of the disease, and are accompanied by a certificate from the said inspector.

Regulation 20.—In States or Territories or portions thereof quarantined by the Secretary of Agriculture for scabies in cattle, where satisfactory dipping is practiced, those cattle which upon inspection by an inspector of the Bureau of Animal Industry at the time of shipment are found to be free from symptoms of scabies shall be given a certificate and allowed to move to points outside the quarantined area subject only to such restrictions as may be imposed by State or Territorial officers at points of unloading and destination; but if a herd or consignment be offered for inspection and a portion thereof is found to be diseased with scabies the diseased cattle shall be dipped twice in either the lime-and-sulphur or the tobacco-and-sulphur dip or once in Beaumont crude petroleum, in the manner hereinafter provided, and that portion of the herd or consignment not visibly diseased shall be dipped once before shipment.

Regulation 21.—Cattle not visibly diseased with scabies may be shipped without inspection from points in the quarantined area where the service of an inspector is not readily procurable to any recognized slaughtering center for immediate slaughter. When so shipped the cattle shall not be diverted en route, and shall be either slaughtered within two weeks after arrival at destination or shall be submitted for inspection. The further handling of the cattle shall be subject to the result of this inspection. When cattle are shipped without inspection, under the terms of this regulation, the officers of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard not less than 5½ inches by 8 inches in size, the letters on which shall be boldface and not less than 1½ inches in height. These placards shall bear the words "UNINSPECTED CATTLE," *and shall not be removed until the cattle have arrived at destination and the inspector has indicated the disposition to be made of the cars.*

Regulation 22.—Cattle that are diseased with scabies and which have been dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip in the manner hereinafter provided, under the supervision of an inspector of the Bureau of Animal Industry, within ten days of date of shipment, may be shipped for immediate slaughter to a recognized slaughtering center, and when so shipped the said cattle shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If cattle diseased with scabies are to be shipped for stockers or feeders, they shall be dipped twice in either the lime-and-sulphur or the tobacco-and-sulphur dip ten days apart or once in Beaumont crude petroleum, under supervision, and shall be submitted to inspection before shipment. However, diseased cattle may be dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip under the supervision of an inspector of the Bureau of Animal Industry at the point of origin and shipped for stocking or feeding purposes if arrangements have been made for the second dipping en route or at destination at the required time after the first dipping at a point where there is an inspector stationed, and under his supervision.

Regulation 23.—Healthy cattle in a State or Territory not quarantined by the Secretary of Agriculture for scabies in cattle may be shipped in clean cars without inspection into any other State or Territory for slaughter or for stockers or feeders, but if the said cattle be unloaded en route or at destination and are placed in infected premises, they shall be treated as exposed cattle, and shall not be forwarded to destination for purposes other than for immediate slaughter, until they shall have been dipped once in any dip herein approved under the supervision of an inspector of the Bureau of Animal Industry.

Regulation 24.—When diseased cattle have been dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip and are shipped in accordance with Regulation 22, the officers of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard, not less than 5½ by 8 inches in size, the letters on which shall be boldface, and not less than 1½ inches in height. These placards shall bear the words "DIPPED SCABBY CATTLE," and shall not be removed until the cattle have arrived at destination or point of second dipping, have been unloaded, and the cars have been disinfected.

Regulation 25.—The dips now approved by the Department are the lime-and-sulphur dip, the tobacco-and-sulphur dip, and Beaumont crude petroleum. The lime-and-sulphur dip is made in the proportion of 12 pounds of unslaked lime and 24 pounds of flowers of sulphur to 100 gallons of water. Weigh both the lime and sulphur. Place the unslaked lime in a mortar box or some suitable vessel and add enough water to slake the lime and form a lime paste or lime putty. Sift into this lime paste the flowers of sulphur, and stir the mixture well. To make 100 gallons of dip, place the sulphur-and-lime paste in a kettle or boiler with about 30 gallons of boiling water and boil the mixture for two hours at least, stirring the liquid and sediment; add enough water when necessary to maintain the quantity. Draw the mixture and sediment into a large tub or barrel placed near the dipping vat and provided with a bunghole about 4 inches from the bottom, and allow ample time to settle—from two to three hours or more, if necessary. When fully settled, draw off the clear liquid into the dipping vat and add enough warm water to make 100 gallons. The same directions apply to larger quantities of dip, proportionate amounts of ingredients being used.

The tobacco-and-sulphur dip is made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur.

When Beaumont crude petroleum is used as a dip for cattle diseased with or exposed to scabies, one dipping only is necessary in any case, and the cattle shall be submerged but once and shall not be held in the dip.

The dipping shall be done thoroughly. When either the lime-and-sulphur or the tobacco-and-sulphur dip is used, the cattle shall be held in the dip two minutes unless the diseased cattle shall have been hand-dressed previously. The cattle shall be completely submerged twice. The dip shall be maintained as nearly as possible at a temperature of 105° F. while the cattle are in it. It shall be renewed as soon as it becomes filthy, regardless of the number of cattle that have been dipped in it, and in no case shall it be used when more than one week old. In emptying the dipping vat the entire contents shall be removed, including all sediment and droppings or other foreign matter. The Department assumes no responsibility for loss or damage resulting from the dipping.

Regulation 26.—Cattle shipped under a certificate from an inspector of the Bureau of Animal Industry are not guaranteed uninterrupted transit; for, in the event of the development of scabies or exposure to the disease en route, the cattle shall then be handled as diseased or exposed cattle and shall be dipped as hereinbefore provided, and the cars or other vehicles and the chutes, alleys, and pens which have been occupied by them shall be cleaned and disinfected.

Regulation 27.—Public stock yards shall be considered infected and the cattle yarded therein as having been exposed to the disease, and no cattle shall be removed from said public stock yards, except for immediate slaughter, without dipping. Where, however, a part or all of the stock yards is reserved and set apart for the reception of uninfected shipments of cattle and is kept free of disease, cattle may be shipped from the said uninfected yards or portions thereof without dipping. If diseased cattle are introduced into said uninfected yards or portions thereof, they shall be immediately removed therefrom and the chutes, alleys, and pens used by them thoroughly cleaned and disinfected. No cattle shall be forwarded for feeding or stocking purposes from any stock yards where an inspector of the Bureau of Animal Industry is stationed without a certificate of inspection or of dipping issued by the said inspector.

Regulation 28.—Cars and other vehicles, yards, pens, sheds, chutes, etc., which have contained diseased cattle shall be cleaned and disinfected immediately after the cattle are removed therefrom in the following manner: Remove all the litter and manure and then saturate the interior surfaces of the cars and woodwork, flooring, and ground of the chutes, alleys, and pens with a 5 per cent solution of 100 per cent carbolic acid in water, with sufficient lime to show where it has been applied.

REGULATIONS TO PREVENT THE SPREAD OF SCABIES IN SHEEP.

Regulation 29.—No sheep which are diseased with scabies shall be shipped or trailed from one State or Territory into another State or Territory or the District of Columbia, except as hereinafter provided; and no sheep shall be trailed or shipped from a State or Territory or portion thereof quarantined for the disease of scabies in sheep into another State or Territory or the District of Columbia, except as hereinafter provided, until the sheep have been inspected by an inspector of the Bureau of Animal Industry, found free of the disease and of exposure thereto, and are accompanied by a certificate from the said inspector. For the purpose of these regulations, all of the sheep in a certain flock or shipment in which the disease is present shall be considered diseased, and none of the sheep in the said diseased flock or shipment shall be removed or offered for shipment until dipped, as hereinafter provided. The practice of "picking" a flock—i. e., removing sheep which are visibly diseased and then offering any portion of the remaining sheep for either inspection or shipment or both—is directly and positively prohibited.

Regulation 30.—Healthy sheep in an area not quarantined for the disease of scabies in sheep which have not been exposed to the disease may be shipped or trailed without restriction by the regulations of the Secretary of Agriculture to prevent the spread of scabies in sheep, but if the said sheep be unloaded en route or at destination and are placed in infected premises they shall be treated as exposed sheep, and shall not be forwarded to destination for purposes other than immediate slaughter until they shall have been dipped under the supervision of an inspector of the Bureau of Animal Industry.

Regulation 31.—Sheep that are diseased with scabies and which have been dipped once in the manner hereinafter provided, under the supervision of an inspector of the Bureau of Animal Industry, within ten days of date of shipment, may be shipped for immediate slaughter to a recognized slaughtering center, and when so shipped the said sheep shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If the diseased sheep are to be shipped for stocking or feeding purposes, they shall be dipped twice, as above indicated, ten days apart, and shall be submitted to inspection before shipment.

Sheep that are not diseased with scabies, but which have been exposed to the contagion of the disease, may be moved for feeding or stocking purposes after one dipping, or they may be shipped by rail or boat to a recognized slaughtering center for immediate slaughter without dipping.

Regulation 32.—When diseased sheep have been dipped once and are shipped for slaughter in accordance with Regulation 31, the officers of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard not less than 5½ by 8 inches in size, the letters of which shall be bold-face and not less than 1½ inches in height. These placards shall bear the words "DIPPED SCABBY SHEEP," and shall not be removed until the sheep have arrived at destination, have been unloaded, and the cars disinfected.

When exposed sheep are shipped without dipping for immediate slaughter, in accordance with Regulation 31, the officers of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard not less than 5½ by 8 inches in size, the letters of which shall be bold-face and not less than 1½ inches in height, bearing the words "EXPOSED SHEEP FOR SLAUGHTER."

Regulation 33.—The dips now approved are:

(*a*) The tobacco-and-sulphur dip, made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur.

(*b*) The lime-and-sulphur dip, made with 8 pounds of unslaked lime and 24 pounds of flowers of sulphur to 100 gallons of water. The lime and sulphur should be boiled together for not less than two hours, and all sediment allowed to subside before the liquid is placed in the dipping vat.

Either one of these dips may be used.

Regulation 34.—The dipping shall be done carefully and the sheep handled as humanely as possible. The Department, however, assumes no responsibility for loss or damage resulting from the dipping, and those who wish to avoid any risks that may be incident to dipping at the stock yards, as well as to avoid liability to prosecution, should see that their sheep are free from disease before shipping them to market.

