

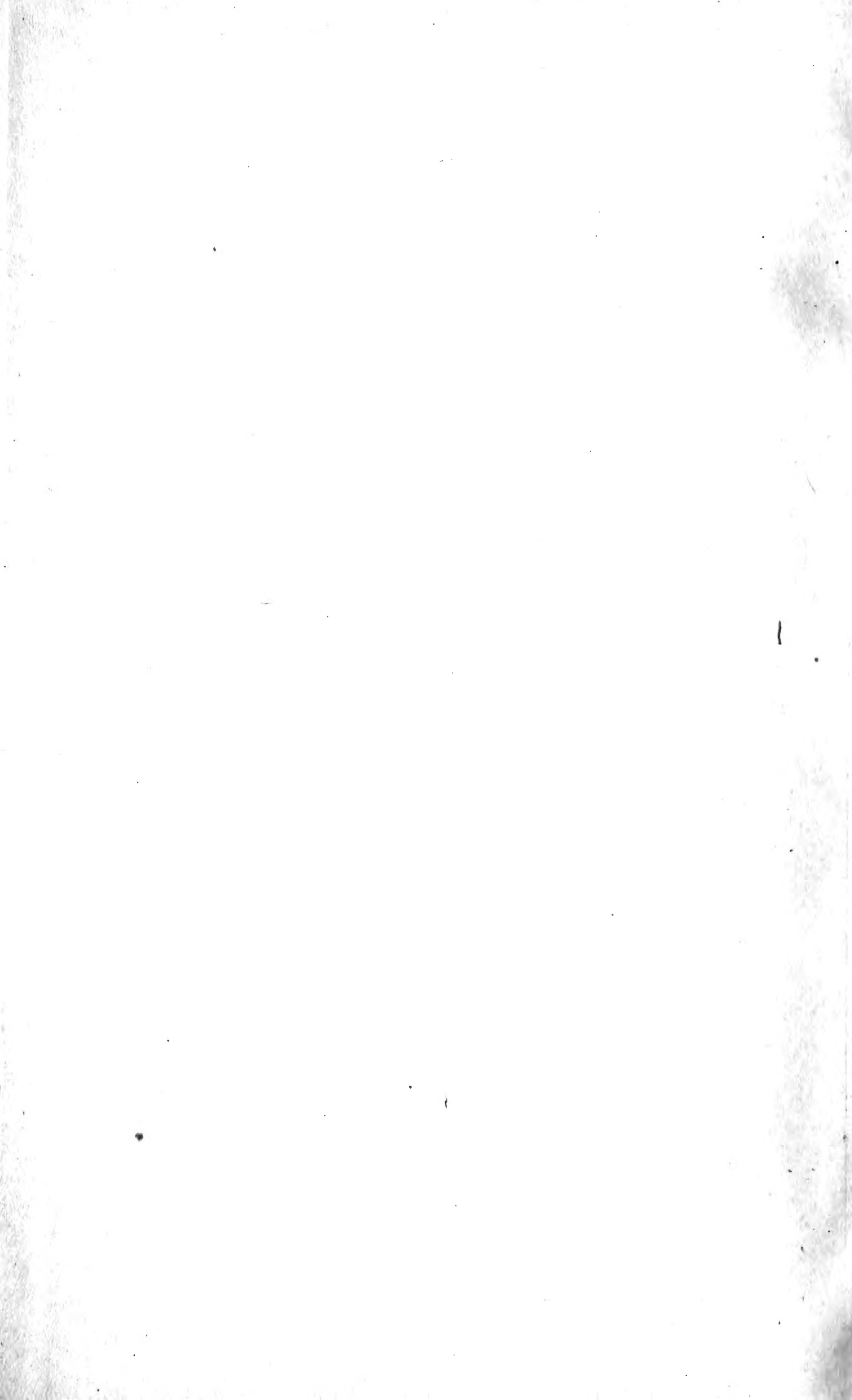


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Principles and Practices Involved in the Breeding, Feeding, and Management of Pure-Bred Draft Horses in the United States

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By
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I

INTRODUCTORY

The world's horse population is 105,400,000, of which the United States shares with 23,015,922, or 23%.¹ The United States is also credited with having 25 horses per 100 population, outranking other countries in this respect.¹ To date census figures for 1920 give the horse and mule population of the United States to be 27,676,939.²

That the horse industry of the United States, particularly of the draft type, is to remain the source of reliable, efficient, and economic power for the major body of agricultural workers and transportation men, is evident. A very plausible undertaking, the "National Survey of the Economic Status of the Horse," sponsored by the saddlery interests,³ has been made, the results of which bear fruit in accord to the foregoing assertion.

This survey, among other things, discloses the following:¹

"(1) All data gathered and studied indicates that the tractor in its present state of development is a means of supplementary or auxilliary power rather than a substitute for the horse.

"(2) That the tractor to date has made no appreciable dent in the number of horses on our farms. In at least 50% of the cases just as many horses are kept as after its purchase.

"(3) Actually, horse displacement which can be credited to the tractor is very, very small, and in no case are the horses displaced equal in value to the tractor which displaced them.

"(4) That the horses remaining after the tractor has been purchased perform on the average from 75% to 90% of all the work."

The survey also points out that the increase in the number of horses and mules has always about kept pace with the increase in population and agricultural expansion, excepting only from 1900 to 1910.

Relative to the effect of the introduction of motor trucks on the farms, the survey reveals the fact that in January, 1919, there were 184 times as many horses and mules as there were of motor trucks, so that the influence is very little. It is mentioned that only one farm in nearly fifty has a truck.

As to the part played by draft horses in city haulage it is worthy of note to consider the following findings:¹

"For all hauls within a radius of 2 or 3 miles where a number of stops are made from terminal to down town business houses—hauling in many cases is superior and in all cases cheaper. Long delays at terminals seem to be inevitable and when this delay amounts to 2 or 3 hours it is quite obvious that the horse is much cheaper due to the small investment idle. Added to this, it is possible to use horses in many alleys and such places that would be almost inaccessible for a motor truck.

"A number of cartage concerns also handle contracting work, such as excavating. In this field it was also clearly demonstrated that the horse has his place. First, in getting into excavation the horse could often get into places where a motor truck could not go. It also was unnecessary to build heavily planked roadways for the horse as are necessary to give the truck traction. This also holds true on the dump.

"In ice companies, bakeries, creameries, etc., having short hauls and regular stops or routes the horse has a distinct place. The truck could

not make any better time over a given route than a horse could. The horse could carry just as big a load and the cost was much less."

Back of the horse industry the country must look into the breeding operations as the basis for the output of proper classes and number of horses to keep pace with the requirement in the United States. The breeding and raising of pure bred horses, which are primarily responsible for the production of good types, must receive due support and attention. To date census figures show that there were in 1919, 1,594,141 colts (horses and mules) in the United States, indicating a decrease of 22% from that of 1909.² This is discouraging, and following the suggestion of the Horse Association of America the number of foals per year should at least be equal to the number of horses replaced on the farm annually, which is 1,811,087 in 1920.²

According to the "National Survey of the Economic Status of the Horse,"¹ there were but 115,000 pure-bred draft horses of the six leading breeds, or 1-165 of the nineteen million horses on the farms and ranches in the United States in 1912. No doubt the total decrease in the number of foals during the ten-year period—from 1909 to 1919—, and the disproportionate small number of pure-bred horses compared to the total horse population on farms and ranches, is due to some extent to lack of knowledge regarding the proper and established methods of breeding, feeding, and management of breeding horses.

II

OBJECT OF THE WORK

It is the aim of this dissertation to elucidate the findings gained from an investigation of the practices relative to the breeding, feeding, and management of breeding pure-bred draft horses as are actually followed and advocated by experienced and observant breeders of this class of horses in the United States.

III

SOURCES OF MATERIALS

In undertaking the work the writer made extensive trips and visited several leading breeding establishments of pure-bred draft horses of different breeds in Illinois, Iowa, and Wisconsin in the summer of 1920. Other data were secured through correspondence by means of questionnaires sent to the principal draft horse breeding farms throughout the United States and several experiment stations. And besides, interviews were held with some breeders during the visits made to the county fair at Janesville, Wisconsin, the interstate fairs at Sioux City, Iowa, and at Kankakee, Illinois, the state fairs at Springfield, Illinois, and at Des Moines, Iowa, and lastly at the Belgian Horse Show, Waterloo, Iowa, all in the summer and fall of 1920.

IV

PAST WORK--GENERAL STATEMENT

A review of the literature written on the breeding, feeding, and management of horses reveals the fact that only a very limited amount of the work was undertaken under controlled experimental means, while legions of books and articles were put forth by competent authorities, whose wide and long experience unquestionably gives strength to their assertions and recommendations.

V

MANAGEMENT OF THE STALLION

1. SELECTION

In choosing the stallion to head the stud Gay⁴ indicates that he should possess the proper type and conformation, and should be sound as well as being strongest in such points in which the mares he is to be mated with are defective. Masculinity is desired and of this Gay mentions that the stallion must have "development of forehead, hardness of feature, and boldness of demeanor" which he points out as indicative of the "impressive sire." In referring to the same point, Johnstone⁵ considers it the most important to bear in mind when right conformation and soundness go with it. Thus he alludes to a "high-headed, bold, noble, masculine presence" as a criterion of promising prepotency. He makes the statement that he has never known one to be a breeder with the head and neck of a mare. Another authority, Carlson,⁶ writes that "no horse has ever proved himself a great sire, if not a stallion of most pronounced masculinity." He characterizes masculinity by "the crest, the massive jaw, the voice, the hard and fixed expression of the eye, the muscular development of the jaw, neck and shoulder, and by his action and every movement." Carlson⁶ goes on to say that stallions of inferior masculinity produce many colts of low vitality although mated with vigorous mares. Pierrot,⁷ in speaking for the breeders of the Perche, France, asserts that a good deal of character and reproductive ability are sought in the stallion as shown by the head, neck, and eye. A stallion with "well-crested, swan-curved neck, a clean throatlatch, a well-poised head with small, fine ears—an intelligent head above all, with a large prominent eye, full of brilliance and fire" is desired. Great emphasis is given to the eye, of which Pierrot remarks that he has never seen a reproductive stallion whose eyes are of the common type. According to Gelder,⁸ the front outlook of a stallion should go with "a good crest, bold masculine appearance, bright, full hazel eye, a broad, full forehead and a strong, wide, well-muscled jaw."

The stallion as a different animal, possessing characteristics essential for a reproductive male, is described by Blum⁹ whose account on the subject is quoted in toto, to-wit:

"The sex character of the stallion is one of his conspicuous features. His head is somewhat stronger and larger than that of the mare, and his neck much heavier and thicker, with some strength of arch. When the stallion is in superior physical vigor and spirits, he tends to carry head and neck high, and shows the self-assertion and dominant quality of the masculine sex. He should show marked strength of character in his head, for it expresses much, whether bold and toplofty, or meek and droopy. Some stallions have heads of an effeminate appearance, or resemble the gelding in sexless character. Such heads should be discriminated against by both judge and breeder. One could not expect the best breeding results from a feminine appearing sire. The neck should show some length, rather than be short and steer-like, and be well laid with powerful, long muscles. A strong development of hair at the fore-top and top of the neck, is also a feature of the stallion, the hair tending to be coarse rather than fine. The stallion should manifest in his head and especially eyes, something of his character, not easy to define, yet expressing personality, temperament, disposition, and sexual dominance. The sex character of the stallion is also shown in his powerful development of bone and muscle, and in his sexual organs. Even when of the

same size as the mare, his bone tends to be heavier, his muscles more prominent and his frame more powerful. The sexual organs should be perfectly developed, and the judge should note that the scrotum consists of a double sac and prominent enough to bear evidence of being on a breeding animal. A stallion with a single testicle is known as a ridgling, and is at least open to criticism in the show ring, though he may not be a non-breeder.

"The general body conformation of the stallion should show closeness of coupling and strength of back, but plenty of length of middle. Some persons favor much compactness of body, but if properly coupled and the back strongly sustained, then the body itself may have length to advantage. The shoulders of the stallion are also usually somewhat heavier and more prominent than on a gelding or mare, giving a thickness in front expressive of masculinity and power.

"The size of the stallion usually exceeds that of the mare though not to a notable extent in many cases. However, a draft stallion weighing 2,000 pounds, might be a satisfactory size, while the female of the breed at 1,700 would meet all requirements. It is not unreasonable to expect the male to weigh three or four hundred pounds more than the female. Most men desire comparatively large, rather stretchy types of stallions, and these weigh distinctly more than the low set, compact, chunky sort. This type of stallion stands higher than the mares, and is larger and coarser in every way.

"The constitutional vigor of the stallion should also receive consideration. This is shown in the strength and character of the head, but is especially seen in the prominence of breast and the depth and fullness of chest. The degree of width of chest will depend upon the type, the draft stallion showing more than the lighter sort, but this should not be extreme. It is important that the forerib be well arched, but even more desirable that it be long, and so account for a strong heart girth and full flank. Not only this, but a long forerib is sure to be associated with general depth of body, feeding capacity and vitality. A horse with shallow body and long legs cannot stand up under work, and does not show the constitution that the deeper bodied, lower set one does. Constitutional vigor in the male is regarded of prime importance, and judges should give it due recognition.

"The temperament of the stallion will be shown in a degree, according to his type, the heavy draft horse being somewhat quieter and more phlegmatic than the lighter type. In general, however, when not overworked, the stallion shows an animated, aggressive character, with evidence of much reserve nervous force. If overworked, he loses much of his fire and ambition. In the city of Paris there are thousands of draft stallions stolidly pulling away enormous loads, quiet and indifferent as to what is going on about them, giving little evidence of the naturally bold temperament of the sex. The stallions should be active and alert, yet not nervous and irritable. His disposition is usually good, but he will bear watching for he may be unnecessarily playful with either teeth or feet."

2. UNSOUNDNESS AND DISEASES AFFECTING SELECTION

The Wisconsin stallion law¹⁰ provides that any of the following diseases shall disqualify the stallion from service: Cataract, amaurosis (glass eye), periodic ophthalmia (moon blindness), laryngeal hemiplegia (roaring or whistling), pulmonary emphysema (heaves, broken wind), chorea (St. Vitus dance, crampiness, shivering, stringhalt), bone spavin, ringbone, side bone, navicular disease, bog spavin, curb (with curby conformation of the hock), glanders, farcy, maladie due coit, urethral gleet, mange and melanosis. The state of New York,¹¹ however, disqualifies the stallion from standing only when affected by any incurable or con-

tageous diseases, and may be passed even though afflicted with some transmissible unsoundness provided that the unsoundnesses are mentioned in the certificate. The law considers the following as transmissible: recurrent ophthalmia, cataract, amaurosis, laryngeal hemiplegia, pulmonary emphysema, stringhalt, bone spavin, side bone, navicular disease, curb (when associated with curby conformation of the hock). Under this law it is further pointed out that stallions which shall have reached their fifteenth year and found to be free from incurable, infectious and transmissible diseases, shall subsequently not be required to pass the examination for diseases or unsoundness after the issuance of the first certificate previous to this time. The Iowa¹² law disqualifies the stallion if affected with glanders, farcy, *maladie due coit*, coital exanthema, urethral gleet, mange, melanosis, blindness, cataract, and periodic ophthalmia, while enrollment may be permitted if possessing any of such unsoundnesses as amaurosis, laryngeal hemiplegia, pulmonary emphysema, bog spavin, bone spavin, ringbone, side bone, navicular disease, curb (with curby conformation of the hock), and chorea, provided that the unsoundness is specified in the certificate and advertisement. The law states that if the condition of the unsoundness is such that the stallion is unfit for breeding the same may be rejected for public service. Somewhat similar to the New York law the stallion is also given a permanent certificate, but in this case, the stallion must have passed examination for three consecutive years and reached the age of six years or over. The permanent certificate must, however, be returned each year for renewal, together with an affidavit that the stallion is free from contagious or communicable disease. Nebraska¹³ bars any stallion from public service if suffering from urethral gleet, melanosis, periodic ophthalmia, laryngeal hemiplegia, dourine, glanders, farcy, or serious defects in general conformation, and certificates are not issued to such stallions brought to the state if affected with urethral gleet, melanosis, periodic ophthalmia, laryngeal hemiplegia, cataract, amaurosis, chorea, stringhalt, bone spavin, bog spavin, ring bone, side bone, curb (with curby conformation of hock), and contagious or infectious diseases, or which is seriously defective in conformation or of vicious disposition. Here again a permanent certificate is given at the second inspection, the time of examination being made, first, between the age of two and three years, and again between the age of five and six years. But the certificate may be repealed if the stallion is found to have melanosis, periodic ophthalmia, or any contagious or infectious diseases or for any other cause. The California stallion law¹⁴ only specifies that licenses issued to unsound stallions should bear the particular disease or unsoundness with which it is afflicted. Such unsoundnesses and diseases as are included in the law, sufficient to cause the stallion unsound, are periodic ophthalmia, cataract, laryngeal hemiplegia, pulmonary emphysema, chorea, bone spavin, ringbone, sidebone, navicular disease, osteoporosis, curb (when accompanied by faulty conformation of hock). Washington¹⁵ bars any stallion affected with bone spavin, ringbone, sidebone, navicular disease, bog spavin, curb (with curby formation of hock), glanders, farcy, *maladie du coit*, urethral gleet, mange, melanosis. The state of New Jersey¹⁶ makes the same provision, but adds that cataract, amaurosis, periodic ophthalmia, laryngeal hemiplegia, pulmonary emphysema, chorea, osteoporosis, canker of the foot, and laminitis as being also contagious diseases and unsoundnesses. New Jersey and Utah¹⁷ laws are similar in this respect excepting that in the latter osteoporosis, canker of the foot, and laminitis are not included; furthermore, the Utah law discriminates against enlarged sidebone and curby formation of hock in place of sidebone and curb with curby formation of hock.

Barring stallions which were unsound before the enactment of the law, or such stallions as have become unsound after passing examination at

over six years of age, the Stallion Registration Board of Oregon¹⁸ is authorized to reject the issuance of license certificates to stallions suffering from cataract, amaurosis, periodic ophthalmia, laryngeal hemiplegia, chorea, bone spavin, bog spavin, ringbone, sidebone, and curb (when accompanied by curby formation of the hock). The Board is further empowered to disqualify stallions that are unfit for breeding purposes to disqualify stallions that are unfit for breeding purposes arising from diseases or deformities. In order that stallions be licensed to stand for public service in the state of Colorado,¹⁹ the law provides that the stallion be free from such diseases or unsoundnesses as roaring, ringbone, chorea, bone spavin, bog spavin, specific ophthalmia, curb (when accompanied with curby conformation), or any venereal or other contagious diseases. Ridglings and deformed stallions are also barred. In the state of Oklahoma²⁰ the stallioners are given the option to apply for license if they are to take advantage of the lien, and certificate of soundness is issued only when it is desired to advertise the stallion as being sound. The stallion is certified to be sound when found free from moon blindness, cataract, roaring or whistling, heaves or broken wind, St. Vitus' dance, stringhalt, bone spavin, curb (with curby formation of hocks), glanders, farcy, urethral gleet, mange, and retention of one or both testicles. The law of Minnesota²¹ provides for the rejection of stallions applying for license when affected with such transmissible diseases or unsoundnesses as bone spavin, sidebone, ringbone, curb (when accompanied by curby formation of the hock), glanders, farcy, maladie du coit, urethral gleet, and mange. But in case that a stallion which has been previously registered is found diseased the Stallion Registration Board is authorized to issue license stating the nature of unsoundness. Under the same law is provided the examination of stallions every four years until said individuals have reached the age of ten years when the same will be exempted from further inspection. Montana²⁸ rejects the enrollment of stallions possessing diseases or unsoundnesses as cataract, amaurosis, laryngeal hemiplegia, chorea, bone spavin, ringbone, sidebone, glanders, farcy, maladie de coit, urethral gleet, mange, melanosis, and curb (when accompanied by curby hock). In South Dakota²² such diseases or unsoundnesses as specific ophthalmia, including moon blindness, laryngeal hemiplegia, bone spavin, ringbone, glanders, farcy, dourine, urethral gleet, mange, bog spavin, or curb (when accompanied by faulty conformation) are sufficient to disqualify a stallion so affected for breeding services. The Indiana Stallion Enrollment Board²³ provides for the rejection of stallions affected with any incurable, infectious, or contagious diseases, but transmissible unsoundnesses are passed which, however, should be indicated in the certificate of enrollment. Condition of soundness is required in the first certificate and every two years until the stallion is ten years old, at which time and afterwards further application for soundness is no longer necessary. The following diseases and unsoundnesses are recognized as contagious, infectious, or transmissible: Recurrent ophthalmia, cataract, glaucoma, amaurosis, laryngeal hemiplegia, pulmonary emphysema, chorea, stringhalt, glanders, maladie du coit, urethral gleet, mange, bog spavin, bone spavin, curb, when associated with curby conformation of the hocks, ringbone, sidebone, and navicular disease. One or more of the following diseases and defects are deemed sufficient to bar a stallion from registration in the state of Idaho:²⁴ "Hemiplegia, roaring or whistling, chorea, stringhalt, bone spavin, bog spavin, ringbone, thoroughpin, enlarged sidebones, urethral gleet, ophthalmia, cribbing and curb (when accompanied by curby hock), or any marked, faulty or weak conformation, which he is liable to transmit." The state of Illinois²⁵ issues license to unsound stallions that may be affected with amaurosis, bog spavin, sidebone, navicular disease, curb, chorea, stringhalt or roaring, provided that the unsoundness is indicated on the certificate. However, the stallion

may be disqualified if afflicted with any contagious or infectious diseases, or suffering from periodic ophthalmia, bone spavin, ringbone, curb (when accompanied by curby conformation). Certificate of soundness is no longer necessary in case of stallions 6 years old or over which have successfully passed examination for two successive years.²⁶ Said stallion is entitled to a permanent certificate of soundness. However, should this stallion contract infectious, contagious, or communicable disease the Department of Agriculture shall have the right to cancel the permanent certificate at any time. The North Dakota Stallion Registration Board²⁷ rules that no stallion should stand for public service if affected by such diseases and unsoundnesses as cataract, amaurosis, laryngeal hemiplegia, stringhalt, glander, sidebone, farcy, maladie cu coit, urethral gleet, mange, bone spavin, ringbone and curb (when accompanied by curby hock), and in like manner the laws of Montana²⁸ includes the same disqualifying factors. Besides, in another clause, Montana statutes provide that "No stallion shall stand for public service . . . which is deformed or so badly diseased as to be . . . wholly unfit for breeding purposes . . ." The Pennsylvania²⁹ laws provide for the licensing of stallions as are qualified and approved by the veterinarian, said examiner to certify on the soundness and conformation of the stallions, and to specify such unsoundness and inferior conformation that may be found, if any. In another section of the same law, it is stated that "Any stallion . . . the patronage of which, in the opinion of those charged with the enforcement of this act, on account of unsoundness, inferior type or conformation, may prove a detriment to the horse breeding interests of the state, shall be refused a license, and when license is so refused the said stallion . . . shall not stand for public service in this state."