Regulation 35.—The sheep shall be kept in the dip between two and three minutes and their heads be submerged at least once, though but for an instant at a time, and assistance should be rendered immediately if the sheep appear to be strangling. The dip shall be maintained at a temperature between 100° and 105° F., while the sheep are in it. It shall be renewed as soon as it becomes filthy, regardless of the number of sheep dipped, and in no case shall the dip be used when more than one week old. In emptying the dipping vat the entire contents shall be removed, including all sediment and droppings or other foreign matter. Suitable dripping platforms and drying pens shall be provided. Sheep shall not be loaded until they have become dry.

Regulation 36.—Sheep shipped under a certificate are not guaranteed uninterrupted transit; for in the event of the development of scabies or exposure thereto en route they shall be dipped before proceeding to their destination, and the cars or other vehicles and the chutes, alleys, and pens that may have been occupied shall be cleaned and disinfected as hereinafter provided.

Regulation 37.—Public stock yards shall be considered infected and the sheep yarded therein as having been exposed to the disease, and no sheep may be shipped from the said yards, except for immediate slaughter, without dipping. Where, however, a part or all of the stock yards is reserved and set apart for the reception of uninfected shipments of sheep and is kept free of disease, sheep may be shipped from the reserved yards or portions thereof without dipping. If diseased sheep are introduced into said uninfected yards or portions thereof they shall be immediately removed therefrom and the chutes, alleys, and pens occupied by the said sheep shall be thoroughly cleaned and disinfected. No sheep shall be shipped for feeding or stocking purposes from any stock yards where an inspector of the Bureau of Animal Industry is stationed without a certificate of inspection or of dipping issued by the said inspector.

Regulation 38.—Cars and other vehicles, yards, pens, sheds, chutes, etc., that have contained diseased or exposed sheep shall be cleaned and disinfected in the following manner: Remove all litter and manure, and then saturate the interior surfaces of the cars and the woodwork, flooring, and ground of the chutes, alleys, and pens with a 5 per cent solution of 100 per cent carbolic acid in water, with sufficient lime to show where it has been applied.

REGULATIONS TO PREVENT THE SPREAD OF MALADIE DU COÏT.

Regulation 39.—No horses or asses shall be offered for shipment, shipped, transported, driven, or trailed, or otherwise removed or allowed to drift from an area quarantined by the Secretary of Agriculture for maladie du coït without inspection and certification of freedom from the disease for the purpose of the particular movement by an inspector of the Bureau of Animal Industry. Owners and custodians of horses or asses for whom inspection is made shall provide such reasonable facilities and render such assistance as may be required by the inspector.

Regulation 40.—Any animal or animals showing symptoms of the disease or known to have been exposed thereto shall, in the discretion of the inspector or employee of the Bureau of Animal Industry, either be immediately quarantined and maintained in quarantine at the expense of the owner or owners until released by the said inspector or employee, or shall be condemned and killed as hereinafter provided.

Regulation 41.—No stallion or jack shall be allowed to run at large on the Pine Ridge and Rosebud Indian reservations in the State of South Dakota, and all the stallions and jacks thereon shall be tagged as hereinafter provided.

Regulation 42.—There shall be no breeding of animals on the said reservations in a herd in which there is an animal which has been exposed to the infection of maladie du coït within eighteen months after the said exposure.

Regulation 43.—When it is necessary, in order to prevent the spread of the disease and to aid in its extermination, the Department of Agriculture will purchase a diseased or exposed animal at a price based upon its actual value for work purposes at the time of purchase. When, however, the owner or owners will not accept the indemnity price offered by the Department, the inspector shall arrange for a board of three appraisers, who shall determine the price to be paid for the condemned animal. This board shall be constituted as follows: An inspector or other employee of the Bureau of Animal Industry, one person chosen by the owner of the animal or animals to be appraised, and the third member to be chosen by the two herein provided for. The animal or animals under condemnation shall be maintained in quarantine at the expense of the owner or owners until disposed of.

Regulation 44.—Any stallions or jacks found running at large on the Pine Ridge and Rosebud Indian reservations on and after the date of this order may be castrated by an inspector or other employee of the Bureau of Animal Industry of this Department, or by such other person as may be duly authorized by the inspector in charge of the district named, and no indemnity shall be allowed the owner in case of damage resulting from such castration. The terms "stallion" and "jack" shall be understood to apply to any uncastrated male horse or ass 1 year of age or over.

Regulation 45.—Each stallion or jack on the above-named reservations shall bear a numbered tag and shall be kept under such restrictions as the inspector in charge shall prescribe, and shall be subjected to examination at such times and as frequently as may be thought necessary by the inspector for the purpose of ascertaining whether symptoms of the disease have developed.

Regulation 46.—The Department will pay a sum of $50 for authentic information leading to the discovery of the ownership and location of a stallion or a jack affected with the contagious venereal disease known as maladie du coït, and the sum of $25 for authentic information leading to the discovery of the ownership and location of a female animal affected with the disease: *Provided,* That when such information is received from more than one person as to the location of the same animal and owner the sum above named shall be paid to the first informant, and when doubt exists or a dispute arises as to who was the first informant no reward shall be paid. When more than one diseased animal is found belonging to the same owner or on the same premises only one reward shall be paid.

REGULATIONS TO PREVENT THE SPREAD OF HOG CHOLERA AND SWINE PLAGUE.

Regulation 47.—No swine which are diseased with hog cholera or swine plague, or which have been exposed to either of the diseases by contact with diseased animals or by confinement in infected cars, pens, or other premises, shall be transported, trailed, or driven from one State or Territory into another State or Territory or the District of Columbia, except as hereinafter provided. All persons intending to ship swine shall ascertain before offering them for shipment that the animals are not diseased and have not been exposed to the contagion of either disease.

Regulation 48.—Swine which are not diseased with hog cholera or swine plague and which have not been exposed to the infection thereof may be shipped from one State or Territory or the District of Columbia into another State of Territory or the District of Columbia without restriction by the regulations of the Secretary of Agriculture, and subject only to such restrictions as may be imposed on the shipment by State or Territorial or District of Columbia officers at destination.

Regulation 49.—Public stock yards shall be considered infected, and no swine shall be shipped therefrom for feeding or stocking purposes. No diseased swine shall be shipped from the stock yards, but shall be slaughtered, subject to condemnation on post-mortem inspection; and all swine in a certain lot or shipment shall be considered diseased when one or more of them show evidence of the disease. Swine that are not diseased and have been merely exposed by being in the yards may be shipped to a recognized slaughtering center for immediate slaughter. Where, however, a part of the yard is set apart for the reception of uninfected shipments of swine and is kept free of infection, swine may be shipped from such part without restriction. Should such part be contaminated by the introduction of diseased swine said animals shall be immediately removed therefrom, and the chutes, alleys, and pens occupied by them thoroughly cleaned and disinfected as hereinafter provided.

Regulation 50.—Cars and other vehicles and pens or yards which have contained diseased or exposed swine shall be cleaned and disinfected as soon as possible after unloading. Cars shall not be removed before the inspector has had time to ascertain the condition of the animals and to give notice that the cars must be cleaned and disinfected. Cleaning and disinfection shall be done by first removing all litter and manure and then saturating the interior surfaces of the cars and the woodwork, flooring, and ground of the chutes, alleys, and pens with a 5 per cent solution of 100 per cent carbolic acid in water, with sufficient lime to show where it has been applied.

Rule 1.—To prevent the Spread of Splenetic Fever in Cattle (Effective on and after June 1, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture and notice is hereby given that a contagious and infectious disease known as splenetic, southern, or Texas, fever exists among cattle in the following-named States and Territories, to wit:

CALIFORNIA, OKLAHOMA, INDIAN TERRITORY, TEXAS, ARKANSAS, LOUISIANA, MISSISSIPPI, TENNESSEE ALABAMA, KENTUCKY, VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA, GEORGIA, and FLORIDA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (Public No. 229), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of California, Oklahoma, Indian Territory, Texas, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Virginia, North Carolina, South Carolina, Georgia and Florida, and that portion of the territory in the State of Kentucky situate in the counties of Clinton, Wayne, and Pulaski.

It is ordered by this rule, under the authority and discretion conferred on the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (Public No. 229), that cattle shall be moved from the area herein quarantined to any point not located in the said quarantined area only in accordance with the regulations of the Secretary of Agriculture promulgated May 1, 1905, and effective June 1, 1905, subject to the following exceptions, to wit:

Exception 1.—The following-named States and Territory have established State and Territorial quarantine lines differing from the line established by the Secretary of Agriculture, and are as follows, to wit:

CALIFORNIA.

Beginning on the Pacific coast where the northern boundary line of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary line of San Luis Obispo County to its junction with the western boundary of Kings County; thence northwesterly along the western boundary of Kings and Fresno counties to the western corner of Fresno County; thence northerly, easterly, and southerly along the western, northern, and eastern boundary line of Merced County to the southeast corner thereof; thence northeasterly along the northern boundary of Madera County to the northeast corner thereof; thence southerly and easterly along the eastern boundary lines of Madera, Fresno, and Tulare counties to the southeast corner of Tulare County; thence easterly along the southern boundary line of Inyo County to its intersection with the eastern boundary line of the State of California.

TEXAS.

Beginning at the intersection of the southern boundary of New Mexico with the international boundary line at the Rio Grande River; thence southeasterly along the said international boundary line to the southwest corner of the county of Pecos; thence following the western boundary of Pecos County to the southeast corner of Reeves County; thence following the boundary line between the counties of Pecos and Reeves to the Pecos River; thence southeasterly, following the Pecos River, to the northwest corner of Crockett County; thence east along the northern boundary of Crockett and Schleicher counties to the southeastern corner of Irion County; thence north along the eastern boundary of Irion County to the northeast corner of said county; thence continuing due north to the southern boundary line of Coke County; thence west with the southern boundary of Coke County to the southwest corner of Coke County; thence north along the western boundary of Coke County, to the southern boundary of Mitchell County; thence east to the southeast corner of Mitchell County; thence north along the eastern boundary of Mitchell County to the northeast corner of said county; thence east along the southern boundaries of Fisher and Jones counties to the southeast corner of Jones County; thence north along the eastern boundary of Jones County to the northeast corner of said county; thence east along the southern boundary of Haskell County to the southeast corner of said county; thence north along the western boundary lines of Throckmorton and Baylor counties to the northwest corner of Baylor County; thence east along the southern boundary of Wilbarger County to the southeast corner of said county; thence north along the eastern boundary of Wilbarger County to the Red River; thence continuing in a northwesterly direction, along the course of said river and the northern boundary of Texas, to the southwest corner of Greer County, Oklahoma Territory; thence north following the eastern boundary line of Texas to the northwest corner of said Greer County.