The laws of the State of Michigan³⁰ do not account for any unsoundnesses or diseases that may bar a stallion of the state for public service, but in Sec. 7, the provisions read: "Every stallion brought into this state from another state or from a foreign country to be offered for sale or for public service shall, before any such sale or use is made, be examined by the state veterinary board or its regularly appointed representative, and certified by said board or its representative that said stallion is free from hereditary, contagious or transmissible unsoundness or disease and is of good conformation and breed type and suitable to improve the horse stock of the state."

Touching on the subject of unsoundness, Section 12 of the Kansas stallion law³¹ reads: "It shall be optional with owners, keepers, or persons in charge of stallions standing for public service whether or not said stallions shall be examined for soundness, but no stallion shall be advertised in any manner either directly or indirectly as a sound stallion until a certificate of soundness has been issued for said stallion by the Kansas State Live Stock Registry Board, and then said stallion may be advertised as sound only during the life of the certificate of soundness. This certificate of soundness shall become null and void and not in force on December 31 of the year during which it is issued." The state of Missouri³² make similar provisions on unsoundness.

The Stud License Law of the state of Kentucky³³ makes no provision for any unsoundness or diseases that may disqualify the stallion for public service.

Alexander³⁴ holds that certain diseases are "heredity or transmissible as a predisposition." These include the following: "eye disease, such as periodic ophthalmia or 'moon blindness', cataract, amaurosis or 'glass eye', chorea or 'St. Vitus' dance', constituting 'crampiness', or 'shivering', 'stringhalt', 'heaves' or 'broken wind', spavin, ringbone, sidebone, navicular disease or 'grogginess', melanotic or pigment tumors, and peculiarities of conformation rendering animals liable to disease or lameness such as

'sickle', curby-formed, 'crooked', 'boggy' or 'sprung' hocks, flat, weak, unsound hoofs, weak, ill-formed knees, 'washy' coupling, short upright pasterns, etc." Alexander also gives a list of communicable diseases which should be guarded against in breeding animals, namely: glanders, farcy, "maladie du coit," infectious abortion, mange, leucorrhoea or "whites," urethral gleet and simple pox.

According to Miles,³⁵ "Bone spavin, curbs, ringbone, navicular disease, and other similar affections of the bones and joints, are of frequent occurrence in the hereditary form." Too, it is claimed that "in horses, strain of the back-tendons, swelled legs, grease, and roaring, are often hereditary; while a predisposition to rheumatism, malignant and non-malignant tumors, chronic cough, ophthalmia and blindness, epilepsy, and a great variety of nervous disorders, is inherited by them . . ." Miles cites Finlay Dun who believes that "a disproportion in the width and strength of the leg below the hock to the width and strength above the hock, predisposes to spavin; a straight hock and a short os calcis, inclining forward, gives a tendency to curbs; 'round legs and small knees, to which the tendons are tightly bound, are especially subject to strains'; while a predisposition to navicular disease is found 'in horses with narrow chests, upright pasterns, and outturned toes'." It is also brought out by Miles, in the words of Dun, that "many farm horses, as well as others without much breeding, are remarkable for consuming large quantities of food, for soft and flabby muscular systems, and for round limbs containing an unusual proportion of cellular tissue. These characters are notoriously hereditary . . . Such characters indicate proclivity to certain diseases, as swelled legs, weed and grease." And again Miles remarks that "If the leg below the hock is disproportionately long and the os calcis is short (giving a narrow hock), a strain of the joint, or some other form of the disease, is liable to result from an amount of work that would not be severe in a limb of proper proportions."

Gay³⁶ asserts that the 'transmissibility of many of the so-called hereditary unsoundnesses has not been established; even roaring and moon blindness in horses, the only two things for which stallions are disqualified in France, where the most comprehensive system of inspection is, are now believed to be more frequently the result of preexisting influenza in the one case, and of an enzootic infection in the other, than of hereditary influences."

Quoting Youatt,³⁷ "there is abundant proof that blindness, roaring broken wind, sidebones, spavins, ringbones, laminitis, and navicular disease have been bequeathed to their offspring both by sire and dam."

And Axe³⁸ believes that spavins, curbs, ringbones, sidebones, roaring, whistling, stringhalt, shivering, specific ophthalmia, and cataract are the most harmful among the hereditary diseases and unsoundnesses of the horse.

In this connection it may be well to consider such unsoundnesses as are deemed sufficient to bar a mare from being bred to a Government stallion by the Bureau of Animal Industry of the United States Government. According to Reese,³⁹ these unsoundnesses include bone spavin, ringbone, sidebone, heaves, stringhalt, roaring, periodic ophthalmia, and blindness, partial and complete.

3. OTHER CONSIDERATIONS AFFECTING SELECTION

Carlson⁶ emphasizes the need of testing the stallion for its wind. He says there is no disease of the horse that is more likely to become hereditary than laryngeal hemiplegia. In discussing this subject, Johnstone⁵ suggests that in testing the horse for this defect go and pass by as if to punch him on the flank and if he grunts then it is an indication of the animal being windbroken.

Johnstone⁵ also adds some important considerations in the selection of the stallion. He brings out the matter of looking into the teeth, and as has been referred to under the stallion laws, he likewise gives importance to examining the eyes and testicles. A full normal set of testicles is required. With regard to testing the virility of the stallion Carlson⁶ advocates that the semen be examined under the microscope. He also points out that the testicles should be well developed and even in size. According to him, the smaller, shorter penis is to be preferred inasmuch as more complete services are obtained thereby, the semen being discharged into the uterus. Carlson further brings out that a stallion with tallowy deposits around the generative organs is to be discriminated against.

As has been referred to, vicious disposition is discriminated against by the Nebraska Stallion Law. Carlson⁶ likewise rejects the dangerous individual or even one that is difficult to handle.

The pedigree of the individual should be carefully examined, bearing in mind the relative merits of the ancestry and above all the authenticity of the records.

Under the caption rejects, outside of actual unsoundnesses, Johnstone⁵ may be quoted: "Avoid long couplings, light ribs, weak loins, light flanks, narrowness of conformation, calf-knees, sickle hocks, straight pasterns, and small, steep, flat, shelly or low heeled or mulelike feet. Very light bone also should be left for some one else, also crooked top lines, low backs, dropping rumps, ewe and short straight necks, sour or 'fiddle' heads, sow ears, dish faces and small piggy eyes . . . The legs should be smooth and clean from the knees and hocks down to the coronet and so to the hoof which should be of fine texture without ridges, cracks or breaks."

4. AGE TO BREED

Carlson⁶ prefers that the colt be started to serve at three years of age, and says that if he is to be used as a two-year old no more than 8 or 10 mares for the year should be covered, with an interval of five days between services. With regard to the two-year-old, Johnstone⁵ gives similar opinion, but adds that he should be vigorous and well developed. He restricts the three-year-old to 25 to 30 mares, and the four-year-old to 40 to 50 mares. The mature horse is limited to two services daily and in exceptional cases may be allowed to serve three times in a day. An average of three covers, according to Johnstone, suffices to beget a foal, and assuming that a stallion settles one-half of the mares, therefore, the three-year-old will on the whole render 45 services during the breeding season of fifteen weeks, or three services to the week. According to the same inference, the four-year-old will make 75 covers, but since his season may be extended to 115 days, his services will be called for at 3 times every two days. Dimon⁴⁰ says that if the two-year-old is at all to be used the services should be light, the three-year-old to be limited to 15 or 20 services, and the four-year-old to 30. According to Bergman,⁴¹ the two-year-old may be allowed 15 mares, the three-year-old 50, and the aged sire as many as 80 to 120 mares during the breeding season of four months. Curryer⁴² mentions that from one to three covers for the first week and four or five times the next comprise a good schedule in starting a stud horse for the season. Then once a day, but never more than two times, may be permitted. Two services a day, however, should be indulged in only occasionally. While the same authority also indicates that with stallions that were idle during the winter the stud work may be so regulated that an individual is allowed only two services a week throughout the season. Axe³⁸ is of the opinion that stallions should be started in the stud as a three-year-old, but remarks that the

two-year-old may stand to the limit of 15 mares. He gives the following average stallion allowances for individuals of different ages: The two-year-old may serve 10 to 15 mares; the three-year-old, 25 to 30 mares; the four-year-old, 45 to 60 mares; and the five-year-old or older, 70 to 100 mares. Axe³⁸ cites a case of a Shire stallion, which, after having completed a heavy stud work in Lancashire, England, was allowed to serve 19 mares in the south where it was then taken to. The mares were served the same day the stallion arrived, of which 13 settled. It is also remarked that some stallions were known to have covered from 200 to 260 mares in one season and still leave a proper proportion of offspring. It is, however, emphasized that such action taken will eventually lead to sterility or premature impotence. Wallace⁴³ asserts that a stallion is able to serve 80 mares during the season and get an average of 40 to 50 foals, and adds that certain individuals may cover 100 and some even 130. It is interesting to note that a horse with one testicle down, according to the same authority, can get foals, while if the two are both out no foals could be expected.

According to Allen,⁴⁴ the stallion American Eclipse, which was a successful getter till the age of 32, began stud work late and light service was allowed till he was fully matured. One extreme is here pointed out by Walley,⁴⁵ however, in that a few draft horses "are capable of 'stinting' successfully more than five mares in a single day." He also remarks that from an aged stallion a dwarf or puny offspring is to be expected. It is interesting to note that Jackson, as quoted by Walley, places the allowance for a stallion in one season at only 25 mares inasmuch as he considers the stallion to make 100 services, or 4 covers to each mare.

In discussing the question of early service Gay⁴ maintains that the two-year-old or three-year-old may be permitted to undertake stud work on the ground that a knowledge of their ability as a sire is desired at an early date. However, they may be allowed to serve only a few selected mares, and only for a short period in order that their development may not be hampered. Sanders⁴⁶ mentions that the two-year-old should not be allowed to serve at all, but, for the same reason as Gay⁴ presents, he may be given a chance to serve a few choice mares in order to test his ability as a foal-getter. It is also brought out that the three-year-old should be limited to 15 or 20 services and the four-year-old, 20 or 30, while in the case of a mature sire 100 mares are given as a safe allowance. Sanders purports to restrict the young stallion to serve only a few mares and to stand only for a few weeks, allowing two or three mares a week. One service a day is advocated although twice a day may be permitted rarely. However, should the stallion have had a long rest he may make three covers a day for a few days, which should be followed by a rest. In the Little Perche in France⁴⁷ stallions destined for breeding purposes are started on stud work at the age of two years and on until they are four years old. At four they are sold in Paris or to foreign caterers. On the other hand, in the Great Perche adult stallions are used for breeding purposes. The breeders of the Percheron country are also opposed to standing stallions below four years old.

5. PROCEEDURE IN BREEDING OPERATIONS

Precautions which are necessary in breeding operations as well as the proper procedure to be followed in handling the stallion and mares on the occasion are given and described by Williams⁴⁸ in the following manner: "It is desirable, if not frequently essential to safety, that special conveniences for restraint be provided for ['trying' or 'teasing']. They should consist ordinarily of a strong, solid wall about three feet high and ten to twelve feet in length with a rather broad and rounded top. The chief object of the structure is the avoidance of kick wounds which may

be inflicted upon the stallion by the mare. To this end it should be merely of sufficient height to guard against such an accident and sufficiently resistant that the mare cannot kick through it. The use of a single pole to separate the stallion and the mare is insecure and hazardous as either may kick through beneath it and injure the other.

"It is also highly essential that the top of the structure be rounded, smooth and free from projections. Either the mare or stallion may get beyond the control of the groom and kick or leap upon the structure and, unless properly built, serious injury is liable to occur. To this end the wall should be low enough that, either animal, getting upon it by rearing or kicking, may readily free itself without injury . . . Posts should not extend above the top of the structure or, doing so, should continue so high as to make injury in this manner impossible.

"When this preparatory period has been passed and copulation has been decided upon, there arise fresh dangers to the stallion from kicks by the mare while approaching her or in the act of mounting. Two methods of avoiding accidents at this point are used; without and with hobbles. In the first method, when both stallion and mare are well-broken and controllable and competent grooms have each well in hand, the stallion should be caused to approach the mare's head and then allowed to mount from the side instead of from the rear. If both are kept well in hand, any attempt to kick on the part of the mare should be at once counteracted by vigourously drawing her head toward the stallion, thus turning her heels from him. After coition has been completed and the stallion is dismounting the same rule should constantly be applied and the mare brought at once to face the stallion in order to avoid kicks.

"Owners of valuable stallions generally prefer to obtain yet greater security by the application of hobbles. Two forms are used of which there are numerous varieties. By one plan, a hobble is buckled about each hind pastern, a rope of sufficient length attached to each, and the two free ends are carried forward between the forelegs and securely tied to a strong collar or the end may be carried upwards on either side of the necks and tied on the top sufficiently tight to prevent the mare from kicking backward for any important distance. By the second plan, the hobbles are attached to the hocks instead of the pasterns. In this case, each hobble is doubled and one portion of each is attached above, the other below the hock of each hind leg, and by ropes or straps are fixed forward the same as in the preceding. The latter possesses some points of superiority. The mare is not so liable to become entangled in the ropes and injure herself and the stallion is probably also exposed to less danger of getting his foot caught in the securing apparatus. Whatever the form of breeding hobbles or other confining apparatus, they need be secure and strong.

"If accidents are to be avoided, it is also highly important that the mare is properly in estrum and that she is not frightened or angered. Gentleness and patience in the handling of both stallion and mare and postponing copulation until the proper moment are always essential elements of safety in breeding. Some breeders place a twitch upon the mare's nose until the stallion has safely mounted her."

Sanders⁴⁶ advises the use of a structure for trying mares. This consists of a barrier made up of three posts set up parallel to and about four feet away from a solid wall, on both sides of which are nailed oak or other hardwood boards from the ground to a reasonable height. On the top of this should be nailed a capping which would prevent injury. The mare is led into the space inside and the stallion is allowed to tease the mare by her left side, but the horse should be controlled by the bit, if required, and not allowed to have his nose go farther back than the mare's flank. According to him some stallions would not take a liking for certain mares, in which case another mare in heat may be led into the

teasing space and after the stallion's sexual desire has been aroused he could usually be made to cover the former mare.

When the mare is ready for the male, Sanders⁴⁶ recommends that the stallion be led up to about ten or fifteen feet on the left side of the mare with his head about opposite the mare's head. As soon as the stallion is ready, he is then led to the mare but he must be kept from lifting his fore-feet up from afar and instead the mount should be allowed on the side of the mare. Rushing the stallion to the mare is objected to. Sanders mentions that the greatest danger from kicks is on dismounting so he advises the groom holding the mare's bit to pull it by a sudden jerk with his left hand towards him during the time that the stallion is coming off.

For uncontrollable, headstrong stallions a special bridle is advocated. Relative to procuring the most effective type and the manner of using it, Sanders⁴⁶ writes: "The one that I have found most effectual is made by taking an ordinary 'snaffle' bit, with rings of moderate size, and with the head piece made in the usual way; get a blacksmith to attach a well-polished, round iron bar to the right-hand ring, by means of a small link connecting the bar and the ring; to the other end of the bar attach the usual sliding rein used on stallion bridles. Put the bridle on the horse in the usual way, and then, with the right hand on the bar and the left on the bridle-ring next to you, press the bar back and the ring forward until the bar will pass through the ring in the left hand. This bar should be made just as long as it can be to admit of its being passed into the other ring in this manner, and the bit and rings should be so adapted to the size of the mouth and underjaw that, when a little pressure is brought to bear upon the rein attached to the end of the lever formed by this iron bar, the rings of the bit will be brought within an inch of touching each other. The leverage given by this appliance, when well fitted, will enable any one to hold the most unruly and headstrong horse in check When the bar is not needed the rein to which it is attached may be passed over the head and down through the ring on the near side, instead of under the jaw."

Johnstone⁵ desires a special breeding plant which he prefers should be a shed with a firm surface. It should be away from public sight and dwellings. On one side of this the teasing stall is to be constructed, with the wall of the shed or fence on the offside. The stall should be about the width of the standing stall in the stable, and for the poles set two pieces about eight feet apart parallel to the wall. To these posts, 3 feet and 8 inches from the ground should be bolted a six-inch pole of tough wood, whose bark should be removed and the corners and edges smoothed. It is further advocated that a small enclosure be provided nearby for the foal. So a small but strong pen is to be constructed right in front of the teasing stall. Having led the mare into the stall the stallion is gotten from the barn and directed at right angles to the mare. It is not desired that the stallion be allowed to rear or fuss when approaching the mare nor is it good that the stallion teases the mare for an undue length of time.

To insure safety on the part of the stallion, Johnstone⁵ wants the mare hobbled even though she is an individual of good disposition. Some precautions should be borne in mind; the hobbles should be fairly tight. And in leading the stallion to the mare the groom should bring him by the mare's side and not by the rear. Also, the stallion should not be brought within kicking range of the mare.

According to Johnstone,⁵ it is best to break the stallion so that he may be led and controlled only with a cotton rope halter.

To break a stallion for the stud service, Carlson⁶ advises that he should right from the first mare be trained to serve in the proper manner. A quiet mare is necessary and, besides, two men on each side of her. The

stallion should be taught to come by the left side of the mare and to avoid kicks he should be taught to place his shoulder against the mare's flanks. He should learn to mount on the groom's command. When he is mounting the two men detailed by the mare's sides should hold him in place until the service is through. This will teach the young sire a good beginning which would obviate the behavior many stallions exhibit by coming off readily and often causing the throwing of the semen on the outside.

Carlson⁶ finds the breeding chute a fitting structure in a horse breeding establishment. Among the advantages which he claims the chute has over the ordinary way of breeding mares are: It is considered beneficial to undersize mares in that they are relieved of the heavy strain resulting from the excessive weight of mature stallions. It furnishes means of protecting the man handling the mare from young or badly broken males during copulation. The chute also minimizes the danger of the stallion getting kicked. Should the mare be rather low Carlson suggests that a board be placed on the ground to raise her up. In this connection it is hinted that by placing the mare a little higher than the stallion better services are obtained. The chute, according to Carlson's illustration, faces a wall, so that a mare placed in it may be tied close to the wall and high up on a ring purposely bolted to the wall. Carlson dislikes holding the mare during service, whether in the chute or in the open. Instead he insists that she should be tied securely.

It is also considered by Curryer⁴² a safer way to lead the stallion toward the side of the mare, even as far as the shoulder, as the approach is made for service. He desires that the man holding the mare should hold the mare's head up at the time the stallion mounts up for the reason that she will in such a position be less liable to kick. While in dismounting it is also suggested that the heads of the two be pulled towards each other to prevent again any possibility of their kicking one another.

6. SYSTEMS OF FEEDING AND WATERING. SALTING

Smith,⁴⁹ in his discussion of the method of feeding, writes: "If a horse be fed first with hay, followed by oats, the presence of the oats causes the hay to pass out more rapidly than it would have done had it been given alone. When given in this order, according to Ellenberger, a portion of the oats may pass into the bowel by the lesser curvature without entering either the left sac or fundus of the stomach. When oats followed by hay are given, the oats commence to pass out first, but the presence of the hay hurries the rate of progress, and the oats pass more quickly into the intestines than they otherwise would have done.

"According to Ellenberger, when foods are given in succession the lease albuminous should be given first. This appears distinctly to reverse the English practice of giving oats first and hay afterwards, but perhaps only apparently so, for experiment shows that the longer digestion is prolonged, the more oats and the less hay pass out, so that some hay (under ordinary circumstances a moderate quantity) is always left in the stomach until the commencement of the next meal. The presence of this hay from the previous feed may prevent the corn of the succeeding meal from passing out too early. According to Ellenberger, in order that horses may obtain the fullest possible nutriment from their oats, hay should be given first and then water; this carries some of the hay into the bowel and after a time the oats are to be given. The remaining hay now passes into the bowel, and the oats remain in the stomach. This does not accord with English views of watering and feeding fast-working horses, views which have stood the test of prolonged practical experience."

Smith⁴⁹ says that the effect of watering after feeding is to disturb the

regular strata of food arrangement in the stomach, half of which perhaps may be carried away because the water drunk passes directly through the stomach without stopping in the cecum. So he states: "Hence . . . the golden rule of experience that horses should be watered first and fed afterwards." In this connection, Smith brings out the effect of watering on digestion by saying: ". . . during the earlier hours of digestion the horses receiving water digested hay better than those kept without it, but there is no difference after the ninth or tenth hour succeeding feeding."

Woll⁵⁰ says in regard to feeding: "It is generally considered necessary to feed the horse three times a day, although the noon meal is sometimes omitted without apparently impairing the working capacity of the horse. The heaviest meal, so far as hay is concerned is given at night, the morning meal being next in amount, and the noon meal smallest, as he has then less time to eat; at least one-half hour is allowed after the morning and noon meals. The daily gain feed is given about one-third each meal. Whatever system is followed, it is important to adopt a regular routine of feeding so that the horse may get his feed when he expects it and in the manner to which he is accustomed."