OKLAHOMA.

Beginning on the Red River at the northwestern corner of Wichita County, Tex.; thence northwesterly along the course of said river to the southwest corner of Greer County; thence north along the western boundary of Greer County to the northwest corner thereof; thence easterly and southerly along the southern boundary of Roger Mills County to the southeast corner of said county; thence east along the southern boundary line of Washita County to the southeast corner of said county; thence north along the eastern boundary lines of Washita and Custer counties to the Canadian River; thence in a southeasterly direction along the course of said river to the southeast corner of Canadian County; thence north along the eastern boundary line of Canadian County to the northwest corner of Cleveland County; thence east along the northern line of Cleveland County to the middle of the right of way of the Atchison, Topeka and Santa Fe Railway; thence northerly following the middle of said right of way through Oklahoma, Logan, Noble, and Payne counties, and the Otce and Missouria and Ponca Indian reservations to the northern boundary of the Ponca Indian Reservation; thence east along the northern boundary of the Ponca Indian Reservation to the Arkansas River; thence in a northerly direction following the course of the said river to its intersection with the thirty-seventh parallel of north latitude at the southern boundary line of Kansas.

TENNESSEE.

Beginning on the Mississippi River at the southeast corner of the State of Missouri at the western boundary of Tennessee; thence southerly along the western boundaries of the counties of Dyer and Lauderdale; thence following the main channel of the Mississippi River (leaving Island No. 37 to the north and west) to the northwestern corner of Shelby County, on the Mississippi River; thence easterly along the northern boundary lines of Shelby and Fayette counties to the southwestern corner of Haywood County; thence northerly along the western boundary line of Haywood County to the Big Hatchie River; thence southeasterly along said river to its intersection with the southern boundary line of Haywood County; thence east and north along the southern and eastern boundary lines of Haywood County to the northeastern corner of said county; thence following the northern boundary line of Madison County to the southwest corner of Carroll County; thence northerly and easterly along the western and northern boundary lines of Carroll County to the northeast corner of said county; thence southerly along the eastern boundary of said county to its intersection with the N., C. & St. L. Railway; thence easterly along the middle of the roadbed of said railway through Benton County to the intersection of said N., C. & St. L. Railway with the Tennessee River at the eastern boundary of Benton County; thence southerly along the eastern boundaries of Benton and Decatur counties to the northwest corner of Wayne County; thence easterly along the northern boundary line of Wayne County to the southeast corner of Perry County; thence northerly, easterly, and southerly along the western, northern, and eastern boundaries of Lewis County to the northern boundary line of Lawrence County; thence easterly along the northern boundary of Lawrence County to the northeast corner thereof; thence southerly along the eastern boundary of Lawrence County to the southeast corner thereof; thence east along the southern boundary of Giles County to the Elk River; thence northeasterly along said river through Giles and Lincoln counties to the eastern boundary of Lincoln County; thence northerly and easterly along the western and northern boundaries of Moore County to the northeast corner of Moore County; thence northerly along the western boundary lines of Coffee and Cannon counties to the northwest corner of Cannon County; thence northeasterly and southeasterly along the northern and eastern boundaries of Cannon County to the boundary of Warren County; thence easterly along the northern boundary of Warren County to the western boundary of White County; thence northeasterly and southeasterly along the western and northern boundaries of White County to the western boundary of Cumberland County; thence southerly, easterly, and northeasterly along the western, southern, and eastern boundaries of Cumberland County to the northern corner of Rhea County; thence southerly along the eastern boundary lines of Rhea and James counties to the boundary line of Bradley County; thence northerly and southeasterly along the northern boundary lines of Bradley and Polk counties to the northeast corner of Polk county; thence southerly along the eastern boundary line of Polk County to the southeast corner thereof, at the southwestern corner of North Carolina.

GEORGIA.

Beginning at the intersection of the western boundary line of Union County with the boundary line between the States of Georgia and North Carolina; thence southerly along the western boundary of Union County to the southwest corner thereof; thence northeasterly and easterly along the southern boundary lines of Union and Towns counties to the western corner of Rabun County; thence easterly, southeasterly, and northeasterly along the western, southern, and eastern boundaries of Rabun County to the northeast corner of said county, on the boundary between Georgia and North Carolina.

NORTH CAROLINA.

Beginning at the southwest corner of the county of Cherokee; thence east along the southern boundary lines of the counties of Cherokee, Clay, Macon, Jackson, Transylvania, and Henderson to the southwest corner of the county of Polk; thence northerly along the western boundaries of Polk and Rutherford counties to the southern boundary of McDowell County; thence westerly, northerly, and northeasterly along the southern, western, and northern boundaries of McDowell County to the North Fork of the Catawba River; thence southerly along the course of said North Fork to the Catawba River; thence easterly along the course of said river to its intersection with the western boundary line of Burke County; thence southerly and easterly along the western and southern boundaries of said county to the northeastern corner of Cleveland County; thence southerly along the eastern boundary of Cleveland County to the boundary line between North Carolina and South Carolina; thence easterly along said State boundary line to the Catawba River; thence northerly and westerly, following the course of the Catawba River to the southwest corner of Alexander County; thence northerly along the western boundary line of Alexander County to the southern boundary of Wilkes County; thence easterly and northerly along the southern and eastern boundaries of Wilkes County to the Yadkin River; thence easterly, following the course of the Yadkin River to the mouth of Mitchell River; thence northerly, following the course of Mitchell River to the eastern boundary of Alleghany County; thence northeasterly along the eastern boundary of Alleghany County to its intersection with the northern boundary line of the State of North Carolina.

VIRGINIA.

Beginning at the boundary line of Virginia at its southwestern corner (Lee County); thence east along the southern boundary of Virginia to the southwestern corner of Patrick County; thence northerly along the western boundaries of Patrick and Franklin counties to Daniels Run; thence easterly along Daniels Run and the Blackwater River to the Staunton River; thence in a southeasterly and northeasterly direction along the southern and eastern boundaries of Bedford County to the James River; thence following the James River to the southeastern corner of Charles City County; thence northerly and easterly along the western and northern boundaries of James City County to the western boundary of Gloucester County at the York River; thence southerly and northerly along the southern and eastern boundaries of Gloucester County to the northeastern corner of said county; thence easterly and southerly along the northern and eastern boundaries of Mathews County to the southeastern point of said county; thence south to the northern boundary of Elizabeth City County; thence westerly and northerly along the boundaries of Elizabeth City and Warwick counties to the James River; thence southeasterly along the course of the said river to the northwest corner of Norfolk County; thence south along the western boundary of said county to its intersection with the northern boundary of North Carolina; thence east along the southern boundaries of Norfolk and Princess Anne counties to the Atlantic Ocean.

The States and Territory above named have enacted laws necessary to enforce said lines completely within their respective boundaries, and these quarantine lines, subject to the changes contained in *Exception 2*, are hereby adopted, to continue as provided in Regulation 11 of the Regulations of the Secretary of Agriculture, promulgated May 1, 1905, and effective June 1, 1905. *The area herein quarantined is modified accordingly.*

Exception 2.—That portion of the quarantine line for the State of Virgina described in *Exception 1*, beginning at the southwestern corner of Virginia (Lee County) and extending east along the southern boundary line of Virginia to the northeastern corner of Alleghany County, North Carolina, is hereby suspended during the continuance of the lines for the States of Tennessee and North Carolina, as described in *Exception 1.*

That portion of the quarantine line for the State of North Carolina described in *Exception 1*, beginning at the intersection of the northwest corner of Union County, Georgia, with the North Carolina State line, and extending easterly along the southern boundary line of North Carolina to the northeast corner of Rabun County, Georgia, is hereby suspended during the continuance of the line for the State of Georgia, as described in *Exception 1.*

Exception 3—California.—During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, Madera, and Merced. No cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Kern, Tulare, San Luis Obispo, Fresno, Madera, and Merced to any portion of the State of California located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of California; and no cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point, not in the State of California, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 4—Texas.—During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Baylor and Throckmorton and that portion of the county of Pecos lying north and west of the line described as follows: Beginning at the west line of Pecos County at the point where the roadbed of the G. H. & S. A. Railroad crosses said line; thence in an easterly direction with the center of said roadbed to a point in section No. 36, block A2, G. H. & S. A. Railroad Company; thence north with the pasture fence running in a northerly direction through the eastern part of sections Nos. 13 and 12 of said block A2 and across section 1, G. C. & S. F. Railroad Company; thence continuing north with said pasture fence through the eastern part of sections Nos. 16, 17, 46, 47, 76, 77, 106, 107, 136, 137, 142, 143, and 194, block D, M. K. & T. E. Railroad Company; thence continuing in a northerly direction to a point on the north line of section No. 6, block 160, G. C. & S. F. Railroad Company, same being corner of pasture fence; thence east with the north line of sections Nos. 6, 9, 10, 11, 12, 15, 16, block 160, G. C. & S. F. Railroad Company, to the northeast corner of said section No. 16, same being corner of pasture fence; thence in a northerly direction with the east boundary line of sections Nos. 22, 21, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, block 1, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said section 32; thence west with the north boundary line of sections Nos. 32 and 33, same block, to the northwest corner of section No. 33, block 1, C. C. S. D. & R. G. N. G. Railroad Company, corner of fence; thence north with the east boundary line of sections Nos. 1, 12, 13, 24, 25, 36, 37, 48, 49, 60, 61, and 72, block 2, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said section No. 72; thence in an easterly direction with the pasture fence to the southeast corner of section No. 9, patented to James E. Evans; thence north with the east line of said section No. 9, to the northwest corner of section No. 100, block A2, T. C. Railroad Company; thence east with north boundary line of said sections Nos. 100 and 89, same block, to the northeast corner of said section No. 89, block A2, T. C. Railroad Company; thence north with the east boundary line of sections Nos. 90, 91, 92, and 93 to the southeast corner of section No. 94, block A2, T. C. Railroad Company; thence northwest diagonally across section No. 94 to the northwest corner of said section; thence continuing in a northwesterly direction, diagonally across sections Nos. 14, 18, and 28, to the northeast corner of section No. 29, block C4, G. C. & S. F. Railroad Company; thence west with the north boundary line of said section No. 29 to the northwest corner of said section; thence northwest diagonally across section No. 1, T. C. Railroad Company, section No. 97, block No. 194, G. C. & S. F. Railroad Company, to the northeast corner of said section No. 96; thence in a northerly direction across section No. 94 to a point on its north boundary line 600 varas west of its northeast corner; thence continuing north through sections Nos. 93, 90, 89, 86, 85, and 58, block 194, G. C. & S. F. Railroad Company, to a point on the north boundary line of said section No. 58; thence northwesterly with the pasture fence, through section No. 59, to the northeast corner of section No. 82 and the southeast corner of section No. 81, same block; thence continuing northwesterly to section No. 17, H. & G. N. Railroad Company; thence north with the east line of said section 17 to the Pecos River; thence northwesterly with said Pecos River to the northwest corner of Crockett County.

No cattle shall be moved or allowed to move from the counties of Childress, Cottle, Hardeman, Foard, Wilbarger, King, Knox, Haskell, Stonewall, Jones, Fisher, Scurry, Borden, Howard, Mitchell, Glasscock, Sterling, Irion, Reagan, Upton, Crane, Throckmorton, and Baylor, and that portion of the county of Pecos as hereinbefore described, to any portion of the State of Texas located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry, or by a duly authorized inspector of the State of Texas; and no cattle from said counties or portions thereof shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Texas, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 5—Oklahoma.—During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Cleveland, Pottawatomie, Lincoln, Pawnee, or into the Kansas Nation or Osage Nation, or into those portions of the counties of Oklahoma, Logan, Payne, and Noble lying east of the right of way of the Atchison, Topeka and Santa Fe Railway. No cattle shall be moved or allowed to move from the counties of Roger Mills, Washita, Oklahoma, Logan, Payne, Cleveland, Pottawatomie, Lincoln, Pawnee, that portion of Canadian County lying north of the Canadian River, that portion of Noble County included in the Otoe and Missouria and Ponca Indian reservations, and that portion of Noble County bounded on the north by the Otoe and Missouria Indian Reservation, on the east by Pawnee County, on the south by Payne County, and on the west by the right of way of the Atchison, Topeka and Santa Fe Railway, nor from the Kansas Nation or Osage Nation, to any portion of the Territory of Oklahoma located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the Territory of Oklahoma; and no cattle from said counties, parts of counties, or localities shall be moved or allowed to move, except as provided for immediate slaughter, to any point, not in the Territory of Oklahoma, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 6—Tennessee.—During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Cannon and Moore and the western and northern parts of Carroll County.

No cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Pickett, Overton, Fentress, Putnam, DeKalb, Cumberland, Cannon, Moore, those portions of the counties of Clay and Jackson lying south and east of the Cumberland River, that portion of Roane County lying north of the Tennessee and Clinch rivers, and the western and northern parts of Carroll County, to any portion of the State of Tennessee located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of Tennessee; and no cattle from the said counties or portions thereof shall be moved or allowed to move, except as provided for immediate slaughter, to any point, not in the State of Tennessee, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 7—North Carolina.—During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Alexander, Yadkin, Iredell, Davie, Rowan, Cabarrus, Mecklenburg, Cleveland, Rutherford, Polk, that part of McDowell south of the Catawba River and west of the North Fork of said river, and that part of Surry east of Mitchell River.

No cattle shall be moved or allowed to move from the counties of Yadkin, Davie, Rowan, Iredell, Alexander, Mecklenburg, Cabarrus, Cleveland, Polk, Rutherford, that part of McDowell lying south of the Catawba River and west of the North Fork of said river, and that part of Surry east of Mitchell River, to any portion of the State of North Carolina, located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of North Carolina; and no cattle from the said counties or portions thereof shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of North Carolina which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 8—Kentucky.—During the continuance of the quarantine as herein established and modified, no cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Clinton, Wayne, and Pulaski, to any portion of the State of Kentucky located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of Kentucky; and no cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point, not in the State of Kentucky, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 9—Arkansas.—During the months of January, February, and March of each year cattle may, after inspection and certification of freedom from ticks (*Boophilus annulatus*) by an inspector of the Bureau of Animal Industry, be moved from the counties of Benton, Washington, Carroll, Madison, Boone, Newton, Marion, Searcy, Baxter, Fulton, Izard, Stone, Sharp, Independence, Randolph, Lawrence, Clay, and Greene to points located outside of the modified quarantined area, for feeding and stocking purposes, subject to the following restrictions, to wit: The cattle shall have been continuously in said counties for not less than thirty days immediately next preceding the date of inspection. Proper facilities shall be afforded for making such inspection. After inspection said cattle shall be moved immediately, without exposure to the infection of splenetic, or Texas, fever direct to pastures or feed lots, without dividing the herd or shipment. The cattle shall be kept continuously in the State into which they are moved for at least three months after arrival. Permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be forwarded.

No cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point located outside of the modified quarantined area, unless accompanied by a written permit for the movement from an inspector of the Bureau of Animal Industry.

Exception 10—Open season.—During the months of January, November, and December of each year cattle originating in the modified quarantined area shall not be moved from the modified quarantined area for purposes other than immediate slaughter into the States of Missouri and Kansas, the Territories of Arizona and New Mexico, and those portions of California, Texas, Oklahoma, Tennessee, Georgia, North Carolina, and Virginia not included in the modified quarantined area until the said cattle shall have been inspected, found free of infection, and a written permit for the movement is issued by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State or Territory to which the cattle are destined, nor until permission shall have been obtained from the proper official of the said State or Territory.

Cattle originating in and shipped from the modified quarantined area into any State outside of the modified quarantined area, other than those States and Territories and portions thereof set out in this exception, shall not be moved into, or unloaded in transit through, any of the States or Territories or portions thereof hereinbefore set out in this exception, within three months of the date of the movement from the modified quarantined area.

Cattle which are moved from the modified quarantined area into those States or Territories or portions thereof hereinbefore set out in this exception, under certificates from inspectors either of the Bureau of Animal Industry or of the States or Territories to which the cattle are destined for feeding or stocking purposes, shall not be placed in stock pens which have been reserved for cattle originating in the modified quarantined area.

FEEDING STATIONS.

Cattle originating outside of the modified quarantined area which are transported by rail through the modified quarantined area may be unloaded for rest, feed, and water into uninfected pens set apart for such cattle at Polk Stock Yards and Union Stock Yards at Forth Worth, Tex.; the stock yards at Baird, Tex.; the Southern Pacific Railway Stock Yards at Los Angeles, Cal.; the stock yards at Colton, Cal., Bakersfield, Cal., and Salisbury, N. C.; and at the Sapulpa Stock Yards of the St. Louis and San Francisco Railroad at Sapulpa, Ind. T., subject to the following restrictions, to wit:

The cattle shall be free from ticks (*Boophilus annulatus*) and shall not have been unloaded at any point in the modified quarantined area other than the authorized unloading points named herein. The cattle shall be reloaded into the same cars from which unloaded or into other cleaned and disinfected cars and reshipped as uninfected cattle.

INTERPRETATION.

This rule must be construed in connection with the regulations of the Secretary of Agriculture promulgated May 1, 1905, and effective June 1, 1905, and is subject to amendment on statutory notice.

CANCELLATION OF PREVIOUS ORDERS.

B. A. I. Order No. 106, dated March 10, 1903, and B. A. I. Order No. 131, dated January 16, 1905, including all amendments thereto, shall cease to be effective on and after June 1, 1905, on and after which date this rule shall become and be effective until otherwise ordered.

Done at Washington this first day of May, 1905.

Witness my hand and seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Rule 2.—To Prevent the Spread of Scabies in Cattle (Effective on and after June 1, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious, communicable disease known as scabies exists among cattle in the following named States and Territories, to wit:

WASHINGTON, OREGON, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, NEBRASKA, KANSAS, COLORADO, WYOMING, TEXAS, NEW MEXICO, and OKLAHOMA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (Public No. 229), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of Washington, Oregon, Montana, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Wyoming, Texas, New Mexico, and Oklahoma.

It is ordered by this rule, under the authority and discretion conferred upon the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (Public No. 229), that cattle shall be moved from the area herein quarantined to any point not located in the said quarantined area only in accordance with the regulations of the Secretary of Agriculture promulgated May 1, 1905, and effective June 1, 1905.

This rule is subject to amendment on statutory notice.

B. A. I. Order No. 106, dated March 10, 1903, and B. A. I. Order No. 123, dated March 18, 1904, shall cease to be effective on and after June 1, 1905, on and after which date this rule shall become and be effective until otherwise ordered.

Done at Washington this first day of May, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON,
Secretary of Agriculture.

Rule 3.—To Prevent the Spread of Scabies in Sheep (Effective on and after June 1, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious, communicable disease known as scabies exists among sheep in the following named States and Territories, to wit:

WASHINGTON, OREGON, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, CALIFORNIA, NEVADA, IDAHO, UTAH, WYOMING, COLORADO, NEBRASKA, KANSAS, TEXAS, ARIZONA, and NEW MEXICO.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (Public No. 229), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of Washington, Oregon, Montana, North Dakota, South Dakota, California, Nevada, Idaho, Utah, Wyoming, Colorado, Nebraska, Kansas, Texas, Arizona, and New Mexico.

It is ordered by this rule, under the authority and discretion conferred upon the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (Public No. 229), that sheep shall be moved from the area herein quarantined to any point not located in the said quarantined area only in accordance with the regulations of the Secretary of Agriculture promulgated May 1, 1905, and effective June 1, 1905.

This rule is subject to amendment on statutory notice.

B. A. I. Order No. 106, dated March 10, 1903, and B. A. I. Order No. 108, dated April 3, 1903, shall cease to be effective on and after June 1, 1905, on and after which date this rule shall become and be effective until otherwise ordered.

Done at Washington this first day of May, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Rule 4.—To Prevent the Spread of Maladie du Coït (Effective on and after June 1, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that an infectious, communicable disease of horses and asses known as *maladie du coït* exists in portions of the States of NEBRASKA and SOUTH DAKOTA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (Public No. 229), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of the Pine Ridge and Rosebud Indian reservations in the State of South Dakota; that portion of the counties of Custer and Fall River, in the State of South Dakota, situate east of the North branch of the Chicago and Northwestern Railway; that portion of Dawes County in the State of Nebraska, situate east of the North branch and north of the Western branch of the Chicago and Northwestern Railway; and those portions of Sheridan and Cherry counties, in the State of Nebraska, situate north of the Western branch of the Chicago and Northwestern Railway.

It is ordered by this rule, under the authority and discretion conferred upon the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (Public No. 229), that horses and asses shall be moved from the area herein quarantined to any point not located in the said quarantined area only in accordance with the Regulations of the Secretary of Agriculture, promulgated May 1, 1905, and effective June 1, 1905.