Woll⁵⁰ cites Colin to have demonstrated "that the stomach of the horse will fill and empty itself two or three times during a meal; the portion of the feed first eaten will remain only a short time in the stomach subject to the action of the gastric juice, being pushed into the intestines by the feed that follows. It has also been shown if a horse is fed grain and then watered much of the grain will be carried along into the intestines and will, therefore, not be fully digested; hence it would seem that the logical order of feeding is hay and then grain; but horses are most anxious to get their grain and will be nervous and excited if it is withheld until the end of the meal. Farmers generally, therefore, feed their horses grain first and put hay before them to be eaten after the grain."

Fitzwygram⁵¹ is here quoted to say the following on the subject: "Experience has shown that it is sufficient to feed the horse three times a day. Less frequent feeding is decidedly objectionable. The corn should be divided into three portions and the hay into two. If a horse is used in the morning the portion of the hay should be omitted at the early feed and reserved for midday and evening. If he is required to work in the afternoon he should get his hay in the morning and evening. Cart horses, whose work is always slow should be fed with hay three times a day." Fitzwygram goes on to indicate that "Horses should not be fed, when heated, immediately after work. If the horse is exhausted a bucket of warm gruel should be given at once; but the corn should be withheld until the animal is cool and has been dressed." It is pointed out that at the close of the stable hour the feeding should best be made.

On the system of watering Fitzwygram⁵¹ states that "It is a cardinal rule in stable management that horses should be watered before being fed. The contrary practice is exceedingly likely to cause colic, otherwise called gripes." Further on he says that "If the horse is thoroughly tired and fagged the water should be made slightly tepid, or a bucket of warm gruel may be given instead."

According to Gardenier, Gill, and Gilbert,⁵² "Hay and straw are digested and pass out of the stomach more rapidly than oats or other grain. If oats are fed first, and are followed by hay, the hay soon passing onward into the intestines will carry along with it oats that are not yet prepared for intestinal digestion thus causing a loss of food. Another reason for feeding hay first (more particularly if the horse is very hungry or tired from overwork) is that it takes time to masticate the hay and the horse cannot bolt it down as it would grains." The same writers state that "An error that produces many disorders of the digestive system is to

feed too soon after a hard day's work. A very small quantity of hay may be given but grain should not be fed within less than an hour."

Referring to the system of watering, these same authorities write: ". . . the horse should be watered at least three times a day when idle and oftener when at work. Remember always to water before feeding." The manner of watering the heated horse is explained by them in the following way: "It does not matter how much heated the horse may be, it is always better to give him a half dozen swallows of water. If this water is given just before being put in the stable, the animal should be immediately supplied with a few pounds of hay, and should not be fed grain until the animal has rested about an hour. The danger is not in the 'first swallow' but is always due to the large quantity which the animal will take when warm if allowed to drink without restraint."

Henry and Morrison⁵³ points out that "Tangl of Budapest, whose investigations concerning the time of watering horses are the most complete of any recorded, found that horses may be watered before, after, or during meals without interfering with the digestion or the absorption of the food they eat." They go on to say that all methods are equally good, tho circumstances may favor one over the other. A horse long deprived of water, or having undergone severe exertion, should be watered before getting his feed. An animal accustomed to a certain order of watering should not be changed to another order, for such change diminishes the appetite. Horses drink the greatest amount of water when it is given after they have been fed, and the least when it is supplied before they are fed. In some cases watering before feeding somewhat decreased the appetite." And again they cite Tangl to show "that the only important point in this whole matter . . . is to adopt a reasonable, convenient system of watering, and then rigidly adhere to it." The same authors make the statement that "It is dangerous to allow a horse to gorge himself with water when very warm, but a moderate drink taken slowly will refresh without harm resulting."

Another authority, Paige,⁵⁴ gives his view on the system of watering as follows: "Either water one-half hour before feeding or one hour after. If a large quantity of cold water is given just before eating, it predisposes to attacks of indigestion. The effect of the cold water in contact with the mucous membrane is to cause contraction of the blood vessels. This forces the blood away from the stomach and intestines. If, now, food is taken in, it cannot be digested, owing to absence of blood about the secreting glands. When cold water is taken a half hour before feeding the circulation of blood in the stomach and intestines becomes established, so that upon the arrival of the food the glands are in condition to perform their function. When a horse is fed, and watered directly afterward, the passage of the water through the stomach carried undigested food into the intestines, beyond the reach of the stomach and intestinal juices. The irritation of the undigested food into the intestines may cause colic. When heated, small quantities of water may be allowed, but giving large amounts should be avoided."

Sanborn,⁵⁵ in his trials on the effect of time of watering on feeding, summarizes his results as follows:

"I. Horses watered before feeding grain retained their weight better than when watering after feeding grain.

"II. Horses watered before feeding had the better appetite or ate the most.

"III. Horses watered after feeding grain, in ratio to the food eaten, seemed to digest it as well as those watered before feeding. In a prior trial there was a small apparent advantage in favor of feeding after watering, on digestion.

"IV. It seems advisable to water both before and after feeding."

But Sanborn is of the opinion that the trials cannot be final for "They fail to conclusively show that grain, thought it be wasted out of the stomach by watering after feeding, is less digestible than it otherwise would have been." And he says that it may be doubted whether grain is washed out of the stomach of a horse on a full stomach of hay, by watering after feeding."

"Salt," according to Woll,⁵⁰ "improves the appetite of the animals and increases the flow of digestive juices; it promotes and regulates digestion and should, therefore, be furnished in ample amounts." Bull⁵⁶ says: "If a mature animal is deprived of even common salt, it becomes weak, languid, and finally dies." Babcock⁵⁷ found that lack of salt in the ration of animals finally led to "a condition of low vitality in which a sudden and complete breakdown occurred," the animals rapidly recovering when the salt was afterwards supplied. The effects were noticed in the "loss of appetite, a generally haggard appearance, lusterless eyes, a rough coat, and a very rapid decline in both live weight and yield of milk." But too much ingestion of salt should be avoided for according to Sherman,⁵⁸ "Large amounts increase the quantity of protein catabolized, and through over stimulating the digestive tract, may also interfere with the absorption and utilization of the food."

The requirements for salt and manner of supplying this mineral to horses is described by Gay⁴ thus: "Salt is required in small quantities, frequently, and regularly. The irregular allowance of too much salt with its consequent drinking of an excess of water does not meet the requirements in this respect. If given frequently or provided for the horse to help himself, only limited amounts will be taken. A satisfactory method of furnishing salt is to season the grain feed. A lump of rock salt in the feed box does fairly well, although the quality of the salt is not good. One of the best patented devices is a container for a cylindrical cake of high grade salt, so arranged that the cake rotates as the horse licks the bottom of it. This insures the salt being used off evenly, the cylinder lasting until it is but a thin disc. The container screws into the wall of the stall at a convenient height. Loose salt should not be made too easy of access."

Roberts⁵⁹ found that a horse could consume as much as two ounces of salt daily. This result is based on four horses fed on dry feed which ate as much as 28 pounds of salt in 56 days.

7. FEEDING

Whether it be during the breeding season or not, Johnstone⁵ believes that oats and bran mixture containing one-fifth of bran, is a most suitable grain ration. However, he alludes to other materials as also acceptable as long as the right quality and sufficient amounts are given. Corn is pointed out as a good concentrate for a working stud horse but such feed or any other given to a working stallion should not be changed. It is desired that most of the hay be fed at night, thus, if 17 or 18 pounds of hay form the daily allowance of roughage, 5 or 6 pounds are to be fed in the morning, none at noon and the major part at night. If the hay is not all eaten reduce the amount. He gives a rule as a basis to determine the amount to be fed daily: One pound of each of grain and hay is stipulated to every hundred pounds of the horse's weight. Individuality differs with different horses so that one may require a certain amount different from another. However, by noticing the condition of the horse it is not difficult to arrive at the proper amount required by certain individuals. As indicated by him, enough should always be fed, and the horse should be hungry and in good condition by the next feeding. More grain is of course necessary when the stallion

is being worked than when he is idle. Johnstone recommends feeding three times a day.

Johnstone⁵ dislikes giving a mash of boiled barley every Wednesday and Saturday night. Likewise such practices as giving green grass to stallions during the breeding season, and the mixing of cut hay with the grain feed are objected to. But with greedy feeders he points out the desirability of mixing cut hay (in half or three-quarter inch lengths) with the grain feed to prevent the stallion from bolting. However, here again it is forewarned that the mixture be not made into mash, or else the hay will turn soft and cause the stallion to bolt the whole mass.

According to Carlson,⁶ the best grain feed for the stallion is oats. Barley comes next but it should be crushed. It is advocated to add bran to either oats or barley if alfalfa or clover is not given as the roughage portion of the ration. Corn is condemned as a feed. During the breeding season Carlson gives an allowance of not more than three-quarters of a pound to every hundred pounds of the horse's weight per day. Of the roughage, clover and alfalfa are ranked first, while clover mixed with timothy comes second. Timothy and good wild hay are rated the same. Clover or alfalfa, however, should be restricted to not more than one pound for every 100 pounds live weight per day. But no badly cured or musty hay should be fed.

From Carlson's investigations,⁶ it is brought out that in the five states in which a survey was made regarding the feeds given to the stallions and percentage of foals begotten, the highest percentage of foals is shown in the grass-and-alfalfa fed stallions of the western states which are pastured on grass during the summer and fed on alfalfa during the winter season. The percentage is 82. The opposite extreme is found in corn-fed individuals with a percentage of foals as low down as 40. Where oats and bran are used the percentage is 61, and even where the use of oats alone is resorted to the percentage is also higher by 6% over that of corn-fed stallions. In another survey presented, it is revealed that in the corn states the highest percentage foal crop is represented by Nebraska's 49% and the lowest by Missouri's 41%. While North Dakota has 56% and Canada 71% as the minimum and maximum percentages of foal crop of the oat district. In the grazing states, Colorado bears the lowest figure of 67% and Idaho 73%.

According to Warren,⁶⁰ the stallion should be given a liberal supply of oats and bran, in a mixture of 2 parts oats and 1 part of bran. This should be fed twice a day and when in season he should get daily boiled barley with a little flaxseed cooked with it, which should be mixed with bran and fed hot at night. For roughage timothy and grass are indicated, and besides a few ears of corn may be given at times. Warren says in this connection: "Avoid feeding hay in the morning and giving large quantities of water, for by observation you will soon learn that no horse serves well when his belly is distended with hay and water."

Kennedy⁶¹ recommends also oats and bran as the grain portion of the stallion's ration during the breeding season, while for roughage, a mixture of timothy and clover hay is mentioned. Roots or cut grass, if obtainable, should be included in the ration. He gives the amount of grain to be fed at one and one-fourth pounds for every 100 pounds live weight, and a similar amount of hay. During the off-season, Kennedy advocates the handling of the stallion similar to that of a gelding. He should be given his daily job six times a week and three heavy feeds during the work day. Light feed is given during his rest on Sundays. The feed should be less than what is given during the breeding season so that three-quarters of a pound of oats for every 100 pounds live weight would be reasonable unless the stallion is performing heavy work.

Curryer⁴² gives oats, corn, bran, and a little oat meal, whether separate or in a mixture, as good grain ration constituents for the stallion. For

roughage, from 12 to 16 pounds of hay may be given to the largest stallion every 24 hours. This amount should be reduced for smaller individuals. According to him, an excessive amount of hay is conducive to dullness, and besides renders the stallion short-winded and uncomfortable during service. It is important that the stallion be allowed access to salt and ashes, or salt alone. Curryer desires that watering be before feeding, or at other times but not within two hours after feeding grain.

Sanborn's⁶² system of providing grain feed for the stallion consists of giving oats twice a day and wheat bran once, while he advises such occasional and gradual change from oats to corn, which, he says, maintains the appetite.

During the off-season in winter, Stericker⁶² advises feeding the stallion a fair allowance of grain together with some bran. The roughage portion consists of cut hay or oat sheaves. But the horse is not allowed to become too fleshy by giving him daily exercises. A few weeks before the breeding season starts the grain allowance, principally oats, is increased, so that when the stallion is active in his stud work he is at the same time fleshing up. During the season he is given all he will eat, not crowding him, however, and besides the concentrate allowance some green feed is provided for once or twice daily. In case that no succulence is available, hay is given morning and night. One of the daily meals is usually dampened with water.

The method followed by W. M. Fields and Bros.⁶² in feeding the stallion during the off-season includes the use of clean, bright hay as roughage, and for concentrates, oats with bran or shorts are recommended. Once or twice a week some vegetables are given, and whenever costiveness is noticed, as indicated by the hard feces, half a pint of steeped flaxseed is mixed with the oat feed. During the breeding period the feed allowance is greater and in addition half a pint to a pint of hempseed and raw eggs are mixed with the ration and given three times a week. The use of fresh grass is considered beneficial.

During the summer time Dimon⁴⁰ recommends good, clean oats, clean hay and a good quantity of green grass, without resorting to drugs, eggs or condiments. Pasturing him in the morning while the dew is still on is considered beneficial to the stallion, especially to his feet. In the winter very little grain is to be fed and this consists of bran, oats and other light food. Whether with or without grain, carrot is pointed out as a good adjunct for winter feeding. A good ration may be in the form of oat straw together with carrots and a few oats. Corn stalks, grass, potatoes, carrots, turnips, and apples are listed as appropriate feeds if fed in small quantities in order to maintain appetite and keep the bowels loose. Mineral salt should always be accessible and dry wood ashes is almost always necessary.

When out of season, Sanders⁴⁶ mentions oats as better food for the stallion than corn. But corn is recommended for part of the time should the stallion come down in flesh, or in case the work is heavy. When he is to be idled such as during stormy days he should not be given any grain at all. It is indicated that giving him access to grass during late fall is most desirable. But good hay must be relied upon in most cases. Corn-fodder, if available, is preferred. In order to prevent or remedy costiveness, the occasional use of bran mash is advocated. To sum up, Sanders points out that the adoption of coarse and bulky food for stallions must be increased in proportion to the extent of confinement, for he says, "there is nothing that will so soon destroy the health and vigor of the horse, and especially of his genital organs, as close confinement and high fever."

In view of the fact that some stallions are "hard" keepers and some "easy," on account also of the exercise they get, McCampbell⁶³ states that it is impossible to formulate any specific directions regarding the total

amount of feed required by them. Nevertheless, it is pointed out that keeping the stallion in good flesh is satisfactory, avoiding the "hog fat" condition. Most horsemen, he says, are in favor of letting the horse be gaining a bit during the breeding season and not come down in flesh. No more should be fed than what will be cleaned promptly, whether he is fed three or four times a day. He gives several combinations of feed which prove satisfactory in practice, thus:

1. Oats; timothy or prairie hay.
2. Oats, 4; corn, 6; and, bran 3 parts by weight; timothy or prairie hay.
3. Oats, 4; corn, 6; linseed meal, 1 part; timothy or prairie hay.
4. Corn, 7; bran, 3; linseed meal, 1 part; timothy or prairie hay.
5. Corn; alfalfa hay one-third and prairie hay two-thirds.

8. HOUSING AND CARE

According to Henry and Morrison,⁵³ the stallion's stall should be near those occupied by other horses because a horse enjoys companionship. Kennedy⁶⁰ is likewise of the opinion that the stallion's stall should not be isolated lest the stallion may become vicious and develop the habits of masturbating and cribbing. He recommends the construction of a special stallion barn, if there are a number of them kept on the farm, while if only one is to be housed the stall should be located in the regular horse barn. He further says that the stallion should be kept in a roomy box stall, not less than fourteen by fourteen feet, of solid construction and with smooth walls. Adjoining the box stall should be a large paddock where the stallion may exercise. It should be roomy and fenced high and strong enough. It is brought out that some favor the use of a small feed-box for grain with a slatted hay-rack high up, all in one corner, while in some barns, the use of a smooth manger across the corner of the stall is preferred. The latter eliminates the presence of sharp edges. No opening in front of the manger should be provided for because the stallion is liable to hurt himself in getting his head out through it. The walls should slope about a foot from the bottom as this will prevent the stallion from rubbing his tail.

Gay⁴ recommends also the use of a boxstall opening into a paddock, and with the doors fastened at the back for keeping the stallion. The fences surrounding the paddock or pasture should be at least four and one-half feet high and strong. The material and construction should be such that horses will not be cut or injured. He considers rails and posts as perhaps the most satisfactory to be had. Four rails are indicated as necessary on the fence. If barbed wire is to be employed only one strand is required, which should occupy the top of the fence and should be kept tight.

According to Dimon,⁴⁰ the stallion boxstall may be 14 by 14, or 15 by 15, or 16 by 16 feet, but it should not be less than 12 by 14 feet. There must be one door four feet wide and eight feet high, and to be thoroughly riveted and made double so as to be strong. This should hang on three hinges. Also one window big enough to admit sufficient light should be provided for, but the location and construction must be such that drafts are absent. From the floor to a height of four or five feet the entire inside of the stall, save the door, should be wainscoted with one and one-half or two-inch plank. The feed-box needs to be broad so as to prevent bolting the feed. The paddock should be 50 by 100 or 40 by 60 feet and not too large. The fence should at least be seven feet high. The boards should be nailed on the inside of the stringers and posts and no space should be left underneath where the stallion may slip his feet through.

Sanders⁴⁶ desires a box stall not less than 12 by 18 feet with a box snugly placed in the corner for the grain, but a hay rack or manger is

considered out of place. All the sides, including the doors, should be lined with stout boards placed about a foot from the wall at the bottom and sloping upward towards the wall at a height of three and a half feet. This arrangement, as in Dimon's and Kennedy's, prevents the rubbing of the horse's tail.

9. EXERCISE

Johnstone⁵ considers normal and vigorous health as being possible only when the stallion is worked and well-fed. He prescribes a full day's work for every stallion as a five-year-old up until he is twelve years of age or even older. In starting the stallion to work Johnstone writes: "Break him like any other horse, preferably as a two-year-old, and make him do light, but not real work at that age. At three make him do what other colts of his age are required to do. If an unbroken stallion of workable age is purchased, let the breaking be the first thing undertaken with him. It will not generally prove a hard job, for a stallion is seldom afraid. Gradually toughen him into doing his full day's work as one of a team. It is preferable to hitch an entire horse with a mare, but if it comes handier to work him with a gelding there is no reason why he should not be matched in that way . . . If the horse is inclined to nip at and bother his mate, tie a staff of the proper length according to the job on hand from the inner ring of his bit to the shank ring of a halter on the head of the other horse in the pair, or to the upper ring on the harness. Use good stout harness and never forget that there is a stallion in the team. Do not let him yell and squeal and generally make a nuisance of himself." Johnstone cites such vices as masturbation, cribbing, and lip-slapping as the result of close confinement, and furthermore he says, the legs may often go wrong and so the temper due to the same environment. He adds that exercising a stallion on a walk of eight miles or so a day is a detestable job for the groom, and while driving him is more agreeable, yet working him is undoubtedly to be preferred because in both ways he is to be in harness anyway. It is recommended that the stallion be made to trot also occasionally.

Carlson⁶ is likewise of the opinion that real draft harness work is the only exercise for the stallion. He says, "the plow, harrow, disc, mower, binder, or farm wagon upon the farm, or the dray or heavy transfer wagon in town or city is an exercise that will fit a draft stallion for producing foals of the highest quality, and possessing a vitality which could not be given them by a stallion not worked." Even during the breeding season putting the stallion in harness is beneficial. Carlson's practice of working him in the first half of the day and allowing him to do the service at four o'clock in the afternoon of the same day has given the best success. But only one service a day should be indulged in if he is to be toned up with good harness work. It is further pointed out that the slow and indifferent horse or the partially sterile individual may be turned to virile and healthy sire if hard work is resorted to.

According to Kennedy,⁶¹ during the breeding season the stallion should be given at least a five-mile walk every day. He may be hitched to a cart or led with a saddle horse. In case of peddled stallions, however, they will get sufficient exercise in a circuit of ten miles or so. Slow individuals may be given more exercise. When out of season, however, he advocates the adoption of like management as applied to geldings. This consists of giving the stallions three fairly heavy feeds a day and working them hard every week day. Sunday should be a rest day and light feed should be provided for. Kennedy agrees with Johnstone in breaking the young stallion to work but less work is to be given him until he is mature.

"Halve the ration and double the exercise when the stallion is not

giving a vigorous, sure service," is cited by Gay,⁴ who also advises that in case the stallion is gaining over his normal weight the exercise should first be increased and afterwards the ration must be reduced if still further gains are being made. On the other hand, if he is decreasing the weight below normal and is receiving sufficient exercise the proper course to follow is to increase the ration first and if this does not suffice reduce the exercise.

Burkett⁶⁴ desires a large box stall where the stallion may be free to move, but besides the stallion should be taken out half an hour each day for additional exercise. According to Henry and Morrison,⁵² ordinarily a draft stallion should have a daily walk of five miles, but exercise could be obtained in the form of work. It should be remembered though that judgment be used in bringing soft stallions to hard work. Similarly, Shamel⁶⁵ expresses his opinion that real draft work is the most ideal exercise for the draft stallion, and even during the breeding season he should be worked. The least that could be done is to walk him three to five miles every day. But during stormy, or very cold days, Starr⁶⁶ believes that exercise should rather be dispensed with, although in large box stalls with ground floor the stallion will get sufficient of it. On the contrary, Axe³⁸ states that stallions are better in the open than in the average stable no matter if it be in the cold days of winter. He directs that as February comes the stallion should commence taking exercise with six miles a day and later to be increased to ten miles.

10. GROOMING

Paton and Orr⁶⁷ state that the importance of grooming is due to the fact that "it removes salts of the sweat, shed epithelium, and loose hairs and dirt. It prevents the development of mange and of lice, and it acts as a form of massage to the skin and subjacent muscles." Fitzwygram⁵¹ advocates that every horse should be groomed at least twice a day. After exercise he should not be allowed to cool down undried but grooming should immediately be resorted to. Besides grooming the body of the horse, Kennedy⁶¹ brings out the necessity of cleaning the sexual organs of the stallion. One method by which this may be accomplished is to get warm water and castile or ivory soap and the sheath and attachments may be cleansed by these. The other consists in packing the sheath with wet bran. The bran will carry a large part of the dirt and filth out. According to Dimon,⁴⁰ with an old and dull curry-comb, a root or broom brush, a bristle brush and a flannel cloth, these should be all the tools that are necessary to clean and polish the horse's coat. These are to be used every day and in the order mentioned. But Dadd⁶⁸ indicates that certain parts of the body should be spared from the curry-comb. These include the inside of the thighs, flanks, chest, and face because the skin in these parts are thinner and more sensitive.