This rule is subject to amendment on statutory notice.

B. A. I. Order No. 106, dated March 10, 1903, and B. A. I. Order No. 126, dated June 28, 1904, including Amendment No. 1 thereto, shall cease to be effective on and after June 1, 1905, on and after which date this rule shall become and be effective until otherwise ordered.

Done at Washington this first day of May, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., May 19, 1905.

On account of failure to comply with the provisions of B. A. I. Order No. 130, the withdrawal of the certification of the following associations and books of record has this day been recommended to the Secretary of the Treasury:

American books of record.

HORSES.

Name of breed.	Book of record.	By whom published.
Suffolk	American Suffolk Horse Studbook.	American Suffolk Punch Horse Association, Alex. Galbraith, secretary, Janesville, Wis.

SHEEP.

Merino (Spanish)	Register of the National Merino Sheep Breeders' Association.	National Merino Sheep Breeders' Associaton, R. O. Logan, secretary, Rural Free Delivery 3, Montgomery, Mich.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT No. 4 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 2, 1905.

The Department having ascertained that the Studbook of the Select Clydesdale Horse Society of Scotland no longer exists in that country, the withdrawal of the certification of this book of record has this day been recommended to the Secretary of the Treasury.

JAMES WILSON, *Secretary.*

(AMENDMENT No. 5 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Certification of the American Suffolk Horse Association.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 8, 1905.

The following association has this day been certified to the Secretary of the Treasury:

American books of record.

HORSES.

Name of breed.	Book of record.	By whom published.
Suffolk............	American Suffolk Horse Studbook.	American Suffolk Horse Association, Alex. Galbraith, secretary, Janesville, Wis.

JAMES WILSON, *Secretary.*

(AMENDMENT No. 6 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Certification of the American Rambouillet Sheep Breeders' Association.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 20, 1905.

The following association has this day been certified to the Secretary of the Treasury:

American books of record.

SHEEP.

Name of breed.	Book of record.	By whom published.
Merino (French)...	American Rambouillet Record.	American Rambouilet Sheep Breeders' Association, Dwight Lincoln, secretary, Milford Center, Ohio.

JAMES WILSON, *Secretary.*

(AMENDMENT No. 7 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 21, 1905.

On account of failure to comply with the provisions of B. A. I. Order No. 130, the withdrawal of the certification of the following association and book of record has this day been recommended to the Secretary of the Treasury:

American books of record.

SHEEP.

Name of breed.	Book of record.	By whom published.
Dorset Horn	Flock Record of the Dorset Horn Sheep Breeders' Association of America.	Dorset Horn Sheep Breeders' Association of America, M. A. Cooper, secretary, Washington, Pa.

JAMES WILSON, *Secretary.*

(AMENDMENT No. 8 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 7, 1905.

Having been unable to obtain any definite information regarding the existence at the present time of Le Studbook Algerien, the Department has this day recommended to the Secretary of the Treasury the withdrawal of the certification of this book of record.

JAMES WILSON, *Secretary.*

(AMENDMENT No. 9 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Amended Certification of the Baltisches Herdbook.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 7, 1905.

The Department has this day recommended to the Secretary of the Treasury that the certification of the Baltisches Herdbook be amended to read as follows:

Foreign books of record.

CATTLE.

Name of breed.	Book of record.	By whom published.
Hollander.........	Pommersches Herdbuch......	Herdbuch-Gesellschaft der Provinz Pommern für Ostfriesen und Holländer in Stettin, General Secretary Schumann, Stettin, Germany.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 46.)

Regulations for the Inspection and Safe Transport of Animals from the United States to Foreign Countries.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 13, 1905.

It is hereby ordered, That the provisions of section 1 of B. A. I. Order No. 46 be modified by no longer requiring export cattle to be tagged before exportation.

This modification to take effect upon July 20, 1905.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 129.)

Regulations Concerning the Importation of Hay and Straw from Continental Europe—Importation of Hay and Straw from Belgium.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 21, 1905.

It is ordered, That the regulations concerning the importation of hay and straw from continental Europe as contained in B. A. I. Order No. 129, issued October 4, 1904, be, and they are hereby, modified so as to permit the importation of hay and straw from Belgium when accompanied by a certificate issued by the proper Government officer, showing that such articles originated in Belgium or have been in that country for a period of six months; that no foot-and-mouth disease or rinderpest existed in that country at the time of their shipment, and that the vessel upon which these articles have been shipped has been inspected and found free from infection and does not carry any hay, straw, or animals which have recently come from a country infected with said diseases.

W. H. HAYS, *Acting Secretary.*

(AMENDMENT NO. 4 TO B. A. I. ORDER NO. 109.)

Regulations for the Inspection and Quarantine of Horses, Neat Cattle, Sheep, and other Ruminants, and Swine Imported into the United States—Importation of Cattle, Sheep, and Other Ruminants, and Swine from the Netherlands and Belgium.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 22, 1905.

It is hereby ordered, That the regulations for the inspection and quarantine of horses, neat cattle, sheep, and other ruminants, and swine imported into the United States, issued under date of April 10, 1903 (B. A. I. Order No. 109), be, and they are hereby, amended by the addition in the second line in section 5 of the said order after the words "Great Britain," the words "or The Netherlands (Holland) and Belgium," and by striking out in the fifth line of the said section the words "stationed in that country," and by inserting in lieu thereof the words "before being exported."

Cattle, sheep, and other ruminants, and swine from The Netherlands and Belgium must be shipped direct from a port of one of those countries to the United States or may be transshipped at an English port. They will not be eligible for entry into the United States if shipped through or landed at any port in continental Europe outside of The Netherlands and Belgium. Cattle imported into the United States from The Netherlands and Belgium will be subjected to a quarantine of ninety days, counting from the date of shipment.

All ruminants and swine imported into the United States from Belgium shall be accompanied with a certificate, issued by the proper government officer, showing that said animals originated in Belgium or have been in that country for six months next preceding the date of shipment, and that no foot-and-mouth disease or rinderpest existed in that country at the time of shipment, and that the vessel upon which these animals are shipped has been inspected and found free from infection, and does not carry any animals, hay, or straw which have recently come from countries infected with said diseases.

The affidavits of the owner and the importer or his agent, required by section (*d*) of paragraph 2 of B. A. I. Order No. 109, shall show that animals imported from Belgium have been in that country for six months next preceding the date of sale; that no foot-and-mouth disease or rinderpest has existed among them, nor among animals of the kind with which they have come in contact for six months last past, and that no inoculation against any contagious disease has been practiced among said animals for the past year. The other requirements of said section (*d*) must be complied with.

Amendment No. 2 to B. A. I. Order No. 109 is hereby canceled, and will be void and of none effect after the date hereof.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT No. 10 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Amendment of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 25, 1905.

In view of the amalgamation of the North and South Wales Black Cattle Herdbooks, the Department has this day recommended to the Secretary of the Treasury that the certification of the following books of record be withdrawn:

Foreign books of record.

CATTLE.

Name of breed.	Book of record.	By whom published.
Welsh	North Wales Black Cattle Book.	North Wales Black Cattle Society, William Arthur Dew, secretary, Wellfield, Bangor, North Wales.
Welsh	Welsh Black Cattle Herdbook.	R. H. Harvey, editor, Slade Hall, Haverfordwest, South Wales.

In place of the above, the following book of record has been certified:

Foreign books of record.

CATTLE.

Name of breed.	Book of record.	By whom published.
Welsh	Welsh Black Cattle Herdbook.	Welsh Black Cattle Society, James Thomas & Son, secretaries, 9 Victoria place, Haverfordwest, South Wales.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT No. 11 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Certification of French Coach-Horse Register.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 25, 1905.

The following association has this day been certified to the Secretary of the Treasury:

American books of record.

HORSES.

Name of breed.	Book of record.	By whom published.
French Coach	French Coach-Horse Register.	French Coach-Horse Registry Company, Chas. C. Glenn, Secretary, Columbus, Ohio.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT NO. 12 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 28, 1905.

Having been unable to obtain any definite information regarding the existence of the Studbook of Jacks and Jennets of Spain, the Department has this day withdrawn the certification of this book of record and recommended to the Secretary of the Treasury that instructions be issued accordingly to the officers of the customs.

W. M. HAYS, *Acting Secretary.*

(B. A. I. ORDER NO. 133.)

Special Order Providing for the Importation of Canadian Cattle, Sheep, and Swine for Exhibition Purposes at the Michigan State Agricultural Society Fair, Detroit, Mich.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., July 28, 1905.

It is hereby ordered, That Canadian cattle may be imported into the United States for exhibition purposes at the Michigan State Agricultural Society Fair, to be held at Detroit, Mich., from September 11 to 16, 1905, without being subjected to the tuberculin test, provided they are accompanied by a certificate issued by a Canadian official veterinarian, stating that such cattle are free from contagious and infectious diseases: *And provided further,* That the cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of said fair.

The Department must be notified of any Canadian cattle which will remain in the United States, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination is allowed.

All Canadian cattle, sheep, and swine intended for this agricultural fair must be shipped directly to the agricultural fair grounds and must not be unloaded in any public stock yards.

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 5 TO B. A. I. ORDER NO. 109.)

Regulations for the Inspection and Quarantine of Horses, Neat Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., August 2, 1905.

It is hereby ordered, That paragraph 1 of the regulations for the inspection and quarantine of animals imported into the United States issued under date of April 10, 1903 (B. A. I. Order No. 109), be and is hereby amended by the addition of Lowelltown, Me. (port of Bangor, Me.), as an animal quarantine station during the months of September, October, and November, 1905, for the inspection and quarantine of animals imported into the United States. This order to terminate November 30, 1905.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT NO. 6 TO B. A. I. ORDER NO. 109.)

Regulations for the Inspection and Quarantine of Horses, Neat Cattle, Sheep, and Other Ruminants, and Swine.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., August 14, 1905.

It is hereby ordered, That section (*i*) of paragraph 6 of the regulations for the inspection and quarantine of animals imported into the United States from Canada, issued under date of April 10, 1903 (B. A. I. Order 109), be and is hereby so modified as to permit the importation of sheep from a district infected with scab, provided such sheep are accompanied with a certificate signed by a Canadian official veterinarian, stating that they have been twice carefully dipped under his personal supervision or under the personal supervision of a Canadian official veterinarian in a lime-and-sulphur dip, or tobacco-and-sulphur dip of not less strength than is prescribed by regulation 33 of the regulations of the Secretary of Agriculture, effective June 1, 1905, as follows:

The lime-and-sulphur dip, made with eight pounds of unslaked lime and twenty-four pounds of flowers of sulphur to one hundred gallons of water. The lime and sulphur should be boiled together for not less than two hours, and all sediment allowed to subside before the liquid is placed in the dipping vat.

The tobacco-and-sulphur dip, made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than five one-hundredths of one per cent of nicotine and two per cent flowers of sulphur.

W. M. HAYS, *Acting Secretary of Agriculture.*

(AMENDMENT No. 13 TO B. A. I. ORDER No. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Amended Certification of the American Percheron Horse Breeders' and Importers' Association.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., August 22, 1905.

The Department has this day amended the certification of the American Percheron Horse Breeders' and Importers' Association to read as follows, and has recommended to the Secretary of the Treasury that instructions be issued accordingly to the officers of the customs:

American books of record.

HORSES.

Name of breed.	Book of record.	By whom published.
Percheron........	Percheron Studbook of America.	Percheron Society of America, Geo. W. Stubblefield, secretary, Union Stock Yards, Chicago Illinois.

W. M. HAYS, *Acting Secretary.*

Amendment No. 1 to the Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce (Effective on and after September 15, 1905).

MODIFICATION OF REGULATIONS 10, 19, 20, 21, 22, AND 24.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., August 30, 1905.

The regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, issued under date of May 1, 1905, and effective on and after June 1, 1905, are hereby modified by the revocation of regulations 10, 19, 20, 21, 22, and 24, and the substitution therefor of the following regulations, which revocation shall take effect on September 15, 1905, on and after which date the regulations given below shall become and be effective until otherwise ordered.

Regulation 10.—Live stock shipped from a quarantined area, not accompanied by a certificate of an inspector of the Bureau of Animal Industry showing freedom from disease or from exposure thereto, shall not be diverted en route to feed lots or to other States for feeding, stocking, or breeding purposes unless inspected and certified by an inspector of the Bureau of Animal Industry.

Regulation 19.—No cattle which are diseased with scabies shall be shipped or trailed from one State or Territory into another State or Territory or the District of Columbia, except as hereinafter provided; and no cattle shall be trailed, shipped, otherwise removed, or allowed to drift from one State or Territory or portion thereof quarantined for the disease of scabies in cattle into another State or Territory or the District of Columbia, except as hereinafter provided, unless the cattle have been inspected by an inspector of the Bureau of Animal Industry and found free from disease and are accompanied by a certificate from the said inspector.

The removal of cattle unaccompanied by a certificate of inspection from an inspector of the State or Territory or the District of Columbia, or an inspector of the Bureau of Animal Industry, from a quarantined portion of a State or Territory or the District of Columbia into a portion of the same State or Territory or the District of Columbia, not quarantined, will subject the unquarantined portion of the State or Territory or the District of Columbia to quarantine.

Regulation 20.—In States or Territories or portions thereof quarantined by the Secretary of Agriculture for scabies in cattle, those cattle which upon inspection by an inspector of the Bureau of Animal Industry, at the time of shipment, are found to be free from symptoms of scabies shall be given a certificate and allowed to move to points outside the quarantined area for any purpose, subject only to such restrictions as may be imposed by the State or Territorial officers at points of unloading and destination; but if a herd or consignment intended for feeding, breeding, or stocking purposes, be offered for inspection and shipment and a portion thereof is found to be diseased with scabies, or if the cattle offered for inspection and shipment are part of a herd that is known to be so diseased, the diseased cattle offered for shipment shall be dipped twice in either the lime-and-sulphur or the tobacco-and-sulphur dip, or once in Beaumont crude petroleum, in the manner hereinafter provided, and the cattle offered for shipment which are not visibly diseased shall be dipped once before shipment.

Regulation 21.—Cattle not visibly diseased with scabies may be shipped without inspection from points in the quarantined area to any of the following-named recognized live-stock centers: Buffalo, N. Y.; Chicago, Ill.; Cincinnati, Ohio; Cleveland, Ohio; Denver, Colo.; Fort Worth, Tex.; Indianapolis, Ind.; Kansas City, Mo.; Kansas City, Kans.; Louisville, Ky.; Milwaukee, Wis.; National Stock Yards, Ill.; Omaha, Nebr.; Sioux City, Iowa; St. Joseph, Mo.; St. Louis, Mo.; St. Paul, Minn. When so shipped, the cattle shall be submitted for inspection at destination, and when found upon such inspection to be free from disease and from exposure thereto en route, no further restrictions shall be placed upon them. If found upon inspection to be infected, they shall not be permitted further shipment until treated as heretofore prescribed for diseased cattle.

When cattle are shipped without inspection to live-stock centers under the terms of this regulation, the employees of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard not less than $5\frac{1}{2}$ by 8 inches in size, the letters of which shall be bold face and not less than $1\frac{1}{2}$ inches in height. These placards shall bear the words "UNINSPECTED CATTLE," *and shall not be removed until the cattle have arrived at destination and the inspector has indicated the disposition to be made of the cars. The waybills, conductors' manifests, memoranda, and bills of lading of said shipment shall also bear the notation* "UNINSPECTED CATTLE."

Regulation 22.—Cattle diseased with scabies which have been dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip in the manner hereinafter provided, under the supervision of an inspector of the Bureau of Animal Industry, within ten days of date of shipment, and cattle not visibly diseased, but which are known to be a part of a diseased herd, may be shipped for immediate slaughter to a recognized slaughtering center, and when so shipped the said cattle shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If cattle diseased with scabies are to be shipped for stockers or feeders, they shall be dipped twice in either the lime-and-sulphur or the tobacco-and-sulphur dip ten days apart, or once in Beaumont crude petroleum, under supervision, and shall be submitted to inspection before shipment. Cattle not visibly diseased, but which are known to be part of a diseased herd, intended for stockers or feeders shall be dipped once before shipment. However, diseased cattle may be dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip under the supervision of an inspector of the Bureau of Animal Industry at the point of origin and shipped for stocking or feeding purposes if arrangements have been made for the second dipping en route or at destination at the required time after the first dipping at a point where there is an inspector stationed and under his supervision. Cattle not visibly diseased, but which are known to be part of a diseased herd, shipped to another State or Territory for feeding or stocking purposes, may be dipped en route instead of at point of origin by special permission first had and obtained from the Chief of the Bureau of Animal Industry.

Regulation 24.—When either diseased cattle that have been dipped once in the lime-and-sulphur or the tobacco-and-sulphur dip, or cattle not visibly diseased, but which are known to be a part of a diseased herd are shipped in accordance with Regulation 22, the employees of the transportation company shall affix to both sides of each car a durable, conspicuous, printed placard, not less than $5\frac{1}{2}$ by 8 inches in size, the letters on which shall be bold face, and not less than $1\frac{1}{2}$ inches in height. These placards shall bear the words "DIPPED SCABBY CATTLE," or "CATTLE EXPOSED TO SCABIES," and shall not be removed until the cattle have arrived at destination or point of dipping, have been unloaded, and the cars have been disinfected. The waybills, conductors' manifests, memoranda, and bills of lading of said shipment shall also bear the notation, to be affixed by the transportation company, "DIPPED SCABBY CATTLE," or "CATTLE EXPOSED TO SCABIES."

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER No. 134.)

Special Order Providing for the Importation of Canadian Cattle, Sheep, and Swine for Exhibition Purposes at the Clinton County Agricultural Society Fair, Plattsburg, N. Y.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., August 31, 1905.

It is hereby ordered, That Canadian cattle may be imported into the United States for exhibition purposes at the Clinton County Agricultural Society Fair, to be held at Plattsburg, N. Y., from September 12 to 15, 1905, without being subjected to the tuberculin test, provided they are accompanied by a certificate issued by a Canadian official veterinarian, stating that such cattle are free from contagious and infectious diseases: *And provided further*, That the cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of said fair.

The Department must be notified of any Canadian cattle which will remain in the United States, and the tuberculin test will be applied to them by an inspector of this department before shipment to destination is allowed.

All Canadian cattle, sheep, and swine intended for this agricultural fair must be shipped directly to the agricultural fair grounds and must not be unloaded in any public stock yards.

JAMES WILSON, *Secretary of Agriculture.*

Amendment No. 1 to Rule 2.—To Prevent the Spread of Scabies in Cattle (Amendment Effective on and after September 15, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the contagious and communicable disease known as scabies is not now known to exist, or exists to a slight extent only, among cattle in certain States and parts of States and Territories quarantined by Rule 2, dated May 1, 1905, and effective June 1, 1905.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, do hereby remove and revoke the quarantine placed by Rule 2 upon the following area, to wit:

The States of WASHINGTON AND OREGON; all that part of the State of KANSAS lying east of the western boundary lines of the counties of Smith, Osborne, Russell, Barton, Stafford, Pratt, and Barber; all that part of the State of COLORADO lying west of the summit of the Medicine Bow Range of mountains in Larimer County, the west line of Boulder, Gilpin, Jefferson, Teller, Custer, Huerfano, and Las Animas counties; and also that part of COLORADO lying west of the Ninth Guide Meridian West in Fremont County; the counties of Big Horn, Fremont, Sweetwater, and Uinta in the State of WYOMING; all that part of the State of TEXAS lying east of the 100th meridian of longitude west of Greenwich and north of the 29th parallel of north latitude; the counties of San Juan, Rio Arriba, Taos, McKinley, Bernalillo, Santa Fe, Valencia, Socorro, Lincoln, Grant, Sierra, Luna, Dona Ana, and Otero in the Territory of NEW MEXICO, and all of the Territory of OKLAHOMA except the counties of Woodward and Beaver.

The quarantine placed by Rule 2 upon the above-described territory shall cease to be effective on and after September 15, 1905, on and after which date this rule shall become and be effective until otherwise ordered.

Done at Washington this thirtieth day of August, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Amendment No. 1 to Rule 1.—To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after October 1, 1905).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given that the contagious and infectious disease known as splenetic, southern, or Texas fever is not now known to exist, or exists to a slight extent only, among cattle in certain areas quarantined by Rule 1, dated May 1, 1905, and effective June 1, 1905.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority of law, do hereby amend Rule 1 to prevent the spread of splenetic fever in cattle, effective on and after June 1, 1905, in the following particulars, to wit:

First. Exception 1.—That part of Exception 1 modifying the quarantined area for the State of Texas is hereby amended to read as follows:

TEXAS.