According to Shaw,⁶⁹ "A superficial rub with the body brush is of no real use; the entire body requires to be thoroughly gone over with the body brush if the coat is short, or with the dandy brush if it is long. The curry-comb should not be applied to any part of the horse, its use being to remove the scurf and dandruff from the body brush, the bristles of which soon become clogged unless they are brought into contact with some rough, hard substance such as the ridges of the curry-comb, but the latter are liable to injure the skin of a horse. After the brush is over a linen cloth should be used for imparting the final polish, plenty of time being devoted to the work. The face and ears should be lightly gone over with a damp sponge and then thoroughly dried on a soft towel, as also the parts on which no hair grows. If necessary, the mane and tail should be combed, but too much of this sort of thing is apt to

bring out the hair, and therefore as a rule the dandy brush is sufficient to do all that is required."

Carter⁷⁰ suggests a method of grooming which is considered more effective, thus: "To produce the greatest effect with the least expenditure of power and in the shortest time, the groom should aid his muscular strength with his weight. He should stand well away from the horse and lean his weight on the brush, which will thus do its work more effectually than if operated by muscular strength alone. The working of the brush should follow the natural direction of the hair. The curry-comb should be used as little as possible, and principally to loosen accumulations of mud."

11. EXTRA CARE

Roberts⁵⁹ maintains that in order to obviate the effect of the weight of the draft horse on his feet, it is necessary that he be shod—the shoe binds and supports the quarters and protects the frog of the foot. Accordingly, shoes wide of web and thick of substance are called for, the wide web protecting the frog, and the thickness of the shoe acting to prevent the spreading of the foot when sustaining heavy weight of the drafter. It is preferred that the web be slightly drawn at the heel and that the shoe be extended well back, for by this arrangement the frog will be more safely guarded. The use of a bar shoe is needed only when the foot is rather wide and weak at the heel, which is to be found but rarely. Certain injunctions are to be set forth to the blacksmith: the use of the buttress on the frog should seldom or never be resorted to; the shoe should be fitted to the foot and not vice versa; the lightest nails capable of holding the shoe in place for a reasonable length of time should be used; and finally, do not rasp, polish or beautify the outside of the hoof. It is only in smoothing the clinches of the nails that light rasping or filing is to be allowed. Roberts hints that some horses need not be shod but semi-monthly and others every twenty or thirty days.

Fitzwygram⁵¹ states that washing the skin of the horse does not give the desired cleansing effect because the water penetrates with difficulty through the hair forming a sort of thatch on the body. Besides, water irritates the skin, inhibits the action of the oil glands thereby making the hair coat look dry and harsh. It is therefore not advisable to wash the horse unless it be for the purpose of removing mud on the body. But the washing of the legs to remove the mud and dirt off finds favor. This is done by washing the legs and then bandaging them with flannel bands. The groom proceeds to clean the body and later when he is through the legs will then be found dry. The brush is afterwards applied to the legs to cleanse the skin which was not affected by the water. He further recommends the sponging of the nostrils twice a day. The wings of the nostrils are slowly distended and the wet sponge is carefully introduced into the opening. Every morning and evening the dock should be cleaned. And too, the sheath should receive occasional cleaning to remove the sebaceous matter contained in it. According to Roberts,⁵⁹ the legs should be washed and rubbed until they are dry during warm weather.

Where parts of the body have been soiled with mud and the latter has been allowed to dry, Barton⁷¹ advocates shampooing as a means of cleansing. The parts are shampooed using the dandy brush or a wisp of straw and the curry-comb until the mud has been completely removed. He says: "Plenty of elbow-grease and a wisp of straw will work wonders in cleansing and drying a horse's coat." After the shampoo the coat is thoroughly dried and then the soft brush, the chamois and the rubbers are employed. The chamois is used to give lustre to the coat. To remove the mud from the belly as may happen during rainy days, thawing

periods, etc., Barton suggests using the sponge to remove the mud. The mud or dirt on the legs, however, may be allowed to dry to be brushed off the next morning. Horses that have been worked, according to the same author, may on arrival to the barn be lightly sponged on such parts which are sweating. These include the parts beneath the saddle, collar, inside the thighs, forearms, etc. This is deemed a good practice, more so if the parts sponged are to be thoroughly dried up afterwards.

12. COMMON AND INFECTIOUS DISEASES, AND OTHER AILMENTS*

(Only such extracts of the following treatises on the common diseases and other troubles of the stallion, as well as those of the foal, weanlings, and mare, treated elsewhere, are presented as would interest the animal husbandry student, while those that properly belong to the veterinarian's field have been excluded.)

Influenza of Horses—Influenza equorum

"Influenza is an acute febrile, contagious, infectious disease of horses, which occurs frequently in stables in enzootic form. It is characterized either by acute catarrh of the mucous membranes or by severe inflammation of the lung and pleura. Accordingly two forms of the disease may be distinguished, namely: the catarrhal influenza and the pectoral influenza.

"*Occurrence.* The disease occurs everywhere either periodically or in a pronounced enzootic form, and in the latter case it spreads rapidly among the horses of large territories. With the great varying character of the disease, it sometimes causes only slight losses while at other times a considerable percentage of the affected animals succumb to the disease, principally as a result of the pleuro-pneumonia which develops in its course. Owing to the latter condition the disease is of great economic importance, but the owner also sustains considerable loss in a milder outbreak as a result of incapacity of the horses for work.

"*Prevention.* Healthy horses should be separated from affected animals, as well as from attendants and utensils that come in contact with diseased animals or with their secretions. It is advisable to place a newly acquired horse for two weeks for observation, and it should be placed among the other horses only after that period. This applies particularly to regions in which the disease is prevalent.

"If the disease has already appeared the affected animals should first of all be separated, and their stalls, as well as the neighboring stalls, should be thoroughly disinfected. As in the first place the immediate neighboring animals are under suspicion of becoming affected, they, as well as all animals showing an elevated temperature or catarrhal symptoms, should be segregated in different isolated places. At the same time the healthy animals which have no fever should be kept out of doors, as far as place and weather conditions permit, or in places which are free from infection. They should be divided in groups, and only animals which are entirely free from fever should be used for work. The infected stable should be thoroughly disinfected, and scrupulous cleanliness, as well as free ventilation of the stable, should be carried out.

"As the development of the disease is favored by influences which have a weakening effect on the animals, the protection of the horses from such influences, and especially from taking colds, should be given due consideration.

"Animals which have passed through the disease may, in the majority

* Dr. H. D. Bergman of the Veterinary Division of the Iowa State College is authority for suggesting all the common and communicable diseases, and other troubles treated in this paper.

of cases, and usually in the catarrhal form of influenza, be considered as recovered and free from the infection two weeks after the cessation of the fever, and the disappearance of all the symptoms. Convalescent patients from the pectoral form of influenza if the changes in the lungs have not entirely disappeared, and especially if in the meanwhile relapses have occurred, are for a much longer time capable of infecting other animals." Hutyra and Marek.⁷²

Dourine

"Dourine is the name of a usually chronic, contagious, infectious disease of breeding horses, which commences shortly after an infective coitus and is at first characterized by a local inflammatory affection of the external genital organs with which subsequently symptoms of paralysis become associated as a result of an infection of the peripheral nerves and the intervertebral ganglia. It is caused by the *Trypanosoma equiperdum*.

"*Occurrence.* Dourine was fairly prevalent in Europe previous to the middle of the last century, and caused heavy losses by its frequent enzootic extension, especially in the horse breeding establishments. The veterinary police measures subsequently adopted resulted in a rapid diminution of the disease, so that at present it prevails only in some southern and eastern states, whereas in other parts of the world it occurs more frequently.

"In America the disease was recently encountered repeatedly in the states of Illinois and Nebraska, and also in Chili; the principal focus of infection, however, exists on the Indian reservation of South Dakota, . . . The energetic measures appear to have been crowned with good results, as since 1906 no other cases have been noted.

"*Prevention.* Stallions and mares should be examined before coitus as to their health, and horses with inflammatory changes on the genital organs should be excluded from coitus on general principles. Besides this it is advisable to wash the penis of the stallion after every covering with a sponge dipped in clean water.

"The veterinary police measures depend on the principle that horses affected with dourine should be excluded from breeding once and for all. Such measures appear to be justified in spite of the possibility of a complete recovery, by the frequent relapses and also by the fact that trypanosomes may be present for months in the genital organs of apparently recovered animals. Accordingly affected stallions should be castrated, while affected mares should receive a distinctive branding. The relatively late development of the symptoms characteristic of the disease, as well as the possibility of a healthy stallion transmitting the disease from an affected mare to a healthy animal, appear to justify an action requiring that healthy stallions which have covered mares affected with dourine should be considered the same as those affected." Hutyra and Marek.⁷²

Coital Exanthema

"Coital exanthema is a disease . . . characterized by vesicular exanthema of the external genital organs. It is usually transmitted from animal to animal during the act of coitus, and usually terminates in complete recovery. The cause of the disease is at present unknown.

". . . The disease occurs more frequently among cattle than in horses . . . Considerable losses are sustained in extensive outbreaks of the disease, because . . . of the inability of draught animals to work, and from the prevention of impregnation . . ." Hutyra and Marek.⁷²

Malignant Hyphomycosis of Horses.—Leeches
(*Hyphomykosis restruens equi*)

“In India as well as on the Sunda Islands a disease occurs among horses which is known by the name ‘bursatte’ . . . According to Lyford and Bitting this same disease occurs quite frequently in North America among horses and mules where it is known as “leeches” while in Europe only a single case has been observed by Drouin and Renon in Afort.” Hutyra and Marek.⁷²

Orchitis

“Inflammation of the testicles . . . arises from a great variety of causes. In all animals, external wounds are liable to cause inflammations of the gland especially when occurring during the active breeding season. Scrotal wounds, especially those penetrating the peritoneal sac of the testicle are very liable to terminate in an inflammation of the glandular tissue.

“Contusions of the testicles without wounds of the skin are more or less common . . . and may at all times lead to orchitis . . . Contusions of the testicles . . . and of a very dangerous character, also occur occasionally from kicks by the mare at time of service.

“Orchitis . . . occur, in some cases, independent of any history of traumatism, as an apparently idiopathic malady . . . It is not improbable that such untraced cases are due to infection of some character passing through the vas deferens into the testicle . . . This may be favored by excessive coition or by any debilitating influences.

“In other cases, the disease is indirectly traceable to an infectious malady . . . we meet, not infrequently, with strangles abscesses in the testicle or about it. In these, the ordinary symptoms of strangles are usually present in other portions of the body, . . . In the contagious cellulitis, or pink eye . . . orchitis is the rule. Orchitis . . . has been recorded also as a result of glanders.

“From whatever cause orchitis may arise, it should always be treated as a very serious disease, in so far as the reproductive powers of the animal are concerned, and should be handled with the greatest possible promptness and care. As with all diseases of the sexual organs, it is especially true of those of the testicles that the fundamental principle in their handling should be the removal, as far as possible, of all sexual excitement. The animal may be exercised, and, possibly, benefited thereby, but it should be done in a manner to avoid any sexual stimulation. In most stallions the application of the stud bridle is in itself a sexual suggestion because the animal constantly associates it with service.

“So far as possible, a breeding male affected with disease of the genital organs should be removed from sight or sound of any female of his kind, especially from those which are in estrum. Every arousal of sexual appetite intensifies any existing irritation or disease in the sexual organs and successful handling of these accidents and diseases demands, first of all, sexual quietude.

“Wounds to the scrotum of male breeding animals should have very careful surgical attention. Strict antiseptic precautions should be taken from the very outset and continued until all danger to the glands has been safely passed.

“Contusions of the testicles should be avoided by the removal of the causes.

Laminitis (Founder)

“By this name we designate a peculiar inflammation of the pododerm at the toe. It arises suddenly in well-nourished and apparently healthy

horses, following excessive work or long-continued rest in the stable, and frequently leads to a decided change of form of the hoof.

"The disease is always accompanied with intense pain. It most often affects both front feet, more rarely all four feet, or only one foot. In the first case the two front feet are planted far in advance of the body, and the hind feet well forward under the belly. When all four are affected, traveling is exceedingly difficult, often impossible; in this case there is nearly always a high fever over the entire body.

"The seat of the disease is in the fleshy leaves about the toe, more rarely upon the sides, walls and quarters. Depending upon the intensity of the inflammation, the fleshy leaves are more or less loosened from the horny leaves, as a result of which there is a change of position of the os pedis, with a simultaneous sinking of the coronet at the toe. This produces a change of form of the hoof. The quarters become higher. Rings form upon the wall, and their course is quite characteristic of the disease. At the toe these rings are quite close to one another, but as they pass back towards the quarters they gradually separate from one another and recede from the coronary band . . .

"A horse in such a condition can be used, but the gait will be short and stiff. The hoofs are shuffled forward and set heels first to the ground, a manner of traveling that rapidly wears away the branches of the shoe.

"In dressing a foundered hoof the outer circumference of the sole is the guide. The thick projecting wall at the toe may be removed with the rasp without injuring the foot. The sole should be spared, but the quarters should be lowered to improve the setting of the foot to the ground.

"The choice of the shoe will depend upon the shape and nature of the sole. If this is still concave, an ordinary shoe may be used. If, however, the sole is flat or dropped, it must be protected by an open shoe with a broad web, or with a bar-shoe . . . which is of especial value when the bearing edge of the wall is weak or broken away.

"As long as there is pain or pressure about the toe there should be no toe-clip, but two side-clips. The wall between these clips should be lowered a tenth to an eighth of an inch to prevent pressure of the shoe upon the sensitive tissues of the toe . . . The nails should be as small as possible and placed well back towards the quarters. No nail should be driven in the wall at the toe when there is separation of sole and wall at the toe (hollow wall, seedy-toe).

"The shoes of horses affected with founder often work forward as a result of the animals traveling upon their heels. To prevent this evil, clips may be raised at the ends of the branches of an open shoe, or one clip in the middle of the bar, in case a bar-shoe is used . . ." Lungwitz and Adams.⁷³

False Copulation

"False copulation or entrance of the penis into the anus instead of the vulva, is possible in almost any of our domestic animals . . . It is by no means rare and is highly dangerous. Its causes are various but it is probably largely due to some resistance on the part of the mare as a result of not being properly in estrum or otherwise becoming excited and attempting to kick or move about.

"Coition is safe only when estrum is present in the proper degree. The mare has ample power to close the vulva against the ready entrance of the penis and thus cause it to glide upward and forwards against and into the anus, which opening may be more readily forced.

"The accident is also invited in aged . . . mares with pendulous abdomen in which the anus is retracted and, drawing the superior commissure of the vulva with it, causes the vulvar opening to approach the

horizontal instead of the perpendicular and the penis to glide forward and slightly upward over the oblique vulvar opening to strike against the inferior surface of the tail and be deflected into the anus. It may be purely accidental. Harms thinks it may result from smallness of the female. All cases we have observed have been in mares of medium or large size, whether viewed actually or comparatively as related to the size of the stallion.

"In the mare the accident is preventable by ordinary precautions on the part of the stallion groom, whose duty it is to see that the penis is guided into the vulva or, at least, not permitted to enter the rectum. To this end, it is best not to attempt service in case of a mare not certainly in proper estrum. It is a part of the business of the groom to see and to know that the penis of the stallion is properly entering the vulva of the mare. If the mare is kicking or otherwise violently resisting the stallion, he should be promptly withdrawn, since copulation under such circumstances is unwarrantedly dangerous for both animals. Such violent resistance of the mare is sometimes offered by the groom as an excuse for his failure to see and know that the penis of the stallion was being properly entered in the vulva, but it is not valid. The mare . . . with retracted anus should be placed with her hind feet on a lower level than her anterior members, leaving the ground upon which the male is to stand at a higher level and thus bringing the vulvar opening more nearly perpendicular.

"The prognosis of penial injuries to the rectum must be based largely upon the position and extent of the injury. When the lacerations perforate the peritoneum and cause escape of feces into the peritoneal cavity the injury is essentially fatal . . . When the injury of the rectal wall occurs behind the peritoneum or otherwise does not perforate it, the prognosis is good if timely surgical aid is given, though after a long period of time, serious or fatal results may follow the impaction of feces in the sac formed in the pelvic connective tissue. The pressure of the feces escaping from the rectum tends constantly to push the loose connective tissue aside and, eventually, to form a large sac, which is constantly filled with fecal masses.

"The handling in such cases consists of gently removing feces from the sacculated wound cavity in the pelvic connective tissue and cautiously flushing it out at least twice daily with a mild antiseptic solution. At the same time the rectum should be manually emptied as far as the attendant can reach and the feces thus prevented from dropping into the sac. The patient should be kept at rest on a very scant, laxative diet during the treatment, which should be continued until the rupture is quite healed as it is highly important to guard against extensive sacculatation in the part, which can only be done by avoiding the accumulation of feces in it.

"In some instances the injuries to the rectum from the entrance into it of the penis are comparatively trivial and consist merely of wounds of the mucosa and somewhat of the muscular walls, with the passage of bloody feces, some swelling about the anus and other slight symptoms of injury, which readily pass away under repeated antiseptic anemata." Williams.⁴⁸

Kicks on Penis

"Injuries to the penis of the male during copulation are by no means rare. The penis of the stallion is most liable to injury from kicks by the mare . . . These contusions of the penis during its great vascularity in the breeding season are very difficult and refractory to handle. The stallion needs be kept quiet, free from sexual excitement, the penis retained at rest within the sheath by means of a suspensorium and the re-

sulting local inflammation ameliorated by the application of cooling astringents such as lead acetate, hamamelis, tannin, belladonna, etc., combined in cases of necessity with antiseptics. Generally the patient may have quiet walking exercise, a restricted laxative diet, saline laxatives or in case of serious disturbance, prompt cathartics of the hypodermic alkaloid group." Williams.⁴⁸

VI

MANAGEMENT OF THE BROOD MARE

1. SELECTION

According to Johnstone,⁵ the mare must possess distinct femininity although loftiness of character is likewise to be insisted on. The mare is a bit more rangy but this must not be sought for at the expense of a strong back and deep flank. She must be roomy all the way through and of good bone. If the stud horse is a 2000-pounder get mares weighing 1500 to 1600 pounds or upwards, and mares weighing 1000 pounds or less should be mated with 1650-pound stallions.

Roberts⁴⁸ describes the brood mare stating that she "should be of good size, considered from the standpoint of . . . breed to which she belongs and the size of the progeny desired. Her body conformation should be rather open, or the reverse of a pony-build. She may be, and often is, a shade too long in body and slightly too coarse. But these defects, if they are defects, may be corrected in the offspring through the sire. The eyes should be prominent, bright and well-set; the head, fine for the breed; neck inclined to be, if anything, too thin, provided it be well set on the shoulders. Short, thick-necked brood mares are too often disappointing. The shoulders should be rather thin, moderately oblique, and withers high rather than low. The back (top line) may be a trifle long if the bottom line is correspondingly long, though a short top line coupled with a long bottom line is best. The hindquarters should be broad and deep, neither steep nor flat, with hips thrown well forward. The hips and short ribs should not approach each other too closely. A brood mare that is a little open-ribbed is preferable to one that is too close-ribbed. Such a structure usually accompanies a symmetrically set tail, a broad pelvis, and well-developed mammary glands. Symmetrical, clean, well-knit legs, a little short rather than a little too long, according to breed, placed rather well under the body, instead of on the 'corners' of the horse, should, if provided with good feet and nerve power, carry the dam safely through ten to fifteen years of strenuous life, while imparting to her offspring her own characteristics."

Carlson⁶ interprets femininity by "mildness and softness" or by "refinement of character." This is shown by refined head, ear, jaw, and neck. That femininity is a very important consideration in the selection of brood mares is attested by Carlson's observations among barren mares that show masculine character. A bigger room is likewise sought for in the brood mare as evidenced by longer loins and wider and deeper ribbing.

The ideal brood mare as a different individual from the stallion is described by Gay⁴ in the following manner: "Her manifestation of sex character is found in a comparatively light forehead, a sweet, refined head and neck, and a matronly appearance throughout. In order to sustain the growth of the foetus well, she should be deep-ribbed and roomy, and somewhat more openly made, with more length, than is desirable in the stallion. She should possess every indication of capacity and vigor."

Hayes⁷⁴ says: "As a rule, the mare, as compared to the horse, has a lighter neck, a broader pelvis, is higher behind and slacker in the loins than he is. The fact of the spines of her withers being lower than those of the horse is no doubt the cause of her being relatively higher over the croup than he is."

To provide for increased roominess in the body of the mare Stonhenge⁷⁵

desires that the tail be set rather low on wide hips. Thus, a level or straight hip with high tail-setting are disfavored. He says: "The pelvis should be wide and deep, that is to say, it should be large and roomy, and there should also be a little more than the average length from the hip to the shoulder, so as to give plenty of bed to the foal, as well as a good depth of back ribs, which are necessary in order to support this increased length."

According to Roudebush,⁷⁶ a good brood mare ought to be intelligent, docile, non-irritable, a good suckler, that she does not worry about her foal, and her heart girth should be large.

It is interesting to note that broken-winded mares, according to Hunt,⁷⁵ seldom would breed.

Other points being normal, the brood mare, according to Plumb,⁹ should be selected on the basis of sex character, conformation, constitutional vigor and temperament. Of these he writes: "The sex character of the mare is seen in a smaller and more refined head than has the stallion, and a more slender, less muscular neck. The beautiful, symmetrical proportions of head; the mild, quiet, inquiring eyes; and the delicate attentive ears, give strong evidence of feminine and maternal qualities; if the stallion is bold and independent, the mare is both shy and friendly. The udder of the mare is small, consisting of a double gland and two teats. This is not conspicuous, excepting while nursing the foal. It is desirable that the judge note the size of the udder and teats. If nursing, the udders should be well extended between the thighs, and carry two good sized teats.