Beginning at the intersection of the southern boundary of New Mexico with the international boundary line at the Rio Grande River; thence southeasterly along the said international boundary line to the southwest corner of the county of Pecos; thence following the western boundary line of Pecos

County to the point where the roadbed of the G. H. & S. A. Railroad crosses said line; thence in an easterly direction with the center of said roadbed to a point on Section No. 36, Block A2, G. H. & S. A. Railroad Company; thence north with the pasture fence, running in a northerly direction through the eastern part of Sections Nos. 13 and 12, of said Block A2, and across Section 1, G. C. & S. F. Railroad Company; thence continuing north with said pasture fence through the eastern part of Sections Nos. 16, 17, 46, 47, 76, 77, 106, 107, 136, 137, 142, 143, and 194, Block D, M. K. & T. E. Railroad Company; thence continuing in a northerly direction to a point on the north line of Section No. 6, Block 160, G. C. & S. F. Railroad Company, same being corner of pasture fence; thence east with the north line of Sections Nos. 6, 9, 10, 11, 12, 15, 16, Block 160, G. C. & S. F. Railroad Company to the northeast corner of said Section No. 16, the same being corner of pasture fence; thence in a northerly direction with the east boundary line of Sections Nos. 22, 21, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said Section No. 32; thence west with the north boundary line of Sections Nos. 32 and 33, same block, to the northwest corner of Section No. 33, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, corner of fence; thence north with the east boundary line of Sections Nos. 1, 12, 13, 24, 25, 36, 37, 48, 49, 60, 61, and 72, Block 2, C. C. S. D. & R. G. N. G. Railroad Company to the northeast corner of said Section No. 72; thence in an easterly direction with the pasture fence to the southeast corner of Section No. 9, patented to James E. Evans; thence north with the east line of said Section No. 9 to the northwest corner of Section No. 100, Block A2, T. C. Railroad Company; thence east with the north boundary line of said Sections Nos. 100 and 89, same block, to the northeast corner of said Section No. 89, Block A2, T. C. Railroad Company; thence north with the east boundary line of Sections Nos. 90, 91, 92, and 93, to the southeast corner of Section No. 94, Block A2, T. C. Railroad Company; thence northwest diagonally across Section No. 94 to the northwest corner of said section; thence continuing in a northwesterly direction diagonally across Sections Nos. 14, 18, and 28 to the northeast corner of Section No. 29, Block C4, G. C. & S. F. Railroad Company; thence west with the north boundary line of said Section No. 29 to the northwest corner of said section; thence northwest diagonally across Section No. 1, T. C. Railroad Company, Section No. 97, Block 194, G. C. & S. F. Railroad Company, to the northeast corner of Section No. 96; thence in a northerly direction across Section No. 94 to a point on its north boundary line 600 varas west of its northeast corner; thence continuing north through Sections Nos. 93, 90, 89, 86, 85, and 58, Block 194, G. C. & S. F. Railroad Company, to a point on the north boundary line of said Section No. 58; thence northwesterly with the pasture fence through Section No. 59, to the northeast corner of Section No. 82 and the southeast corner of Section No. 81, same block; thence continuing northwesterly to Section No. 17, H. & G. N. Railroad Company; thence north with the east line of said Section 17 to the Pecos River; thence northwesterly with said Pecos River to the northwest corner of Crockett County; thence east along the northern boundary of Crockett and Schleicher counties to the southeastern corner of Irion County; thence north along the eastern boundary of Irion County to the northeast corner of said county; thence continuing due north to the southern boundary line of Coke County; thence west with the southern boundary of Coke County to the southwest corner of Coke County; thence north along the western boundary of Coke County to the southern boundary of Mitchell County; thence east to the southeast corner of Mitchell County; thence north along the eastern boundary of Mitchell County to the northeast corner of said county; thence east along the southern boundaries of Fisher and Jones counties to the southeast corner of Jones County; thence north along the eastern boundary of Jones County to the northeast corner of said county; thence east along the southern boundary of Haskell County to the southeast corner of said county; thence north along the western boundary lines of Throckmorton and Baylor counties to the northwest corner of Baylor County; thence east along the southern boundary of Wilbarger County to the southeast corner of said county; thence north along the eastern boundary of Wilbarger County to the Red River; thence continuing in a northwesterly direction, along the course of said river and the northern boundary of Texas to the southwest corner of Greer County, Oklahoma Territory; thence north, following the eastern boundary line of Texas to the northwest corner of said Greer County.

Second. Exception 4—TEXAS.—That part of Exception 4 which provides that no cattle shall be moved or allowed to move without inspection from the counties of Crane, Scurry, Fisher, and that portion of Pecos County lying north and west of the line through Pecos County described in Exception 4, is hereby revoked.

Third. The following additional exception to Rule 1, numbered Exception 11, is hereby promulgated and added to Rule 1:

Exception 11—VIRGINIA.—During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into that portion of Campbell County, Virginia, situate north and east of the line beginning at the Evington, Rustburg and Concord public road where it crosses the western line of said county; thence easterly along said road to Rustburg; thence northerly and easterly along said road to Concord; thence due east to the Campbell County line.

No cattle shall be moved or allowed to move from that portion of Campbell County, Virginia, above described, to any portion of the State of Virginia located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of Virginia, and no cattle from the said portion of Campbell County, Virginia, shall be moved or allowed to move except as provided for immediate slaughter, to any point not in the State of Virginia which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained, in advance of the movement, from the proper official of the State or Territory into which the cattle are to be shipped.

Done at Washington this twenty-third day of September, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Amendment No. 2 to the Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce—Modification of Regulation 21 (Effective on and after October 16, 1905).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., September 27, 1905.

The Regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, issued under date of May 1, 1905, effective on and after June 1, 1905, as amended by Amendment No. 1, issued under date of August 30, 1905, and effective on and after September 15, 1905, are hereby modified by the revocation of Regulation 21, and the substitution therefor of the following regulation, which revocation shall take effect on October 16, 1905, on and after which date the regulation given below shall become and be effective until otherwise ordered.

Regulation 21.—Cattle not visibly diseased with scabies may be shipped without inspection from points in the quarantined area to Buffalo, N. Y., Chicago, Ill., Cincinnati, Ohio, Cleveland, Ohio, Denver, Colo., Fort Worth, Tex., Indianapolis, Ind., Kansas City, Mo., Kansas City, Kans., Louisville, Ky., Milwaukee, Wis., National Stock Yards, Ill., South Omaha, Nebr., Sioux City, Iowa, South St. Joseph, Mo., St. Louis, Mo., South St. Paul, Minn., or to any other market or slaughtering center where inspection is maintained and where facilities are available for either dipping or slaughtering cattle under the supervision of this Department. When so shipped the cattle shall be submitted for inspection at destination, and when found upon such inspection to be free from disease and exposure thereto en route no further restriction shall be placed upon them. If found upon inspection to be infected, they shall not be permitted further shipment until treated as heretofore prescribed for diseased cattle.

When cattle are shipped without inspection under the terms of this regulation, the employees of the transportation company shall affix to both sides of each car a durable conspicuous printed placard not less than 5½ by 8 inches in size, the letters of which shall be bold-face and not less than 1½ inches in height. These placards shall bear the words "UNINSPECTED CATTLE" *and shall not be removed until the cattle have arrived at destination and the inspector has indicated the disposition to be made of the cars. The waybills, conductors' manifests, memoranda, and bills of lading of said shipment shall also bear the notation* "UNINSPECTED CATTLE."

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 135.)

Order Providing for the Importation of Canadian Cattle, Sheep, and Swine for Exhibition Purposes at International Live-Stock Exposition. Chicago, Ill.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 6, 1905.

It is hereby ordered, That Canadian cattle may be imported into the United States for exhibition at the International Live-Stock Exposition, to be held December 2 to December 9, 1905, at Chicago, Ill., without being subjected to the tuberculin test: *Provided,* They are accompanied by a certificate issued by a Canadian official veterinarian stating that such cattle are free from contagious and infectious diseases: *And provided further,* That the cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of the Exposition.

The Department shall be notified of any Canadian cattle that are to remain in the United States, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination is allowed.

All Canadian cattle, sheep, and swine intended for this Exposition shall be shipped directly to the Exposition grounds and shall not be unloaded in any public stock yards.

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and Their Products.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 9, 1905.

Proprietors of slaughterhouses, canning, salting, and rendering establishments, engaged in the slaughtering of cattle, sheep, or swine, or in the packing of any of their products which are to become the subjects of interstate or foreign commerce, for whom inspection is conducted by this Department, are hereby notified that on and after November 1, 1905, the cost of the numbered labels indicating such inspection which are placed upon carcasses or parts of carcasses that leave official establishments for local, interstate, or export trade, under Section No. 15 of the Rules and Regulations for the inspection of live stock and their products, dated June 27, 1904 (B. A. I. Order No. 125), and also the meat inspection stamps applied to packages of meat products under Section No. 17 of the above rules, shall be borne by the proprietors of official establishments and will not be defrayed by this Department as heretofore.

The Rules and Regulations for the inspection of live stock and their products, dated June 27, 1904 (B. A. I. Order No. 125), are hereby amended as above stated.

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and Their Products.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., October 28, 1905.

It is hereby ordered, That the first paragraph of section 25, B. A. I. Order No. 125, Rules and Regulations for the inspection of live stock and their products, dated June 27, 1904, be, and the same is hereby, amended to read as follows;

SEC. 25. A microscopic examination for trichinæ shall be made of all swine products exported to countries requiring such examination, except fat pork from which all lean meat has been removed.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 4 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and Their Products.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 7, 1905.

It is hereby ordered, That Amendment No. 1, dated April 6, 1905, to B. A. I. Order No. 125 be, and the same is hereby, revoked, and subsection (*k*) of section 7 of the Rules and Regulations for the inspection of live stock and their products, dated June 27, 1904 (B. A. I. Order No. 125), be, and the same is hereby, amended to read as follows:

(*k*) *Tuberculosis.*—All carcasses affected with tuberculosis shall be condemned except those in which the lesions are slight, calcified, or encapsulated, and are confined to the tissues indicated in any one of the following five paragraphs, or to a less number of such tissues:

(1) The cervical lymphatic glands and two groups of visceral lymphatic glands in a single body cavity, such as the cervical, bronchial, and mediastinal glands, or cervical, hepatic, and mesenteric glands.