"The conformation of the mare is narrower all through than in the stallion. The shoulders are comparatively light, the withers narrow, the breast and chest less thick than with the male, and the body long and deep. At maturity, the belly of the mare often shows considerable roundness and downward curve features associated with reproduction. While her back should be well sustained, she should show a long line and great capacity between the front and hind flanks. The limbs of the mare often display delicacy of outline and refinement of bone.

"The constitutional vigor of the mare as with the stallion, is shown in the active, alert character of head and eye, in the depth and prominence of breast, the width and strength of back, and the length, depth and capacity of body. There are really no essential differences, excepting in degree, in the various features which guide one in determining constitutional vigor, in either mare or stallion.

"The temperament of the mare is less active as a rule than in the case of the stallion. She is not self-assertive, but not necessarily lacking in interest in things about her. Her disposition may be quite variable, though she is not likely to be as aggressive as the stallion. The temperament in most cases is more notable from the standpoint of type than sex."

2. BREEDING AND PRODUCTIVE AGE

Smith⁴⁹ gives the period of puberty of the horse at one and one-half years of age and Bergman⁴¹ puts it from one to 2 years. Bergman⁴¹ also says that individuals are known to have foaled at 22 and 30 months of age. Murray⁷⁷ places the breeding age at two years, saying that no harm would result provided that the mare is not worked while nursing the foal. Wallace⁴³ also vouches for the plan of breeding the 2-year-olds, and maintains that the best Shire foals are produced from mares bred at such an early age, which, however, are liberally fed and are early-maturing.

According to Sanders,⁴⁶ if the 2-year-olds are to be bred at all, they should not be bred the next year but again afterwards so as to foal at 5 years of age. Otherwise, he advocates to breed mares for the first time as 3-year-olds and continuously on without intermission so long as she is fertile. Kennedy⁶¹ and Dimon⁴⁰ likewise give similar opinion,

and in addition Kennedy remarks that although it has not been fully proven the breeding of young mares is supposed to render the mare a more reliable breeder.

Hunt⁷⁵ believes in breeding the mare for the first time when coming 4-year-old, while Allen⁴⁴ and Dadd⁶⁸ fix the breeding age at further extremes. Allen⁴⁴ places the breeding age at 5 or 6 years. To secure the best breeding age, according to Dadd,⁶⁸ is to allow strength and beauty to become developed first, which comes at the age of 5 years. It is claimed that when bred at this age the offspring obtained is likely to be healthy and strong in constitution.

Walley⁴⁵ is of the opinion that the breeding age is not a matter of any specific period. Rather the mare may be bred as soon as she is well-developed and has acquired sufficient vigor.

Carlson⁶ compiled figures relative to the prime breeding age of the brood mare. Observations were carried for 29 years and the deductions arrived at are as follows: 1. That the largest foal crop was obtained from mares ranging from 7 to 11 years of age, with the 9-year-olds topping the list. 2. That the 3 and 4-year-olds made low percentages, which was to be accounted for troubles in dentition. The 5-year-olds also showed a lower percentage than the more mature individuals. 3. That mares over 14 years of age are low producers and their breeding, as a general proposition, does not pay. However, when these old mares have foals at foot, or if any way breeding has not been interrupted during their life, the breeding power is not altered. 4. That the 2-year-olds gave poor showing, but Carlson explains this on the poor feeding and poor development of the fillies under observation.

Sanders⁴⁶ gives the most fertile period of the mare at from 5 to 15 years of age. Crisp³⁸ states that mares have been known to produce foal at 28, 32, and 38 years of age. Mention is also made of a Suffolk cart-mare which foaled at the age of 39.

According to Law,⁴⁶ difficult impregnation is often encountered with young and idle mares, which he ascribes at times to undue sexual excitement so that there occurs a spasmodic and rigid closure of the neck of the womb during the act of coition, or excessive expulsive contractions of the womb and the vagina causing the evacuation of the semen before impregnation takes place. Harper⁷⁸ states that from his experience it seems that about one filly in four will conceive as 2-year-olds.

According to Miles³⁵ the employment of very young animals or those whose constitution is affected by abuse or overwork leads to the inheritance of the system which predisposes to diseases that might develop from slight causes. And it is further pointed out that such practice of early mating may transmit the diminished fecundity of the young parents and eventually gives rise to barrenness. The same principle applies in the transmission of defective development of the young mother. Miles cited that "precocious marriages are not only less fertile, but the children also which are the result of them have an increased rate of mortality."

On the other hand, delaying the breeding of females long after maturity, according to Law,⁴⁶ will result to difficult impregnation for the first time. Such a condition is frequently found in mares that have been worked for a long time. It is interesting to note also, that in mares not bred after a single conception marked diminution of the womb and passages result. Smith⁴⁹ says that mares bred late in life are often found barren.

3. BREEDING SEASON—PERIOD OF HEAT—SIGNS OF HEAT—TIME TO BREED

Smith⁴⁹ gives the breeding season of the mare from February to June or July. According to Mumford⁷⁹ the generative functions of the mare are more active in the spring season. Bergman,⁴¹ too, states that the breeding season lasts from spring till summer. Harper⁷⁸ believes that, besides the fact that mares breed naturally in spring, their breeding

condition is also most readily noted at this season and too, they conceive more easily at this time. According to Youatt,³⁷ heat period usually comes early in the spring. Curryer⁴² says: "Frequently, if the weather in this north latitude is warm in March or April, mares are very sure to come in heat; but our experience is that where one mare gets in foal, 3 or 4 will fail when bred before the middle of May or June."

Mumford⁷⁹ states that in mares the 'foal heat' comes 7 to 9 days after foaling and oestrus ordinarily occur while the mares are nursing, although some do not show this indication during the same period. It is pointed out also that the tendency with some mares is to breed but once in 2 years.

According to Carlson's investigation, the period of heat comes every 21 days, although variations from this are to be found with certain individuals. However, the mare that shows more or less constant 'heat' is an irregular breeder. The heat period lasts for 4 to 9 days, and according to his findings, in 85% of the animals under observation, the duration of the heat period was from 5 to 7 days. Here again variations were noted so that the duration of heat period in a few mares may extend for only a few hours. Carlson advocates the breeding of the mares two days after the start of the heat period because the discharge of the ovum occurs after the heat period.

Bergman⁴¹ holds that the period of heat occurs every 21 days, each period lasting from 2 to 4 days. He points out that better success is obtained by breeding the mare on the second heat period after foaling.

Marshall⁸⁰ places the foal heat 11 days after parturition but in some it occurs 17 days afterwards.

Wallace⁴³ points out also that foal heat occurs 11 days after foaling when, he says, the mare gets settled most readily. The heat period lasts for 3 days. Later periods come every 3 weeks in spring and early summer during which time each period extends for about a week. It is brought out that mares coming in heat in 4 weeks instead of the usual 3 weeks do not ordinarily conceive. Wallace further says that mares that are not bred at the first indication of heat are likely not to conceive until after the foals are weaned, and even then they settle with difficulty. An explanation offered to this behavior is the fact that mares in their second season have a large flow of milk which to some degree affects the system and so makes conception difficult.

Wallace⁴³ maintains also in accord with Carlson, that mares bred when going out of season are most likely to settle so he advocates the breeding of the mare in a day or two after the first service in case that she has been covered immediately after she comes in heat.

According to Axe,³⁸ the period of heat lasts for 2 or 3 days at a time, occurring every 15 or 21 days. He believes that mares will be more successfully bred if service is made 9 days after foaling.

Johnston⁵ likewise maintains that mares will generally conceive if bred 9 days after parturition. He recommends the return of mares for three trials, as follows: About the 18th, 25th, and 32nd day.

According to Curryer⁴² the best time to breed the mare is at the height of the heat period.

Quoting Axe,³⁸ the indications of heat period are as follows: "The animal is usually irritable or sluggish and less able to sustain severe exertion; the sensibility is increased, and the appetite is more or less in abeyance or capricious, and thirst is often present; there is a tendency to seek the company of other horses, especially males; attempts to pass urine are frequent, and there are spasmodic ejections of a whitish fluid, accompanied by movements of the vulva."

Smith⁴⁹ says: "The external signs of proestrus in all animals are a swelling of the vulva, more or less pronounced, with a slight flow of mucus, which may be blood-stained. There is excitement. The mare may

refuse to work, squeals and kicks when approached, elevates and protrudes the clitoris, and micturates frequently, the material being very mucoid."

Mumford⁷⁹ characterizes oestrus by "great restlessness, constant movement and often great mental excitement . . . The genital organs become congested. The mammary glands in animals not suckling young increases in size. The external genitals, particularly the vulva, become swollen and red, and mucous and bloody excretions flow from the generative organs. In many animals, there are frequent attempts at urination."

4. SPRING FOALING

Gay⁴ states that spring is the natural time for foaling and is the customary period, especially in breeding studs. Such benefits as are derived by the open-air surrounding and new grass are ascribed to the desirability of spring foaling. And too, breeders of show horses who are after the age limit prefer spring foaling.

With regard to spring foaling, Harper⁷⁸ writes: "Mares breed naturally in early spring. At this season their breeding condition is more readily observed and they conceive more frequently than at any other time during the year. [These have just been referred to above.]

"Thus, when convenient, the spring is the proper time to breed the mare, being attended by many advantages. The foal comes at a time when it is much more easily managed, the housing is simplified, since, if the weather is warm, the mare and foal may be turned into a small paddock or pasture. The grass the mare gets will serve to keep her in good physical condition and will stimulate the milk flow. This also gives the foal the range of the field and the much-needed exercise, without which no foal can develop endurance. Soon the foal will learn to nibble the grass, which will prove beneficial, since grass is a very good supplement for milk for a nursing foal. If the foal is given a little grain at the same time the dam receives her ration, he will thrive and develop in a manner difficult to equal with a fall colt."

Van Alstyne⁸¹ asserts that mares breed with difficulty at other seasons than spring. According to him, the desirability of March foals is to be accounted to the fact that "After the birth of the colt the mare has time to recuperate before her services are needed. A little later she can take her share of light work, and by the time the heavier work of the later spring comes on, she can take her share. The colt will then be eating solid food and it is important if the mare's milk supply is not abundant.

"The colt is large enough by midsummer that the flies do not affect it as they do a younger foal. It can be weaned in late July or August while pasture is yet good, and the mare will have time to gain flesh before winter."

5. FALL FOALING

According to Gay,⁴ fall foaling should be a feasible system provided good stables, feed and help are made available. It is especially desirable where mares are being used for farm work besides for the production of colts. It is pointed out that fall foaling enables the colts to acquire good start so as to minimize the effects of adverse conditions of short pastures and attacks of flies during midsummer. Gay says: "In fact, if one is forced to choose between a spring foal, with no chance to properly favor the mare, and a fall colt which arrives and is suckled while the mare is laid by, the latter would be more desirable."

Harper⁷⁸ has the following to say on fall foaling: "When the fall foals are to be raised the mare should be bred so as to foal as soon as convenient after the season's work is done, providing the foal does not

come when the flies are so cruelly annoying. To encourage the mare to breed, she should be fed an abundance of nutritious food which should be of a laxative nature. She should be blanketed and regularly exercised or moderately worked. Her physical condition can be much improved by feeding a moderate amount of succulent food, the object being to make the condition as spring-like as possible.

"If the foal comes in the winter it will need extra warm quarters and extra attention. The dam will need milk-producing foods such as clover or alfalfa hay, oats, bran, and a few carrots if possible . . . The winter colt has one advantage over the spring colt in that he is weaned in the spring of the year and may be turned to pasture where he should thrive, particularly if given a small allowance of grain."

Van Alstyne⁸¹ advises that fall foaling should be so timed that it comes between early September and November. In this way "The mare will do much of the fall plowing, work on the drill, make a third horse on the corn harvester, or help to haul silage corn if the road is hard and level."

Van Alstyne⁸¹ cites the case of the best fall colt he ever reared. This colt was foaled on the last day of August. According to him, "By selecting her work the mare put in full time through harvest. She helped with the plowing, which that year was done early, and she had a chance to lie idle for ten days after the colt was born, before sowing and silo filling. After that she was free until winter. Then the colt was four months old and eating like a horse. The mare made one of a necessary team to be kept up and fed grain to draw out manure and do other winter work. Very little more feed kept her with plenty of milk for the colt. Separated from the colt the last of March she was in as good condition for the spring's work as her mate which had no colt."

Van Alstyne⁸¹ is further quoted to say: "The second spring when my fall colts are 18 months old they have been as large and well-developed as the spring colt at two years. This means that at three and a half years a fall colt will do as much work as a 4-year-old; thus subtracting six months from the maintenance of the colt before he can earn his keep. For this there are three reasons: the colts get a good start on grass in the fall when the weather is warm and there are no flies; by winter it is eating freely and with a little selected silage and roots in a comfortable stall it is easily kept growing instead of being weaned when flies are at their worst, and the best of the summer feed is gone and it must subsist on dry food until spring; the fall colt soon gets grass after weaning and never stops growing.

"Colts usually shed their incissor teeth about three months before the end of their second, third, and fourth year. Fall colts therefore shed their teeth when grass is abundant—an important reason for their more rapid growth.

"It is of great benefit to the colt to be handled when young. The farm is a very busy place after April 1st, and however good the intent, little time can be given to such training after spring work sets in. In winter there is time for this training without neglecting the putting in or harvesting of the crops."

Roberts⁸⁰ in supporting the idea of fall foaling contends that with this practice the colts will have all of its incissor milk teeth by the time they are weaned in the middle of May or before so that on being turned to pasture their growth will be rapid even without the use of concentrates.

6. OTHER BREEDING CONSIDERATIONS

Gelder⁸ states that a good breeding time is in the afternoon. It is also pointed out that even slight cold or excitement might prove detrimental

to successful impregnation. It is desired that mares be driven or led moderately when being brought for breeding and should not be ridden. That excitement is harmful in breeding operations is attested as follows: According to Carlson,⁶ in both instances where casting harness have been used in throwing down the horses, the percentage of those that conceived from capsule breeding was very much lower, in comparison with the success obtained by simply applying the capsules in a standing position. Another investigation carried out by him brings out that the highest percentage of foals was produced by those led by the halter whereas lower percentages were observed in mares that were ridden, driven double to wagon and driven double to buggy.

Dadd⁸⁸ says it is better to breed the mare when a whitish discharge is seen from the vulva. At this time she often neighs and shows great desire for the male. Dadd disfavors breeding early in the season for the reason that by so doing the mare not only has to furnish nourishment for the suckling foal but also to the developing fetus, besides herself.

The best mating is said to result from the use of a relatively old horse with a young mare (Biddell, Douglas, Dykes, Fleming, Macneilage, Murray, Trotter⁸²), while Walley⁴⁵ says that equality in size between the male and female should be insisted upon in breeding operation, and he further maintains that a small and young female bred to a disproportioned stallion might cause some trouble in parturition through certain abnormalities in the development of the body. But a roomy and mature mare can be mated with a stallion differing much in size and still good results may be obtained. Allen⁴⁴ believes that much of the success obtaining among the Arabian and Eastern breeders is due to the fact that mares larger than the stallion are used in breeding operations. Johnstone⁵ recommends the mating of a ton stallion with mares weighing 1500 to 1600 pounds or upwards, and the 1650 pounder with mares weighing 1000 pounds or less.

7. ARTIFICIAL INSEMINATION

That artificial insemination, whether it be by the syringe or by the capsule method, can be undertaken successfully, is without question (Johnstone⁵). Riley⁸³ states that this practice has been followed by stallion and jack owners for over 20 years. It is resorted to not only in America, but also in France, Germany, Russia, the British Isles, India, and other countries. (Axe.³⁸)

In a comprehensive way Brown⁸⁴ enumerates a number of advantages accruing from an artificial insemination, as follows:

“First—Stallion owners are able to restrict the services of their animals to one period a day, thus conserving the virility of the sire and contributing to more vigorous offspring.

“Second—By effecting a division of the semen from 7 to 18 mares may be easily bred from a single service.

“Third—That a higher percentage of foals results for the reason that insemination is certain and the stallioner soon learns to detect and reject mares showing evidence of confirmed sterility.

“Fourth—That impregnation is far more certain in case of atresia of the cervix, a tortuous or elongated cervical canal, together with various pathologic conditions of the vaginal tract and numerous other conditions.

“Fifth—The opportunity for conveying contagious or infectious genital diseases is greatly lessened and reduced to the minimum by the observing operator.

“Sixth—That the opportunity for physical injuries to either stallion or mare is practically nil by this method.

“Seventh—That the offspring are equal to and generally should be

superior to the natural product on account of the sire not being over-taxed.

“Eighth—That the results obtained justify the stallioner reducing the service fee if necessary, making it no excuse for any man to breed to a scrub and putting the latter out of existence through competition alone.

“Ninth—That certain shy breeders may be bred successfully at the termination of the oestral period and in the hands of several experienced men impregnations have been accomplished by breeding at any period without regard to oestrus.

“Tenth—That with proper care semen may be transported distances and impregnations successfully made.

“Eleventh—That cheap females may be utilized as in the case of the burro which when crossed with a horse of proper type results in a hinny that finds a ready market at a remunerative figure.”

According to Johnstone⁵ who originated the capsule means of artificial insemination the two methods are equally good, although infection is possible in the case of the syringe method when used with some diseased mares. Strict cleanliness and sterilization should therefore be adhered to when the syringe is used in order to safeguard clean mares. Besides cleanliness, Riley⁸³ gives cheapness as another advantage in favor of the capsule method.

Carlson⁶ calls for a set of tools in carrying artificial insemination by the capsule method, as follows: These are a pan for holding warm water, a device for heating the water, thermometer, quart bowl, soap of good quality, towels, creoline or other disinfectants, powdered slipper-elm bark and semen extractor. It is desired that the pan be made of a non-corroding and rust proof metal such as zinc or galvanized iron. It should be of a size sufficient for the extractor with its extended piston to lie lengthwise in it, so accordingly it may be made 6 inches wide and 36 inches long. An oil stove may be used to heat the water, and for gauging the temperature a dairy thermometer, which has the advantage of floating is recommended. Riley⁸³ recommends for heating the water a container made of galvanized iron, 30 inches long, 5 inches wide and 6 inches deep.

For insemination by the capsule method, Johnstone⁵ has no need for tools other than the capsules. Carrol and Frederick⁸⁵ mention the same tools in connection with the capsule method as indicated by Carlson.⁶

Cleanliness and sterilization of instruments should be closely followed, but the use of disinfectants, or other agents in this connection should be judiciously and carefully adhered to because, according to Riley,⁸³ such agents as direct sunlight, temperature (above 100° or below), soap, vaseline, grease, oil, chemicals, urine, water, cold instruments, cold air, and rubber are injurious to spermatozoa. In an experiment conducted by Lewis⁸⁶ the rubber bag and pig's bladder proved most harmful to the spermatozoa. Lewis also found that the sperm cells are very sensitive to high temperatures and that low temperatures have less effect on their vitality than any other conditions tested.

Before proceeding to the execution of breeding operations the mares should first be examined (Carlson).⁶ Carlson⁶ points out that if the mare is already fifteen years or more old and has no foal on foot, she may be rejected for service. The discharge from the vulva is to be looked for next. The sticking together of the hairs of the vulva would be a sign of leucorrhoea and mares so affected should not be bred. Mares that show reddened mucous membrane as shown by the eyes, which normally is pale pink, should likewise be refused for breeding. And too, it is brought out that mares discharging liquid on the notsrils will not breed.

Mares which have been picked for the service are next lined together at a reasonable distance apart, but not unduly far from each other (Carlson).⁶ The condition of the cervix is next looked into, and should

the opening to the uterus be closed Carlson⁶ indicates the insertion of one finger as sufficient, for the mistake of opening it with two or more fingers may lead to too wide an opening, which is said to cause difficulties among breeders. The matter of objecting to mares found with lacerated cervix or with cervix of wide opening is brought out. Carroll and Frederick⁸⁵ suggest the use of a speculum in examining the os uteri.

As to the means of collecting the semen Carroll and Frederick⁸⁵ write: "When all the mares have been examined, their external organs sterilized, the utensils prepared . . . the stallion is led out and allowed to cover some quiet mares in heat which the examination has shown to be perfectly normal and clean in every way. As the stallion mounts, the operator should approach the rear of the mare with the bowl and extractor both filled with the 100° water. His arm should be previously greased with the powdered slipper-elm bark or vaseline. As the stallion begins to dismount empty the water from the bowl and catch any semen which may follow the penis out. As soon as this is done or if none comes out give the bowl to an assistant, immediately empty the extractor of water, grasp its end between the thumb and first two fingers, and gradually insert hand and all into the vagina, always keeping the point of the extractor thus protected.

"If the semen has been discharged into the vagina the hand as it enters will detect this, and it can be taken up by pulling out the piston of the extractor. If no semen is encountered in the vagina it has been discharged into the uterus. To collect it from here carefully insert the point of the extractor (always preceded by the end of the forefinger) into the uterus. When in the length of the finger, bend the flexible end of the extractor downward by pressure from the forefinger above supported by the thumb underneath.

"Firm yet gentle pressure downward will cause a pocket to form in the floor of the uterus into which the semen will naturally flow. With the end still protected by the finger tip to prevent drawing in any of the delicate membrane lining the uterus, fill the extractor by gently pulling out the piston. When the instrument is filled straighten its point, draw it from the mare, take it at once to the operating room, and have the assistant immerse it in the water at 100° F. His finger should be kept over the end to protect the semen from water or air."

It is indicated that the work should be carried in a place free from dust, particularly if the semen is exposed. Also, the semen should be kept in a dark place and not exposed to direct rays of sunlight.

Where a bulb is used to collect the semen, Riley⁸³ advises, that in case a large quantity of semen has been collected, the bulb may be unscrewed, corked and then placed in water heated to a temperature of 95° to 100° F.