(2) The cervical lymphatic glands and one group of visceral lymphatic glands and one organ in a single body cavity, such as the cervical and bronchical glands and lung, or the cervical and hepatic glands and liver.

NOTE.—The pleura or peritoneum may be substituted for the group of visceral lymphatic glands in paragraph 2; for example, the cervical glands, pleura, and lung, or the cervical glands, liver, and peritoneum.

(3) Two groups of visceral lymphatic glands and one organ in a single body cavity, such as the bronchial and mediastinal glands and lung, or the hepatic and mesenteric glands and liver.

(4) The cervical lymphatic glands and one group of visceral lymphatic glands in each body cavity, such as the cervical, bronchial, and hepatic glands.

(5) Two groups of visceral lymphatic glands in the thoracic cavity and one group in the abdominal cavity, or one group of visceral lymphatic glands in the thoracic cavity and two groups in the abdominal cavity, such as the bronchial, mediastinal, and hepatic glands, or the bronchial, hepatic, and mesenteric glands.

CARCASSES THAT MAY BE RENDERED INTO LARD.

(6) The hog carcasses condemned, in which the lesions of tuberculosis are located as described in any one of the above five paragraphs, but are in a state of caseation or liquefaction necrosis or surrounded by hyperemic zones, and also those in which slight, calcified, or encapsulated lesions are found in more visceral organs or more groups of visceral lymphatic glands than are indicated in any one of the above five paragraphs, may be rendered into lard after the diseased parts are removed, provided they are cooked by steam at a temperature not lower than 220° F. for not less than four hours.

DISPOSITION OF PARTS.

(7) All diseased parts of carcasses showing lesions of tuberculosis shall be condemned and deposited in receptacles provided for that purpose, and either be tanked at once or locked in the retaining room until such time as an employee of the Bureau of Animal Industry shall be able to see that they are placed in the offal tank.

(8) All heads showing lesions of tuberculosis shall be tanked for offal irrespective of the disposition of the carcasses.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 14 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Amendment of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 25, 1905.

The Department has amended the certification of the Stutbuch der Münsterländisch-Oldenburgischen Geest to read as follows, and the Secretary of the Treasury has been so informed:

Foreign books of record.

HORSES.

Name of breed.	Book of record.	By whom published.
Oldenburg Coach	Stutbuch der Münsterländisch-Oldenburgischen Geest.	Oldenburger südlicher Pferdzüchter-Verband, Ad. Runge, Secretary.

JAMES WILSON, *Secretary.*

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(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 135.)

Order Providing for the Importation of Canadian Cattle, Sheep, and Swine for Exhibition Purposes at International Live-Stock Exposition, Chicago, Ill.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 28, 1905.

As the date of the International Live-Stock Exposition has been changed,

It is hereby ordered, That B. A. I. Order No. 135, dated October 6, 1905, be and is hereby amended to read as follows: That Canadian cattle may be imported into the United States for exhibition at the International Live-Stock Exposition, to be held December 16 to December 23, 1905, at Chicago, Ill., without being subjected to the tuberculin test: *Provided,* They are accompanied by a certificate issued by a Canadian official veterinarian stating that such cattle are free from contagious and infectious diseases: *And further provided,* That the cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of the exposition.

The Department shall be notified of any Canadian cattle that are to remain in the United States and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination is allowed.

All Canadian cattle, sheep, and swine intended for this exposition shall be shipped directly to the exposition grounds and shall not be unloaded in any public stock yards.

JAMES WILSON, *Secretary of Agriculture.*

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Amendment No. 3 to the Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce—Modifications of Regulations 41, 42, 44, and 45 (Amendment Effective on and after January 1, 1906.)

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., December 15, 1905.

The Regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, issued under date of May 1, 1905, effective on and after June 1, 1905, as amended by Amendment No. 1, issued under date of August 30, 1905, and effective on and after September 15, 1905, and as amended by Amendment No. 2, issued under date of September 27, 1905, and effective on and after October 16, 1905, are hereby modified by the revocation of Regulations 41, 42, 44, and 45, and the substitution therefor of the following regulations, which revocation shall take effect on January 1, 1906, on and after which date the regulations given below shall become and be effective until otherwise ordered.

Regulation 41.—No stallion or jack shall be allowed to run at large in an area quarantined by the Secretary of Agriculture for maladie du coït, and all stallions and jacks in such quarantined area shall be tagged as hereinafter provided.

Regulation 42.—There shall be no breeding of horses or asses in a herd in an area quarantined by the Secretary of Agriculture for maladie du coït in which there is a horse or an ass which has been exposed to the infection of maladie du coït within eighteen months after the said exposure.

Regulation 44.—Any stallions or jacks found running at large in an area quarantined by the Secretary of Agriculture for maladie du coït may be castrated by an inspector or other employee of the Bureau of Animal Industry of the Department of Agriculture, or by such other person as may be duly authorized by the inspector in charge of such quarantined area, and no indemnity shall be allowed the owner in case of damage resulting from such castration. The terms "stallion" and "jack" shall be understood to apply to any uncastrated male horse or ass one year of age or over.

Regulation 45.—Any stallion or jack in an area quarantined by the Secretary of Agriculture for maladie du coït may, in the discretion of the inspector of the Bureau of Animal Industry of the Department of Agriculture in charge of such quarantined area, be tagged with a numbered tag, kept under such restrictions as the inspector in charge shall prescribe, and shall be subject to examination at such times and as frequently as may be thought necessary by the inspector for the purpose of ascertaining whether symptoms of the disease have developed.

JAMES WILSON, *Secretary of Agriculture.*

Rule 5.—To Revoke and to Withdraw the Quarantine for Maladie du Coït Placed by Rule 4, Dated May 1, 1905, upon Portions of the States of Nebraska and South Dakota (Effective on and after January 1, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the infectious, communicable disease of horses and asses known as maladie du coït, which formerly existed in portions of the States of Nebraska and South Dakota, has ceased to exist in those States.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by the act of Congress approved March 3, 1905 (Public No. 229), do hereby remove from quarantine the following area, to wit:

All territory situate within the boundaries of the Pine Ridge and Rosebud Indian reservations in the State of South Dakota; that portion of the counties of Custer and Fall River, in the State of South Dakota, situate east of the North branch of the Chicago and Northwestern Railway; that portion of Dawes County, in the State of Nebraska, situate east of the North branch and north of the Western branch of the Chicago and Northwestern Railway; and those portions of Sheridan and Cherry counties, in the State of Nebraska, situate north of the Western branch of the Chicago and Northwestern Railway.

Rule 4, to prevent the spread of maladie du coït, issued under date of May 1, 1905, and effective on and after June 1, 1905, is hereby revoked, such revocation to take effect on and after January 1, 1906.

Done at Washington this fifteenth day of December, 1905.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

ACT OF CONGRESS APPROVED MARCH 3, 1905.

[PUBLIC—NO. 229.]

AN ACT To enable the Secretary of Agriculture to establish and maintain quarantine districts, to permit and regulate the movement of cattle and other live stock therefrom, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Agriculture is authorized and directed to quarantine any State or Territory or the District of Columbia, or any portion of any State or Territory or the District of Columbia, when he shall determine the fact that cattle or other live stock in such State or Territory or District of Columbia are affected with any contagious, infectious, or communicable disease; and the Secretary of Agriculture is directed to give written or printed notice of the establishment of quarantine to the proper officers of railroad, steamboat, or other transportation companies doing business in or through any quarantined State or Territory or the District of Columbia, and to publish in such newspapers in the quarantined State or Territory or the District of Columbia, as the Secretary of Agriculture may select, notice of the establishment of quarantine.

SEC. 2. That no railroad company or the owners or masters of any steam or sailing or other vessel or boat shall receive for transportation or transport from any quarantined State or Territory or the District of Columbia, or from the quarantined portion of any State or Territory or the District of Columbia into any other State or Territory or the District of Columbia, any cattle or other live stock, except hereinafter provided; nor shall any person, company, or corporation deliver for such transportation to any railroad company, or to the master or owner of any boat or vessel any cattle or other live stock, except as hereinafter provided; nor shall any person, company, or corporation drive on foot, or cause to be driven on foot, or transport in private conveyance or cause to be transported in private conveyance, from a quarantined State or Territory or the District of Columbia, or from the quarantined portion of any State or Territory or the District of Columbia, into any other State or Territory or the District of Columbia, any cattle or other live stock, except as hereinafter provided.

SEC. 3. That it shall be the duty of the Secretary of Agriculture, and he is hereby authorized and directed, when the public safety will permit, to make and promulgate rules and regulations which shall permit and govern the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of cattle or other live stock from a quarantined State or Territory or the District of Columbia, and from the quarantined portion of any State or Territory or the District of Columbia, into any other State or Territory or the District of Columbia; and the Secretary of Agriculture shall give notice of such rules and regulations in the manner provided in section two of this act for notice of establishment of quarantine.

SEC. 4. That cattle or other live stock may be moved from a quarantined State or Territory or the District of Columbia, or from the quarantined portion of any State or Territory or the District of Columbia, into any other State or Territory or the District of Columbia, under and in compliance with the rules and regulations of the Secretary of Agriculture, made and promulgated in pursuance of the provisions of section three of this act; but it shall be unlawful to move, or to allow to be moved, any cattle or other live stock from any quarantined State or Territory or the District of Columbia, or from the quarantined portion of any State or Territory or the District of Columbia, into any other State or Territory or the District of Columbia, in manner or method or under conditions other than those prescribed by the Secretary of Agriculture.

SEC. 5. That every person who forcibly assaults, resists, opposes, prevents, impedes, or interferes with any officer or employee of the Bureau of Animal Industry of the United States Department of Agriculture in the execution of his duties, or on account of the execution of his duties, shall be fined not less than one hundred dollars nor more than one thousand dollars, or be imprisoned not less than one month nor more than one year, or by both such fine and imprisonment; and every person who discharges any deadly weapon at any officer or employee of the Bureau of Animal Industry of the United States Department of Agriculture, or uses any dangerous or deadly weapon in resisting him in the execution of his duties, with intent to commit a bodily injury upon him or to deter or prevent him from discharging his duties, or on account of the performance of his duties, shall, upon conviction, be imprisoned at hard labor for a term not more than five years or fined not to exceed one thousand dollars.

SEC. 6. That any person, company, or corporation violating the provisions of sections two or four of this act shall be guilty of a misdemeanor, and on conviction shall be punished by a fine of not less than one hundred dollars nor more than one thousand dollars, or by imprisonment not more than one year, or by both such fine and imprisonment.

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