As pointed out by Riley,⁸³ the extractor filled with semen may immediately be applied to the mares awaiting insemination, if there are only one or two of them. Otherwise, the use of the capsule is to be resorted to. But with only one or two mares to be bred, besides the one served by the stallion, the capsule may of course be used also instead of the extractor. According to Carlson,⁶ the capsule without its cap is introduced into the vagina with the hand from which the semen is scooped out, holding the fluid by means of the forefinger. This is then inserted into the uterus. But Riley⁸³ remarks that such a practice is possible only when semen is to be found on the floor of the vagina.

Where a number of mares are to be bred, the semen in the extractor or bulb kept in a heated water is poured in capsules which are one by one introduced into the line of mares awaiting operation. According to Carlson,⁶ the cap of the capsule is removed and this is then filled about half full of semen by an assistant who holds the extractor in water. The capsule is then capped, and holding it by the left hand it is immediately

inserted into the uterus of the mare ready for insemination. This is repeated until all the mares have been treated.

To avoid danger from kicks, Carlson⁹ advises that the left foot of the mare be held up while the operation goes on, while Riley⁸³ suggests that the mare be hobbled, adding that the tail be bandaged to eliminate attendant inconvenience when the hairs are in the way.

Lewis⁸⁶ states that a vigorous stallion is capable of ejaculating as much as from fifty to one hundred cubic centimeters of semen in one service, containing from one hundred and fifty thousand to two hundred and fifty thousand spermatozoa per cubic millimeter. There may be as many as twenty-five billion of the sperm cells in the semen from one service. These would give an idea of the potentiality a stallion has in procreating its kind when artificial insemination is practiced. And according to Brown⁸⁴ instead of the 50 or 60% of foals begotten by the natural method of breeding the stallioner may raise this to 80-90% when artificial insemination is adopted.

Lewis⁸⁶ through his experiment, brings out interesting results as regards the number and vitality of the sperm cells in the course of natural matings. A draft stallion was used and it was found that at the beginning of the experiment there were present in the semen 131,000 sperm cells per cubic millimeter with vitality lasting over nine hours. At the end of 9 days, allowing the stallion one service daily, the sperm cells per cubic millimeter was found reduced to 5,800, the vitality lasting for only three hours.

With regard to the practicability of transferring semen for long distances, it is worthy of note that Johnstone⁹ succeeded in inseminating a female burro, carrying the capsule filled with semen from a Shetland pony from a distance of forty feet. The burro successfully produced a hinny.

In concluding the subject of artificial insemination, the following "don'ts" formulated by Riley⁸³ will not be amiss:

"1. Don't expect much, if any, success in artificial breeding unless you practice care, cleanliness, and sanitation.

"2. Don't allow direct sunlight, cold air, dust, dirt, or disinfectants to come in contact with semen.

"3. Don't allow water in which instruments or semen is placed to become warmer than 100 degrees or colder than 95 degrees.

"4. Don't breed a stallion to a mare showing symptoms of disease. If you breed her, use a capsule.

"5. Don't breed mares that are very warm, tired, or excited, until after they have been cooled off and rested.

"6. Don't give mares violent exercise immediately after breeding.

"7. Don't be disappointed if you meet with a few failures—they come in nearly all lines of work."

8. FEEDING

Kennedy⁹¹ states that the brood mare during the breeding season does not only have to do regular work, but besides she is putting herself in condition for breeding, suckling her colt or developing a fetus. So the carbohydrates needed for the work and protein and ash for other demands just mentioned must be met with by a comparatively large supply of these substances. It is advocated that the feed consist of oats balanced with oil meal or bran, and sound clover or alfalfa hay for roughage.

According to a table presented by Carlson⁹, range feeding proves to be the best system in carrying through brood mares, as far as the percentage of foals obtained is concerned. Feeding on grass during the summer and alfalfa in winter shows up high, ranking second to range

feeding. The percentage of foals begotten through this method of feeding is even higher than other means in which some sort of grain or grain combinations are used. Mares fed with oats and bran for concentrate lead the grain-fed lots with the oat-fed individuals coming next. While corn may be used when balanced with bran, clover, alfalfa, or other feed, yet, in comparison with lots in which oats take the place of corn, the corn-fed animals show the lowest in percentage of foals produced.

Johnstone⁵ believes in providing the brood mares with grain during the winter. Oats and bran is considered the best combination, about one-fourth or one-third bran by weight. This should rather be fed dry. Corn may also be used provided that it is used with clover hay. For hay, clover or alfalfa hay mixed with an equal quantity of timothy or prairie hay is recommended. But spoiled or dusty hay should be avoided. Oat hay is also considered palatable and beneficial, while cured corn fodder, if to be used, should have been procured from stalks cut when quite green so as to make them more easily digestible and more nutritious. During the cold season from the beginning of winter till the middle of January, sorghum is said to give good results. At other times, sorghum as well as millet and Hungarian hay are all condemned as horse feed.

Other feeds such as carrots, sugar beets or rutabagas, according to Johnstone,⁵ are excellent for brood mares in winter. As soon as the mares get accustomed to these they may be given as much as about seven or eight pounds per head daily. Silage is disliked as a feed and if it is ever to be used the amount should be small and the quality good for moldy silage, says Johnstone, will surely kill the horse.

Johnstone⁵ advises feeding the mare two or three times a day. This does not only apply to grain feeding but also with respect to hay. It is desired that enough hay be fed each time so that all is cleaned at each feeding. The same combination of feeds as above mentioned should apply equally well in feeding working mares.

On this subject Henry and Morrison⁵³ writes: "Mares used for breeding purposes do well without grain when on nutritious pasture. With insufficient pasture and in winter some grain should be given. The feed should not be concentrated in character, but should have considerable bulk or volume. The bowels should be kept active through a proper combination of such feeds as bran, linseed meal, roots, etc."

Stericker⁶² believes that pasture, if in sufficient quantity, should be nutritious enough and plenty for brood mares, although it is advisable to give them some grain by the time they are about to be bred, at which period they must be gaining in flesh.

Gelder⁸ advises the feeding of the brood mare in the same manner as that of the gelding during the first six months of pregnancy. Later she may be fed nitrogenous and mineral feeds. A combination of crushed oats and corn together with wheat bran for a concentrate is recommended, and for roughage clover or mixed hay but not too much alfalfa, is to be given. To keep the bowels loose a handful of oil meal once a day is advocated. Precautions are to be remembered in the way of giving ice cold water late in pregnancy, as well as the effect of costive feeds or strong purgatives.

Carter⁸⁷ dwells more at length on the care of brood mares in foal, saying that there is not any more important time in the raising of horses than this phase of the work. Carter writes: "A mare should be prepared for breeding for it is not wise, I find, and sometimes impossible to breed her when she is out of condition and her blood is heated. It may be necessary to start preparing the mare for the stud two months before the time she is to be bred. To obtain the desired condition, I feed a cool laxative ration of bran and ground oats and some roots, preferably raw carrots. Boiled oats have proven even better than ground

oats but it is not always possible to prepare them this way. I feed equal parts of ground oats and bran or if the oats are boiled I use equal parts before boiling . . . I believe that ground oats are two or three times as valuable for feeding as whole oats, for there is much less waste and all the grain is digested, which is not the case when the whole oats are fed. A pint of oil meal a day should be included in the mare's ration to keep her blood cool. This ration is only necessary before she can be turned out to pasture. Grass is the best food to put a mare in condition and three weeks on grass should put her in excellent shape to breed."

Sellers's⁸⁷ dictum on the feeding of the brood mare is as follows: "Before service, she should be well fed and regularly exercised for several months. She should be healthy and vigorous. A few weeks before service, take the raw oats away from her. If on dry feed, give her scalded bran, a few boiled oats, or carrots. If on grass, this alone will cool her blood, and she will conceive much easier or sooner. After service, comes a critical period in the life of the young foal. If the mare is allowed a full drink of cold, especially ice cold water, at this time, you will not, at all likely, have a foal from that service. Always take the chill off the drinking water for several days after service . . . As soon as she proves in foal, the regular allowance of grain can be resumed, and the mare is all the better of being worked or exercised moderately right along, until within a short time of her foaling."

For the nursing mare Sanders⁴⁶ states that wheat bran is a very valuable feed when given in conjunction with more nutritious feeds. This may be turned into slop and fed with ground oats or rye together with cut hay or sheaf oats. Or, whatever grain feed is to be used Sanders emphasized the importance of grinding it and feeding it wet, with cut straw or hay. A good supply of fresh grass is claimed to furnish healthfulness and nutrition to the body.

Sanders⁴⁶ makes the remarks that "it is the general opinion of those who have given close attention that mares, when first turned to grass, after having been kept stabled and on dry feed for a considerable period, are not so likely to get in foal as those that have been on grass for some time previous to service by the stallion; or as those that are not on grass at all. The theory is that turning mares to grass produces, for a time, a sort of general muscular relaxation, or softening, that is not favorable to conception. That mares which had been kept stabled previous to being sent to the stallion should be kept on dry food for at least four weeks after the service. If the mare has been kept on grass let her so remain for at least a month; if she has been kept stabled and in idleness let her remain so a few weeks; if she has been worked continue to work her moderately . . . These directions apply only to such mares as have not proved hitherto barren. In case a mare has been served repeatedly, and has failed to conceive, a radical change in food and management may bring about the desired result."

According to Roberts⁵⁹ the ration for mares doing heavy work should be rather wide, say one to seven, or one to eight. But as the time of parturition comes near, when the work is accordingly lessened, the ration should be made narrower, or one to six. In feeding nursing dams the ration should be narrow, about one to five. It is indicated, however, that the ratio should be made wider if the temperature in the stables is low. The ratio recommended in this case may be one to seven or one to eight. During any time, whether the mare is nursing or not, the mare should be supplied with some succulent feeds, preferably carrots. Other feeds such as matured apples, potatoes, and sound corn silage may be used in limited amounts. For roughage, bright clover and timothy hay, mixed, is recommended. Roberts⁵⁹ prescribes a ration for a nursing mare weighing 1100 pounds while the foal is still subsisting entirely on

her milk, thus: mixed hay—15 pounds; wheat bran (or its equivalent)—5 pounds; oats—5 pounds; carrots—8 pounds. It is pointed out that the more the percentage of clover in the hay the better. And too, it is suggested that cracked corn may be substituted for a portion of the oat constituents. The carrots included in the ration are to stimulate milk secretion and to help tone up the healthfulness of both dam and foal.

Dimon⁴⁰ advocates the following practice in treating doubtful mares: The mares are turned into grass for a few weeks without grain, after which they are fed grain and worked lightly until the season comes when they are bred. It is claimed that mares turned to grass after breeding or those always having the run of grass would not so likely conceive as those treated by the method just discussed.

Evidently the practice in the British Isles, as Murray⁷⁷ asserts, is to turn the mare and foal out in the pasture till weaning time, or at the end of September or early in October. This is done soon after foaling.

Axe³⁸ says that mares would subsist well and produce well-developed foals when pastured on sufficient good grass. This, however, would not be enough during unfavorable weather, or when pastures are otherwise poor. In such cases, hay and oats are to be furnished, especially in the morning. It is claimed that for pregnant mares oats and hay are considered best feeds, while for farm in-foal mares that are worked mashed or bruised oats or barley mixed with pulped roots and chopped hay or straw dampened with linseed-cake water are indicated. Maize is disfavored. But the mare is never to be allowed fat, instead she must be maintained in a moderate condition, whether she is working or not.

For feeding the suckling mare Axe³⁸ writes: "In the loose box, good hay and a small allowance of crushed oats two or three times a day should be given; and if grass is not available, and especially if the mare does not furnish a sufficient supply of milk, mashes of boiled barley or oats, to which coarse sugar or treacle has been added, may be allowed frequently, and with great advantage. Crushed oats is especially to be recommended for the mare when the foal is a few weeks old, as the foal begins to nibble at and soon to eat them, and thus to prepare itself in the best way for being weaned, while this addition to its food will greatly tend to its robustness and development."

In the Palo Alto Farm⁸⁹ the suckling mares are run to grass and fed hay for roughage, while for their grain feed they get, night and morning, steamed or cooked food, either oats or barley. Carrots are also given.

Hughes⁹⁰ gives a few combinations of grain for brood mares, as follows:

1. Corn, 4 parts; oats, 4 parts; bran, 2 parts.
2. Corn, 7 parts; bran, 2 parts; linseed oil meal, 1 part.
3. Corn, 8 parts; linseed oil meal, 1 part.

For roughage, good quality of clover or alfalfa, or timothy and clover mixed are recommended.

For feeding suckling mares, Ogilvie⁹¹ recommends oats and bran in equal bulk together with corn to the amount of about one-fourth the bulk. This should be dampened before feeding. While in regard to feeding mares that are not worked during the winter Ogilvie writes: "Ensilage is too much of a laxative to be adopted as a daily ration for mares with foal. Dry corn stalks will have the opposite effect on them. Both conditions are equally injurious to the prospective mother. One feed of corn stalks, and one of hay with access to a rack kept well filled with fresh straw, with a few ears of corn daily, will prove an economical as well as a safe way of feeding mares that are not in the harness during the winter season." On the other hand, if the mares are being worked oats and corn together with wheat bran for grain and hay for roughage are considered a satisfactory and safe ration.

Jordan⁹² states that a good pasture would be an efficient source of feed for the nursing mare; however, should the grass be insufficient or other-

wise inferior supplementary feeds are indicated. These include among the grains such feedstuffs as barley, oats, wheat, wheat bran, wheat middlings, peas, and also a little of linseed meal. Soiling-crops especially alfalfa, if available, are also recommended, and if the roughages fed consist of legumes, green or dried, corn could be used to form the larger percentage of the ration. Under average conditions, Jordan recommends a grain mixture consisting of cracked corn 2 parts, wheat bran 7 parts, and linseed meal 1 part. Another formula advocated includes ground oats 4 parts, wheat middlings 5 parts, and linseed meal 1 part.

McC Campbell⁶³ gives five feed mixtures for the working brood mares as follows:

1. Corn, 8 parts; bran, 1 part; alfalfa hay.
2. Oats; alfalfa hay.
3. Oats, 4 parts; corn, 6 parts; bran, 4 parts; prairie or timothy hay.
4. Corn, 6 parts; bran, 3 parts; alfalfa hay, one-third; prairie hay, two-thirds.
5. Corn, 6 parts; bran, 3 parts; linseed meal, 1 part; prairie hay or timothy hay.

9. HOUSING AND CARE

Carlson⁶ recalls the practices of early settlers of this country by which mares and horses were sheltered in cheaply constructed stables, where the question of ventilation was not thought of on account of sufficient openings being provided. Mares of those days are said to be more fecund, and such consequential ailments as colds, coughs, and influenza were then unknown. Williams⁴⁸ claims even that pregnant animals are healthiest if grazed in pastures under the most natural environment. In fact, he says, "rain, snow, cold, or heat is not more prejudicial to the well-being of a pregnant animal than to that of a non-pregnant one." That this is possible is substantiated by Smith.⁴⁹ Smith⁴⁹ discusses the behavior and adaptability of horses to external environment in the following manner: "The young of the horse comes into the world prepared by its heat-regulating mechanism to deal with the question of external temperature, and as time goes on this is supplemented by an extra growth of hair for winter use and a lighter covering for the summer. If no interference with the coat be practiced it is undoubted that no extra covering of any kind is required during the coldest weather, and even where the natural covering is of the lightest . . . it is sufficient for the purpose. The thoroughbred mares of this country once they go to the stud, live in the open for the remainder of their lives, and never wear a blanket. And practical experience tells us that this may be gradually imposed on all horses with impunity, even those which have been kept in hot stables." This method of handling has the added advantage in that "coughs, cold, and inflammatory chest affections, usually attributed to cold, are practically unknown among horses living in the open, even during the coldest weather, and it is easy to show that these diseases are largely the result of the artificial conditions under which working horses have to live." But Carlson⁶ advises that an open shed be constructed wherein the mares may take refuge during stormy days. On the same ground, Johnstone⁵ recommends the construction of a similar shed, which should not only be airy but dark. Besides the protection it will give the horses during stormy weather, it will also serve as a refuge to resort to in summer time when flies are bothersome. Or else, if sheds are not to be had on the pasture when flies are abundant it is advised to take the mares during the daytime into the barn and turn them out to pasture in the night. Carlson⁶ says that mares to be worked during winter should be housed at night.

Roberts⁵⁹ desires that the mare and foal be turned out in the field

or paddock a few hours each day in the winter whenever the weather permits, and during summer they may be turned out at night after getting their grain ration in the stable.

According to Henry and Morrison⁵³ the mares laid off from work should be kept in roomy, well-lighted, well-ventilated boxstalls with wide doorway and plenty of bedding.

10. EXERCISE

Williams⁴⁸ points out that pregnant females that are given freedom and securing natural exercise get by without difficulty or danger. Second to this, he considers it a good practice to work the pregnant mare regularly, but the work must be gentle. Carter⁵⁷ believes, too, in imposing labor on the mare which must be light for about the last month of pregnancy, and holds that the mare must have complete rest seven days before parturition. Sanders⁴⁶ says that mares could be worked up safely to the time of foaling, if proper care is maintained, but as parturition comes near the pace should be slower and the weight lighter. Wallace⁴³ likewise advises the working of mares, as for example, plowing, but she should not be placed between the shafts, which might prove dangerous as the belly increases in size during pregnancy. Henry and Morrison⁵³ say that mares being worked are more certain in producing good foals than the idle individuals. It is suggested that pregnant mares be worked up to 3 days to a week before foaling, but the work should be lighter as pregnancy advances. While working the five-year-old (or over) mares is advised, yet in the case of the two-year-olds they should rather be allowed to graze during the summer months (Biddell, Douglas, Dykes, Fleming, Macneilage, Murray, Trotter).⁸² Axe³⁸ believes in working the mares up to three or four weeks before foaling. Gay⁴ speaks of giving work to the mare, which should, however, be so regulated that the mare is not tired, overheated, or otherwise injured. Precautionary measures are advanced as foaling time comes near so that the mare is not fretted by another horse or rough hand, nor should she be pulled in a jerky or heavy manner. Also avoid extreme speed, rough saddle handling and jumping. While work is advantageous to the mare yet, as has been pointed out, to work her up to within a month of foaling and the confining in a stall without exercise is considered almost as bad as to work her hard at the end of two months' rest after conception. Johnstone⁵ is of the opinion that the mare be worked up to within ten days of her foaling time but the work must be steady and the mare should not be made to back a load.

11. SIGNS OF PREGNANCY

Under this caption it is important to include a detailed and lengthy treatise presented by an obstetrician Williams.⁴⁸ He entitles the subject "The Diagnosis of Pregnancy," under which the following paragraphs are quoted:

"The diagnosis of pregnancy during its early stages is difficult, and during the very earliest period is impossible. The symptoms of pregnancy are divided into three principal groups, the subjective, or physiologic signs; the objective signs; and the positive or direct signs, which are observed by examination of the parts in a way to determine definitely the presence of the fetus or the fetal sac, or of some other structure indicative of the presence of a fetus.

"When an animal has been regularly in estrum and after copulation estrum does not occur, it is generally and properly accepted by the breeder as conclusive evidence of conception. The cessation of estrum as a sign of pregnancy is most reliable in those animals in which estrum has been regular and normal.

"Estrum may occur regularly or irregularly in . . . mares which are pregnant, most commonly in early pregnancy, but not rarely after mid-term, so that the veterinarian must be constantly on his guard in examining such animals and must rely upon other signs to arrive at a safe conclusion.

"Estrum is frequently absent in non-pregnant female. The persistence of corpus luteum, sometimes of a former pregnancy, may inhibit estrum for months. It is only rarely, if ever, that estrum occurs when a large corpus luteum exists.

"Pyrometra also prevents estrum. At times the presence of a very small amount of pus in the uterine cavity may prevent estrum for months or years. In such cases the yellow body sinks deeply into the center of the ovary, the ovarian tissues draw over it, and it remains as a persistent structure, which by failing to atrophy prevents the occurrence of estrum. The presence of a macerating or a desiccating fetus in utero ordinarily inhibits estrum for months or years.

"*The Uterine Seal.* In the non-pregnant animal there is a normal secretion of lubricant mucus in small amounts. When estrum occurs, the volume of mucus becomes enormously increased and it flows from the vulva. When pregnancy occurs, the mucus of the vagina is decreased in amount, ceases to be lubricant, and becomes adhesive. A new type of secretion takes place in the cervical canal, having the character of a tough gelatin rather than mucus. This fills all the depressions in the very irregular cervical canal and becomes massed in a firm body from one end of the cervical canal to the other, completely filling it and projecting forward into the uterine cavity and backward into the vagina. The uterine seal, which is highly adhesive, brings about a most thorough and efficient sealing of the canal. As a general rule the seal can be palpated at the external os uteri of the mare . . . with the finger tip within thirty to sixty days after conception. The finger is to be pressed carefully and gently against the external os uteri and then cautiously withdrawn; if the seal is present it is readily revealed by its adhesiveness.

"Very rarely this seal, or a substance closely resembling it is found in the cervical canal of the non-pregnant animal and may mislead the observer. Sometimes when the animal is pregnant, the seal is partly or wholly absent. Such is the case in purulent inflammation of the cervical canal. In some animals which are to abort as a result of cervicitis the seal is not formed, or the formation is very imperfect. Consequently the presence of the typical seal not only gives evidence of pregnancy, but adds to that a certain feeling of security, suggesting that the animal not only is pregnant, but perhaps is safely pregnant . . . it is one of the most valuable signs of pregnancy.

"*Palpitation of the Uterus per Rectum.* This is one of the most valuable means. After conception the uterus undergoes prompt and marked changes in volume, form, consistence, and location.

". . . In pregnancy the uterus is smooth and even in outline, firm, tense and fluctuating . . . In the mare owing to the crucial uterus, the embryo may develop transversely in both horns, resulting in equal volume. At the region of the internal os uteri the superior uterine wall rises up suddenly like a terrace, instead of sloping forward gradually as is observed in case of pus or lymph distending the organ. The firmness of the uterine wall is in marked contrast also to the character of the walls when the organ is distended with pus or lymph. In pregnancy the uterus is distinctly firm. It exhibits to the touch a sense of vigor and life. When lymph distends the uterus, the walls may be thin as in pregnancy, but they are soft and placid and the horns are probably equally filled. When the organ is distended with pus, the contents do not move as freely as the fetal liquids. The uterine walls are soft and

flabby with a moderate amount of thickening, or they are tense and at some place an abscess of the uterus may point, or the organ is very dense, with thick, hard walls.

"As pregnancy advances, additional evidences appear. The organ becomes very greatly enlarged, the walls are tense and the fetal fluids are quite readily recognized as such . . . The fetus becomes increasingly easy of recognition as pregnancy advances. In some cases, however, both fetus and uterus fall forward into the abdomen and may be beyond the reach of the examiner. In such cases there is still good evidences of pregnancy. The vagina is drawn far forward, the cervix has been dragged anterior to the pubis, and the posterior end of the uterus constitutes a large, thick, firmly stretched band passing downward and forward beyond the examiner's reach. This of itself does not indicate pregnancy with absolute certainty, because the same displacement of the uterus might occur from the presence of large uterine tumors or from other pathologic conditions which would cause an increased weight of the organ, possibly dragging it downward and forward. In this emergency, however, other signs appear to aid the examiner in making his diagnosis. As a general rule in such cases, the diagnosis can be verified by abdominal ballotement, and also by palpation of the enormously enlarged uterine arteries.

"*Palpation of the Fetus per Vaginum or per Rectum.* When pregnancy is well advanced, the fetus . . . may usually be felt upon rectal palpation, though not always in early pregnancy. Up to the fourth month, the fetus ordinarily lies upon the floor of the uterus and cannot, without undue violence, be palpated through its surrounding fluids. Even at the fifth or sixth month, or later, the fetus may have dropped so far forward and downward in the abdominal cavity that it cannot be palpated from the rectum. Later, however, the fetus becomes so large that a portion of it necessarily projects up near or into the pelvis, where it is readily felt. Palpation of the fetus per vaginum has a very limited application. It generally succeeds during the last months of pregnancy. At this time in many cases, some portions of the fetal body, usually the head and the two anterior feet, rest upon the vagina posterior to the os uteri externum, occasionally giving the inexperienced examiner the impression of extra-uterine pregnancy.

"*Abdominal Ballotement.* After the sixth month of pregnancy, the buttocks or other portions of the fetus usually lie in close contact with the abdominal floor of the lower right flank regions. If the hand is placed firmly against the abdominal wall, a somewhat vigorous thrust made upward, and then suddenly the force released, but the hand kept in contact with the abdominal wall, the adjacent portion of the fetus is pushed away upwards in its fluids, floats for a moment, and then drops back against the examiner's hand with a recognized impact. This is a good sign of pregnancy, but not always reliable. In many cases no portion of the fetus chances to lie in sufficiently close contact with the abdominal wall to render the test efficient. On the other hand a tumor or a very large and heavy calculus might mislead the examiner when the animal is really sterile.

"*Auscultation of the Fetal Heart.* In the advanced stage of pregnancy it is frequently possible, by careful auscultation of the abdominal walls over the region of the fetus, to detect the beat of the fetal heart, which is usually at least twice as rapid as the beat of the maternal heart.

"The abdominal ballotement and the auscultation of the fetal heart are of minor value, because when these can be successfully applied the other signs which have been enumerated above should already have decided the question long before these signs, however good they may be, can come into play.

"The physical diagnosis of pregnancy is not dependent upon any one

sign, but rather upon a summary of all signs, all of which are in close accord and are available to the careful examiner. They should always be considered individually, and later collectively.

“Other Signs of Minor Value. One of the commonest physical signs of pregnancy is a change in the volume and form of the abdomen. During the early months, the apparent increase in the volume of the abdomen must be due to an increased volume of fat or of internal contents, since the actual increase in the size of the gravid uterus is not sufficient to bring about any visible changes. Later, this change in volume becomes more marked and there ensues also some degree of change in form, which helps to distinguish the enlargement of pregnancy from other abdominal enlargement.

“The pregnant uterus, having a very high specific gravity, drops directly upon the abdominal floor and bears it down, causing the abdomen to enlarge chiefly in the lower part, while the upper portion apparently sinks somewhat. It is not reliable, however, although important.

“The enlargement of the mammae normally begins quite early during pregnancy in primipara; on animals which have produced young several times the glands do not ordinarily show signs of enlargement until toward the close of gestation. The enlargement of the mammae is not, however, a trustworthy sign of pregnancy. In some animals the glands fail to enlarge to any appreciable degree and, after parturition, fail to furnish milk for the nutrition of the young. This is especially observed in old mares which have been bred for the first time.”

Harper,⁹³ writing on this subject, says:

“The first sign of pregnancy upon which reliance is placed is the cessation of the periods of heat. During this period the female persistently refuses the attention of the male.

“A second sign of pregnancy is the tendency of females to take on fat, which is often very marked during the early stages of gestation. Later, the abdomen enlarges, due to the developing fetus, and the pregnant animal becomes very clumsy, and is often incapable of performing certain movements.

“A third sign of pregnancy is the development of the milk-secreting organs. In the case of young females with their first pregnancy this begins early in the period of gestation although among older animals it is not so apparent until later in the period. The development of the mammae or milk organs is not a sure sign of pregnancy, as in some animals the glands fail to enlarge, and after parturition fail to secrete milk. This is particularly true of old mares which have been bred for the first time.

“A fourth and positive sign of pregnancy is the movements of the living fetus. This is readily observed in mares where the strength and size of the fetus are sufficient to bring about vigorous movements. Such movements cannot be observed until rather late in the period of pregnancy. While there is no safe or reliable method for inducing the movements, they frequently can be noted while the mother is drinking, particularly in the morning.”

According to Carlson⁶ the most significant among the signs of pregnancy is the cessation or non-recurrent heat periods. This, however, is not to be relied upon at all times. As a rule, too, if the mare refuses the stallion in 30 days after service, she is most likely in foal. There are other signs that may indicate pregnancy. Mares that are naturally vicious and excitable become gentle and docile if conception took place after service. Fleshing, loss of energy, or indisposition for work are also signs of pregnancy. Carlson considers the nature of the color of the vulva and vagina as the most reliable sign. These organs are normally pale rose or pink in color but with pregnant mares the color gradually becomes darker until the third month when they turn bluish-red. The fetus begins to move in about five and a half months after con-

ception and from the seventh month and on till foaling time the movement of the fetus may be discerned by pressing the hand into the abdomen in front of the stifle and then removing it suddenly. Internal examination is condemned.

Kennedy⁶¹ describes the changes occurring in a pregnant mare, thus: "The first signs of pregnancy, and the one which is used in breeding mares, is the absence of the usual heat period. When a mare becomes pregnant, the usual periods of heat do not appear, and the mouth of the womb becomes closed. As the pregnancy advances, the mare usually becomes quieter, has a tendency to take on fat, is cross toward other horses, has somewhat fuller flanks, and there is a general contraction of the vulva. In the more advanced stages the belly becomes more pendulous, the udder develops, and a jerking movement of the foetus is often noticed, especially after the mare has taken a drink of cold water."

12. GESTATION PERIOD

Williams⁴⁸ writes on the gestation period of the mare as follows: "As a general rule, the duration of pregnancy in the mare is about 12 lunar, or a trifle over 11 calendar months, or about 330 to 340 days. Bonnet gives 11½ to 12 lunar months (322 to 336 days) as the normal. Detrichs, among 500 observations, found that 80 per cent of mares foaled between 331 and 350 days. Count Lehndorff . . . gives a table of more than 8,300 records, in which the average duration of pregnancy was 11 months and 3 days. Statistics show that, in various studs, the male foals were carried from one-half to 6 or 8 days longer than the female. There are great variations of opinion by different writers in reference to the normal duration of pregnancy. Some consider normal a birth which occurs at from 300 days, or 10 calendar months, to 365 or more days and some even extend the limit to 394 or even to 420 days, as in a case given by Baumeister and Rueff.

"Saint-Cyr concludes that the normal duration of gestation in the mare is 340 to 350 days. Some may be born alive, and continue to live, from the 300th day forward. It is not rare for foals to be borne up to nearly 365 days. Rarely, normal gestation may be prolonged to 400 days, or even 13 months. It would seem, therefore, that there may be a variation in the period of gestation in the mare of about 100 days, or more than 3 months, and that we apparently have no means for determining in advance at what time a mare will foal, except that, in a general way, we may expect the vast majority of births to take place between 11 and 11½ calendar months.

A client, engaged in breeding pedigreed French draft horses, found that, in 55 mares, the average duration of pregnancy was 336 days. Among the thirteen pregnancies in one year, the average was 333 days—the longest 364 days, a mare foal, and the shortest 318 days, a horse foal. The shortest duration recorded by him was 298 days, a mare foal."

According to Henry and Morrison⁶³ "The average period of gestation for the mare is about 11 months, or 340 days, tho it may vary quite widely. William Russel Allen of Allen farm, Pittsfield, Massachusetts, from records of 1,071 foals produced by trotting mares during 15 years, found the maximum gestation period 373, the minimum 319, and the average 340. A wider range was observed by Tessier, who reports that the shortest gestation period of 582 mares was 287, the longest 419, and the average, 330 days."

In an investigation carried on by Harper⁶⁴ the gestation period of the mare, basing the data from 82 parturitions, ranges from 316 to 361 days, or an average of 333 days. The period varied from 317 to 361 days, or 335 days average, for male foals, and from 316 to 357 days, or 331 days average, for females. Together with the above figures data were ob-

tained from observations on 171 other mares. It was found from these that the period fluctuates from 314 to 364 days or an average of 335 days—317 to 364 days, or 336 days average, for males, and 314 to 361, or 335 days average, for females. Harper asserts that although the male foals bear gestation figures a little longer than those of females yet this is not always true. It is claimed that in some years the variation is reversed. From the above figures the gestation period may be inferred to be approaching 11 months or slightly short of 340 days.

13. SIGNS OF PARTURITION

To get a full detailed understanding of the signs of parturition Williams's⁴⁸ account on the subject is set forth: "Preliminary to the completion of pregnancy there appear certain signs which indicate, with more or less certainty, the near approach of labor.

"One of the most conspicuous of these is the increased functional activity of the milk glands. In all domestic animals there is a tendency for the glands to become gradually enlarged and tense as the period for giving birth to young approaches. The date at which this enlargement appears varies: It occurs earlier in primiparae than in those which have previously given birth to young. Usually a few weeks before birth there appears in the udder at first a water secretion, which may be passed from the teat, but which bears only a faint resemblance to milk. Later the secretion becomes more milk-like and assumes the characters of colostrum. When parturition is near, the milk secretion may be so profuse, especially in the mare, that it escapes from the teats in drops or in streams. This sign may, however, be very miselading. Sometimes, on the other hand, almost no milk is secreted prior to parturition and the glands are only slightly enlarged. Such is especially the case in very old mares which have been bred for the first time.

"Another symptom of approaching birth, which is important, is the preparation which is taking place in the vagina and the vulva. The vulvar lips become somewhat thickened and edematous and tend to stand apart more loosely than ordinarily. From the vulva there generally appears, a more or less abundant discharge of a thick, lubricant mucus. Part of the mucus emanates from the glands in the vaginal mucosa, part from the voluminous uterine seal, and part apparently from the exalted secretion of the mucous glands in the cervix. If the lips of the vulva are parted, there is observed an injection of the mucosa.

"As the time for birth draws near, certain psychic signs are observed. The animal seems to be somewhat disturbed and anxious. She exhibits some desire to withdraw from her usual associates. She moves slowly and cautiously. There may be interruptions in feeding suggesting that uterine contractions are taking place . . . Sometimes the advent of the uterine contractions is suggested by the appearance of slight colic, accompanied by occasional pawing or lying down. The mare may show evidence of pain by whisking the tail. Finally the pregnant animal, if at liberty, tends to withdraw from other animals of her own or other species and seeks a quiet and secluded place, where she may bring forth her young without disturbance or annoyance."

According to Carlson,⁶ the approach of parturition is evinced in most cases "by the enlargement of the vulva, the falling in of the muscles about the croup (relaxation), and the filling of the udder and teats. A day or two before parturition the teats show a waxy substance at their ends, and frequently there is a flow of milk. At last the mare usually becomes uneasy, stops feeding, and sometimes she will be down and rise again for several times. In many mares this is not repeated, but the mare remains down."

Kennedy⁶¹ advises that the mare be watched even as early as the tenth

month of gestation period, because foaling time is uncertain in mares. Some of the signs of the coming parturition, according to him, are: "The udder becomes greatly distended some time before foaling, but the teats very seldom fill out full and plump to the end more than a few days before the foal is born. In most mares the vulva enlarges, and a reddening of the lining of the vagina is noticed immediately prior to parturition. There is also a marked falling away and depression of the rump muscles about a week before the time. About twenty-four hours before foaling a clear wax forms on the end of the nipple. This wax is often confused with that formed from the colostrum which escapes from the udder so care is needed in distinguishing it. Immediately prior to time of parturition, the mare will usually show some nervousness and if with other stock, a desire to be left alone."

14. MANAGEMENT OF NORMAL PARTURITION

To gain full insight into the different steps involved in the management of normal parturition as well as the different changes and problems confronting the attendant during the act, it is again deemed fitting to refer to Williams's⁴⁸ lengthy presentation on the subject. Thus, he writes: "In order to secure the required degree of cleanliness, [the mare] . . . should receive prior to parturition, a thorough bath with soap and warm water, to which is added a reliable antiseptic. The vagina and vulva should be thoroughly doused with warm physiologic salt solution, to which a mild antiseptic may be added. The tail, buttocks and udder should be thoroughly disinfected prior to the birth of the young, and again immediately after birth before the young is permitted to suck.

"Some writers claim that the mother should be able to get the fetus at once, in order to release it from its membranes, but . . . it is doubtful that the . . . mare ever saves the life of her fetus by quickly removing the fetal membranes from its nostrils so as to permit it to breathe. Admittedly, it is important that the mother be allowed to cleanse her fetus thoroughly by licking it as soon as she has recovered from the exhaustion of labor. An attendant equipped with dry towels may, however, rub a fetus dry. In tuberculosis, it is even better that the dam shall not lick the fetus, lest she infect it, e. g., in the navel stump. Shavings are the most nearly aseptic bedding available for animals.

"Some animals . . . become very nervous or even frantic when removed from their companions and placed in a strange stall. This should be avoided.

"The best place in which a herbivorous animal may give birth to young is the open field or pasture, if the weather will permit.

"The watch upon an animal should therefore be barely sufficient to guard against any serious accident.

"It is a general rule . . . that a veterinarian never saves the life of a foal in a case of dystocia, so abrupt is the labor in the mare and so quickly does the foal perish because of the early separation between the fetal and maternal placentae. Therefore it is highly important that the owner or caretaker of breeding mares should be competent to give first aid in cases of parturition, and it is a part of the duty of the veterinary obstetricist to instruct the owners of such animals, so far as may be practicable, in these matters.

"In some cases an extremity becomes pushed up against the roof of the vagina and into the rectum, so that a portion of the fetus may begin to protrude through the anus, still covered by the vaginal roof and rectal floor. If the owner promptly pushes these parts back and directs them properly in the genital passage, birth occurs safely, and perhaps a living foal is produced, but a few minutes' delay leads to the rupture of the

perineum and the virtual destruction of the value of the mare. In another case a fetus presents almost normally, but the nose or a foot becomes impacted against or caught upon the pelvic girdle. If the owner intelligently releases the part and gives it proper direction, the foal is born alive without further difficulty, but if it is allowed to go without this slight aid until a veterinarian arrives the deviation of the part has become magnified, the life of the foal has been sacrificed, and that of the mare more or less seriously endangered.

"In the mare the duration of labor is usually but a few minutes.

"When a fetus presents posteriorly . . . it is essential to hasten its expulsion as soon as the body has advanced far enough into the canal that the umbilic cord is engaged, and compressed between the fetal body and the pubic brim of the mother. In managing such a case, the advancement of the fetus should be very deliberate until the buttocks of the young animal have appeared at the vulva and have passed through it, thus dilating normally the entire length of the passage. Then, when the critical moment has arrived, the fetus should be promptly and carefully withdrawn in order that it may not be suffocated.

"When the fetal fluids are fetid, there is no longer reason for doubt that the fetus is dead, though admittedly the line of demarcation between a non-fetid and a fetid state of the fetal fluids is not always easily drawn. Any active movements of the fetus establish clearly that it is living.

"When the fetus presents anteriorly, with the head protruded through the vulva, and remains incarcerated for some time, the head becomes engorged and swollen; the tongue swollen, blue-black and protruding from the mouth; and the eyes glossy and insensible. However, the conclusion is not to be hastily drawn that it is dead; on the other hand, it may be very much alive, revive immediately, and begin to move as soon as it is released from its perilous position. In fact such engorgement of the head and cyanosis of the visible mucosa show that the fetus was alive when the head appeared. Had it been dead at the beginning of labor, the engorgement could not have occurred . . . however, it may generally be considered that, if vigorous expulsive efforts have continued for two or three hours, or if the fetus has been engaged in the pelvis even half an hour, unless definite sign of life can be observed, the foal has already perished.

"In case where a living fetus is expelled more or less enclosed in the amnion in such a way as to interfere with respiration, the attendant should remove the obstruction promptly."

Johnstone⁵ advises that as soon as wax forms on the teats of the mare, she should be closely watched. But the mare dislikes the presence of persons during parturition so it is recommended that a peep-hole be provided through which the groom could see the mare, without the latter seeing the attendant. Normal presentation is manifested by the appearance, first by the forefeet and then the nose. Should the presentation deviate from this send for a veterinarian immediately. Likewise in case the mare is unable to deliver after a reasonable length of time, it is also advisable to get the aid of the obstetrician. Otherwise, normal delivery should be left alone.

In describing natural presentation and its management Carlson⁶ says that "after two or three pains the water bags appear and usually burst, followed by the forefeet of the foal, with the nose between the knees. With such a presentation one can help the mare very much by taking a foot in either hand and pulling as she labors. If your labor is in concert with hers, you can do no harm by pulling with all your might. By this help one can relieve a mare of her foal quickly, thereby saving her much wasted energy. At such times one should work with clean hands to avoid infection.

"When there is a twin birth the second foal usually comes with its

hind feet first. If the tail is turned upward toward the tail of the mare, this presentation will be expelled as easily as an anterior one, since the curvature of the body corresponds to the curvature of the genital passages of the mare. In an anterior presentation the face and ears of the foals should always be turned upwards for a like reason." Carlson mentions several causes of delayed presentation, among which are mal-presentation and such others as are due to small narrow pelvis, which may result from fracture, to tumors in the vagina or in the pelvis, to calculus in the bladder, or to impaction of the rectum with feces. It is also pointed out that delayed parturition may result from inflammation in which case the fetus and its membranes are firmly attached to the uterus. When found to be so, however, the adhesions should be torn and then the foal extracted.

Kennedy⁶¹ describes the normal presentation as well as abnormal forms, for which he suggests corresponding aids that might be given whenever necessary. As has been referred to the normal presentation is indicated by the forefeet first, with the head between the fore limbs. In this form the anterior portion acts in the manner of a wedge and serves to dilate the passage. The foal may be born with hind feet first. The deviation from normal delivery may assume the position in which the front feet are held back. Kennedy recommends that the fetus be pushed back and the limbs straightened out, should this abnormality present; however, in case the mare is roomy and open delivery may succeed normally even with the legs held up this way. Or it may occur that instead of the feet coming first the rump may instead be protruded. It is claimed that the colt could hardly be delivered in this way so again the body may be pushed back and the parts rearranged so as to assume the normal position. Another abnormality may occur in which one of the legs, of either the front or rear presentation, is held back. This needs similar course of treatment by which the crooked leg may be brought to normal position, although in this case it may at times be possible to deliver the fetus even with one leg held back. If aid is to be given to the mare, Kennedy suggests that it be done as soon as it is known that there is abnormal parturition, or as soon after the examination reveals that some assistance is needed. If assistance is delayed the mare will be found weakened and the fetus and other parts dry. If the fetus is to be pulled do it gently and steadily downwards. The fetus may sometimes have to be dissected to save the mare. Care should be taken so that inflammation is lessened or else it may lead to blood poisoning."

15. THE CARE OF THE PUERPERAL MARE

Williams⁴⁸ discusses this phase of the brood mare's life and says: "After the completion of labor, the mother should not be annoyed by the presence of other animals of her own or other species, or by the unnecessary presence of persons. She should have clean and comfortable quarters, whether in the stable or in the field, and her body should be kept as clean as circumstances permit. Any blood or discharges should be washed off her tail and thighs or other parts of her body which have become soiled. The afterbirth, if it has come away, should be removed and destroyed, although as a general rule, no material harm comes to the mother from eating it.

"An abundance of good drinking water and suitable food should be allowed. For herbivorous animals which have given birth to young during the warm season of the year, grass constitutes the most favorable diet. Mares which are used for work purposes should be rested for a few days after parturition, as a safeguard against disease. As a general rule the mare may safely return to work in the course of three or four days, if parturition has been easy and without accident, but the labor must be of a gentle character.

"If the genital organs have suffered any material injury during the act of birth, proper precaution should be taken against infection. For this purpose physiologic salt solution should be used to flush out the vulva and vagina.

"As a general rule, when evidences of abdominal pain follow shortly after parturition, they suggest some pathologic condition, which may be more or less important, such as the portion of the fetal membranes or some genital displacement, such as a beginning inversion of the uterus. Consequently, whenever such pains are observed following parturition a careful manual exploration of the uterus should be made to determine the causes, followed by the application of the necessary remedies.

"After the expulsion of the fetus and its membranes then follows immediately from the uterus a small volume of blood and placental debris . . . Except for this very trivial discharge, which is designated lochia, amounting . . . to barely a few ounces, expelled within the first two or three hours after parturition, there is physiologically no puerperal genital discharge in domestic animals.

"The mother often resents the approach of other animals or of persons, and is very liable to injure her young by treading upon them in an effort to protect them. Such danger is often observed with nervous mares. It is very common in the mare, and in many cases it is more or less dangerous to approach her when she is giving her first attention to a new-born foal. Not only may she trample the foal, but she may bite, strike, or kick any person who approaches her."

Relative to the same subject Kennedy⁶¹ writes: "The mare should now be allowed to rest. The working of the mare after foaling should be delayed as long as possible, preferably until after weaning. If kept up, the mare should have plenty of nourishing, rather laxative food, except for the first day or two, when she must be fed lightly. Medicines and physics should be avoided, and if any serious condition arises a veterinarian called. The place, however, for both mare and foal is out in a good, rich pasture, unless the weather is extremely bad, and even then they should be kept in just as little as possible. Scours and other digestive troubles are the chief dangers at this time, and they are seldom contracted in the pasture.

"If it is necessary to work the mare she should at least be given a rest of ten days to two weeks. When first started to work the mare should be brought in so as to allow the colt to suck during the middle of the forenoon and afternoon. After the colt becomes accustomed to doing without the mare and her milk the period may be lengthened to the half day periods if the days are not too long. If the mare is warm or is a heavy milker, some of the fluid should be milked out, or scours and indigestion will be produced in the colt. The colt should never be allowed milk from hot mares. The mares should be allowed to cool to some extent and part of the milk drawn before turning with the colt."

Of this Johnstone⁵ says that "after foaling the mare may have her ration gradually increased to its usual size. As a rule when the mare has been worked regularly almost up to her parturition a holiday of two weeks after it should see her in shape to go back to light work. About the third day, or even on the second, if the weather is fine, give her a chance to get out into some dry lot for exercise. At the end of two weeks she should have been gradually gotten back onto her usual feed and of course she should run out into the lot whenever she wants to. When it comes time to put her back in the harness leave the foal in the boxstall when she is taken out to work. He will fret at first but he will soon get accustomed to doing without his mammy. At first work the mare but half a day. She will be soft and worry greatly, probably heating herself up quite badly. A good plan in such cases is, on coming in at noon, to milk the mare almost dry and then put her in a stall in the work stable to eat a little hay and cool off. After she has cooled off so

she may be watered she may be taken to the boxstall, turned in with the foal and fed her grain. Beginning with half a day in this fashion, she may be gradually toughened back into doing her full share of the regular team work. Never let a foal suck milk from a warm mare. It sets up indigestion and starts scours. Keep a bucket of water in the boxstall so the foal may take a drink whenever he wants it."

After foaling, Axe³⁸ advises that the teats be first of all examined for opening. He emphasizes the necessity of carefully selecting and regulating the amount of the feed to be given during the first twenty-four hours. Warm oatmeal or linseed gruel is recommended as the first diet to be given, to be mixed with a pint of good ale in case of exhaustion resulting from prolonged parturition. Four to six ounces of whisky may take the place of ale, should the latter fail in its action. Following the above mixture a little scalded bran with crushed oats should be fed. Afterwards the mare may be supplied with liberal quantities of rich and nutritive diet, which should consist largely of green feeds. He recommends also the cleaning of the udder and tail for the first few days after foaling. The udder should be sponged and the tail washed and cleaned. Both the mare and foal should be protected from cold and wet environment, particularly from the harmful effects of the easterly and northwesterly winds, during the first two days after foaling. They should be turned out to grass as soon as the weather is favorable, and in doing so for the first time the sun must be out, the ground dry and the wind not too strong and blowing in a favorable direction. It is advocated to give a couple of feeds of crushed oats daily to those mares which foal as three-year-olds or to old ones having scant supply of milk, during two or three weeks after they have been turned out or as long as the grass is of insufficient growth.

It is brought out that both the mare and foal should be kept in the boxstall during the first three or four days after foaling in the early part of the season when the weather is rather cold. Turning them out into a small, well-sheltered enclosure for a few hours in the midday should be their first taste of outdoor life, and later on when the weather permits they may stay outside for a longer time. They should always be housed at night until the sun shines bright and the days grow longer. Meanwhile artificial feeding should still be insisted upon.⁸²

Wallace⁴³ advocates that the puerperal mare be given frequent small drinks of natural water into which a little oatmeal has been added. Together with this the mare should be fed succulent and digestible food. He calls attention to the fact that the mare should be "clean" an hour or two after parturition, and in case this fails and the afterbirth hangs for 8 hours assistance should be rendered by which a well-washed hand and arm which is moistened with carbolic oil or carbolic soap and water is inserted and the afterbirth detached and removed before decomposition takes place. The so-called "Hanging cleansing" disease is claimed to prove fatal if neglected and is contagious. In case this has become established on a farm, Wallace recommends for its eradication the temporary cessation of breeding operations, the disinfection of horses and the liming of the pastures. It is claimed that such feeds as a mixture of steamed barley, Indian corn, a few beans and bran, or succulence, as those available roots during the season, stimulates the flow of milk before grass becomes available, which should, however, be given at a temperature of not higher than 60° F. It is pointed out that some breeders resort to the practice of breeding half of the mares so as to foal in November by means of which the pressure of work early in the spring is much lessened because mares bred then could be so managed that milk secretion could be induced to maintain sufficient supply for the foals by feeding them roots or steamed feeds. The same authority is of the

opinion that nursing mares need not be put to work if it could be avoided or else the condition may lead to scouring or rickets of the foals. Or, if the mare has to be worked the work should be only for half a day each time, and she should first have a month's rest immediately after foaling. When returning from work it should be borne in mind that the milk which has collected in the udder during the work is poorer in fat than the milk drawn at frequent intervals and besides such milk differs from the natural kind in other respects and certain poisonous substances might have developed, so it is advised that a little milk should first be drawn before the foal is allowed to suck the mother.

Hunt⁷⁵ states that after foaling the mare should be allowed to clean the foal and then she may have warm gruel, or a stimulant if she is worn out. A pint of strong ale, or Guinness's porter is recommended, which can be handled by the inexperienced. Feeding during the first twenty-four hours consists of gruel and a moderate amount of hay. Richer food may be given as soon as milk secretion is established.

Reynolds⁴⁶ says: "If the mare has been pastured up to the time of foaling, they [mare and foal] will be benefited by being turned to grass during fine weather, in a week or so after birth; but they must be sheltered from rain and cold, particularly at night, so long as the weather continues unfavorable.

"At this early period the mare should never be permitted to graze until she has had a small allowance of sweet hay, or some other nutritious dry food, nor should she be subjected to work for at least three weeks before parturition . . . In the absence of a plentiful supply of grass, boiled barley made into a sloppy mash, with the addition of some treacle and a little salt, is a palatable nourishing diet, tending to increase the lacteal secretion. Should the season not admit of mares being pastured, barley mashes, pulped roots, scalded oats and hay of the best procurable quality, should be liberally supplied. A plentiful allowance of water, or for bad milking mares, nutritious gruel is necessary.

"Most mares, however, secrete a plentiful, and many a superabundant supply of milk . . . The provision of rich but close herbage suffices for their general requirements.

"In districts where the mare is not required to work until the foal is weaned grass suffices for all her requirements.

"If at any time during the period of lactation the udder becomes inflamed, hot or tense, the diet must be promptly reduced, the milk reservoir very frequently emptied, and warm fomentations adopted, to be followed by very gentle friction with soap and water (greasy substances ought not to be rubbed upon the glands or if used, the residuum should be carefully removed by subsequent washing). If the foal is dead, or can conveniently be weaned, a dose of physic may be administered to the mare."

According to Harper⁹⁵ a beneficial, cooling and laxative feed which may be given to the mare during the first few days after foaling is a hot bran mash fed once a day. The mare may be placed to work at the end of one week after parturition.

Timmis's⁹⁶ "prescription" for the brood mare after parturition consists in giving her crushed oats with boiled oats at night for several weeks after delivery. It is pointed out that only little amounts should be furnished at a time but she may be fed as much as she will eat. Afterwards uncrushed oats can be fed and linseed meal added to the feed.

Dimon⁴⁰ writes on the care of the puerperal mare: "It is always well to have on hand at such times, and to give the mare a wheat bran mash mixed with warm water or a few quarts of warm oatmeal gruel. Give no cold water to drink for two days after foaling if in cool or cold

weather but take the chill off by adding a little hot water or by the insertion of a hot iron into a pail of water.

"Care should also be used in feeding grain to the dam directly after foaling, but in a few days she may be fed liberally commencing lightly and increasing gradually—with a mixture of ground oats, cracked wheat, and corn meal lightened up with bran. A good mixture may consist of five bushels of oats to one of wheat, one of corn meal, and two of bran. The foals will soon learn to eat with their mothers.

"If the weather is suitable the sooner the foal is turned into a warm, dry, and sunny yard the better. The dam should not be allowed to stand in a draught of air or remain out in damp or chilly weather."

After foaling Henry and Morrison⁵³ advise to give the mare "a drink of water or better, of gruel made from half a pound of fine oatmeal in half a bucket of lukewarm water. A light food of bran is good for the first meal, and this may be followed by oats, or by equal parts by bulk of corn and bran. After foaling the mare should be confined for a few days, her ration being simple and not too abundant. With favorable conditions, after 4 or 5 days she may be turned to pasture, and in about 2 weeks, or even before, if work is urgent and the mare has fully recovered, she may go back to light work, for a part of the day at least."

16. COMMON AND INFECTIOUS DISEASES, AND OTHER AILMENTS

Metritis

Acute Metritis. "Foremost among the puerperal infections, from the standpoint of frequency and seriousness, stand the acute infections of the uterus.

"The causes of acute metritis consist of any of those elements which may favor the introduction into the uterine cavity, and the growth there, of disease-producing bacteria.

"Standing at the head of causes of metritis, is the retention of the fetal envelopes. Whenever the normal period at which these should become separated and expelled has passed by, without such expulsion, they immediately constitute a source of danger for the well-being of the animal. They promptly cease to constitute a part of the living tissues, the circulation of blood within them ceases, and they furnish a favorable medium in which bacteria may multiply. In most cases the membranes extend from the uterus out through the vagina and vulva, where they become soiled with feces and other highly infected material, and constitute an open highway, along which the bacteria may rapidly travel as well as multiply, until they reach the uterine cavity. The presence of the membranes keeps open the cervix of the uterus, and prevents to a large degree the normal involution of the organ. Added to this the interference with the retained membranes, with a view to their removal, by laymen, empirics or other incompetent persons, serves to intensify the danger of infection by wounding and abrading the organ.

"Another very fruitful cause of metritis is the introduction of infection into the cavity of the organ, upon the hands, instruments or apparatus of the veterinary obstetricist during the overcoming of dystokia or other manipulations of the organ.

"Wounds of the organ during manipulations of any kind greatly facilitate the entrance into the tissues of any infection which may gain admission to the uterine cavity.

"The presence of a dead fetus, which is undergoing putrid decomposition in the uterus, inevitably causes a more or less serious metritis. In some instances, where the death of the fetus is comparatively recent and the putrid decomposition has not progressed far, the degree of metritis may be comparatively unimportant or may even pass unnoticed. In other cases, where the putrid fetus has remained in the uterus for a longer

period of time and the decomposition has become quite complete, the inflammation of the organ is correspondingly great and serious. After a long period of fetal decomposition, the uterine walls may finally assume the character and functions of abscess walls.

"When the fetus dies in the uterus and does not become decomposed, but undergoes mummification instead, it does not tend to induce inflammation of the organ.

"Tardy involution of the uterus constantly tends to invite infection. When the uterus does not promptly close, and its walls fail to quickly come in contact with each other, there is probably a similar tardiness in the contraction of the vagina and vulva, so that the entire tract remains somewhat freely open, inviting infection. The debility of the organ, of which the tardy involution is but a symptom, decreases its power of resisting the infection. When the organ undergoes normal involution and contracts vigorously, that vigor in itself acts largely to prevent or overcome infection.

"Exposure to cold or wet has also been claimed to act as a causative agent in metritis. It no doubt occupies an important, though indirect place. Any sudden chill, or disturbance of the body in general, weakens and depresses the highly sensitive genital tract, and renders infection far more probable than though the animal were kept under more favorable conditions.

Chronic metritis. "Allied to acute metritis, and frequently following it as a sequel, there occurs a chronic inflammation of the uterus, which is characterized by suppuration of the uterine cavity, with more or less accumulation of pus, constituting pyometra, or in case the cervical canal of the uterus becomes completely occluded a large volume of pus may be confined within the uterine cavity, to constitute abscess of the uterus.

". . . It may appear at almost any period in the life of the animal, and its relation to parturition is variable. It occurs almost always in females which have previously bred, but the duration of time elapsing between the last birth and the appearance of the disease is not constant. In some cases, pyometra or chronic metritis follows parturition after an interval of a few weeks, or there may be a more or less definite acute metritis, which partially recovers, to be continued somewhat indefinitely as a chronic, purulent inflammation.

"Anything which may lead to an infection of the uterus, and permit it to continue for a long period of time, suffices to establish the disease. Anything, therefore, which would debilitate the organ or the general system, or which would favor or lead to the introduction of micro-organisms into the uterus, would act as a cause of the malady. Prominent among the recognizable causes of this malady are retained fetal membranes and any of those causes which operate to bring about acute metritis . . .

"In many cases manipulations during dystokia appear to be the essential source of an infection, which, though not sufficiently virulent to bring about an acute metritis, nevertheless induces a chronic suppurative disease of the organ.

". . . This affection is by far most frequently seen in those mares which have at some previous time been bred, and have been allowed to go without further attempts at breeding. It is consequently more common, according to our observations, in localities where few horses are raised, than in those districts where most mares are regularly used for breeding purposes.

"In addition to the general causes of chronic metritis . . . it is not rare to observe chronic metritis in the mare, in cases, because of apparent sterility, the stallion groom has attempted to 'open' the uterus with a view to inducing the mare to conceive. The groom has forced his dirty hand through the cervix of the uterus in a rough manner,

wounding the organ more or less seriously and depositing in the lacerations or abrasions, abundant infection from his dirty hand.

"The mare should be kept directly under the supervision of the veterinarian from the beginning of the treatment to its successful termination, and the handling on no account be entrusted to an ordinary layman. The treatment should not be stopped or relaxed until the recovery is complete. By following these lines of handling we have not met with an unsuccessful case, while we do not recall an instance where the treatment has proven successful when the application of the remedies has been entrusted to a layman.

"Upon the question of breeding after recovery we have no definite data, but there is the danger that the oviducts may occasionally become occluded during the course of the disease and cause sterility." Williams.⁴⁸

Constipation

"This is a symptom present in a variety of abdominal affections, and varies in degree. The term is applied in a general sense to a condition in which the faeces are abnormally retained in the intestines, or when passed are less in amount and harder in consistence than normal.

". . . It is well known that some horses have a tendency to this variety of constipation. The faeces are dry and hard in consistency, and passed in the form of small-sized balls as compared with normal appearance. Atony of the muscular walls of the intestine is responsible in some cases; in others, liver derangement is the cause, or the diet may be too dry, and sufficient water is not allowed. Want of sufficient exercise is another cause, also the condition is observed during the course of febrile diseases. In some cases loss of condition is present, and the horse has a capricious appetite. There seems little doubt but that this topid condition of the bowels predisposes to intestinal disorders.

"The treatment indicated is to pay attention to the food, and allow diet of a laxative character. Small doses of sulphate of magnesia or sulphate of soda should be given in the food or drinking water, and if the animal will take it, small amounts of raw linseed oil may be administered in the food. Tonics, such as nux vomica, are required in some cases. Repeated doses of purgatives are of no service, as when their action ceases constipation again occurs. A combination of bicarbonate of soda, common salt, and sulphate of soda, often proves useful. In such cases the faeces are exceedingly foetid, and hyposulphite of soda, given at intervals will overcome this condition. Attention should be directed to the teeth, as dental irregularities interfere with proper mastication, and indigestion results, which tends to bring about constipation. A proper supply of drinking water should be allowed." Hoare.⁹⁷

Lacerations of Vulva and Vagina

"The vagina, especially of the mare, is not infrequently lacerated or ruptured by the penis of the male. The size of the penis of the stallion does not bear a constant ratio to the size of the body, but is comparatively excessive in coarsely bred animals with long legs and large heads. Such stallions, copulating with small mares, constantly tend to produce vaginal injuries. Sometimes it is merely a slight laceration in the mucous membrane, which may cause limited hemorrhage and some straining; sometimes the lacerations in the mucosa and muscular walls are extensive and induce marked symptoms of wound infection in the vagina with tumefaction, discharge and straining; while, in other cases, the vaginal walls are completely ruptured, with great danger of fatal peritonitis.

"When such injuries occur, there is observed an abnormal amount of straining immediately after copulation, with, perhaps, some discharge of blood from the vulva. Later, swelling of the vulva and a muco-purulent discharge may occur.

"If the wound penetrates the peritoneal cavity, septic peritonitis is highly probable, with early collapse and death.

"Injuries to the mare from this cause should be obviated by means of a roll or padded surcingle encircling the body and passing just in front of the sheath in a manner to prevent the penis from entering the vagina to its full length, the pad or roll being adjusted in size according to the case. The diameter of the roll should always be ample, since little fear need be entertained that the prevention of the entrance of the entire length of the penis will unfavorably affect the results of copulation, as general observations show the contrary. In constructing this roll or pad an ordinary surcingle may be used and a tube made of sheeting or other sufficiently strong material and this, open at each end, slipped over the surcingle. Padding of cotton, oakum or other material is then to be inserted into the tubular covering until it is tightly filled so that it presents a diameter of 4 to 8 inches in that part of the surcingle to come in contact with the abdominal floor, after which the open ends of the tube are to be secured to the surcingle and closed by tying. When the stallion is ready for service, the surcingle is passed around his body just in front of the opening of the sheath and secured by buckling. In copulation, only that portion of the penis projecting beyond the roll can enter the vagina.

"Lacerations of the vulvo-vaginal canal during copulation somewhat rarely occur because of pathologic changes due to prior diseases, especially to adhesive inflammations leading to important stricture or occlusion.

"Injuries to the bladder by the penis of the male have been recorded, though very rarely . . . In the mare, this accident would seem quite as possible because of the very wide, valveless meatus, through which several fingers may be passed, but the penis of the stallion is much larger and the glands very broad." Williams.⁴⁸

VI

MANAGEMENT OF THE FOAL

1. HANDLING

As directed by Williams,⁴⁸ "The first object . . . of a caretaker of new-born animals is to see that they begin breathing promptly, that any impediments to respiration are removed quickly, and that any other means necessary for the prompt establishment of respiration are employed.

"It should immediately be seen that the nostrils of the fetus are free, so that air may readily enter the lungs; if portions of the fetal membranes cover the nose, they should be removed; if mucus has collected in the nostrils, it should be taken away promptly . . . In many cases perhaps, this mucus (clot of firm mucus which may be found lodged in the larynx) could be dislodged by manipulating the tongue—by alternately drawing it forward and allowing it to retract.

"It has been claimed that in some cases the fetus has been strangled during birth owing to the inhalation of fluids because of interruption of the umbilic circulation. This is rarely if ever, true, but if suspected it may be advisable to drain out some of the fluid by suspending the young animal for a few moments by the hind legs or by placing it in a position with its head lowered. This is a good practice . . . as the lowering of the head stimulates the respiratory center in the brain. If, however, the fetal circulation is good, any fetal fluids which may have been inhaled are promptly absorbed and cease to have danger for the young animal.

"In tardy birth, suspended animation may occur because of a too long delayed respiration . . . It seems to make little difference whether a fetus be born where the temperature is at 0° or 90° to 100° F. It seems, however, that the dashing of cold water upon the fetus or vigorous stroking of the chest will arouse the act of respiration in some cases. Generally, the induction of respiration should be attributed to the reflex influence of the venous blood upon the central nervous system. This reflex is best aroused by suspending the new-born by its hind legs as mentioned in the preceding paragraph.

"Artificial respiration may also be induced by the usual compression and relaxation of the chest walls, or by inflating the lungs by forcing air through the nostrils with a small bellows, should such an apparatus be at hand. So long as the heart continues to beat, there is possibility of inducing respiration, and efforts should consequently be continued, so long as the cardiac action persists. As a general rule, respiration can not be established at all unless it succeeds very promptly so that in those cases where the animal does not breathe within two or three minutes it will probably die in spite of the fact that the heart may continue to act for ten or fifteen minutes.

"The umbilic cord must be divided and the previous relation between the mother and young severed. This result in a wound which involves the arteries, veins, and urachus, each of which communicates with internal parts of the system of the young animal. Naturally, the umbilic cord becomes ruptured in a variety of ways. In the foal the cord is so long that it is usually not ruptured when the fetus is expelled, if the mare is recumbent, but gives way only when she rises to her feet, and even then in some cases not until she turns her head toward the fetus in order to care for it, and in so doing pulls the cord in two near the umbilicus. In other cases . . . the chorion becomes detached from

the uterus almost immediately after the expulsion of the fetus and comes away with cord still intact. It is then ruptured later by the struggles of the fetus itself. The mare may step upon some portion of the membranes when the foal is attempting to get up, and the foal, in falling, throws its weight upon the cord in such a way as to rupture it.

“ . . . In examining the navel cord of the foal, one finds that immediately against the umbilicus there is a dense area extending for a distance of about 1½ inches which changes somewhat abruptly at a marked ring to the soft umbilic cord. This projection consists of a hairless skin, which, in the healing of the navel, atrophies and disappears. Just beyond this point, one or two inches from it in the foal, is the weakest point in the cord, where it ruptures or is torn in two.

“The rupture of the umbilic cord stands a part as a universal physiologic wound, which under favorable conditions pursue a course in healing which fulfills the highest ideals of surgery. The processes involved in the healing of the wound include prompt and efficient hemostasis, thorough drainage, and the rapid aseptic desiccation of a large mass of necrotic tissue, which hermetically seals the tissue of the young animal against invasion by bacteria. In normal environment, these fundamental processes of repair proceed perfectly and rapidly, far more safely than the healing of accidental or surgical wound, in the hands of many surgeons. The hemostasis is notable for its promptness and perfection in detail. The umbilic arteries, usually ruptured by linear tension, at a distance of about two inches outside the umbilicus . . . recoil elastic cords, and their broken ends come to rest at or near the urachal end, or fundus, of the urinary bladder . . . The ruptured ends are somewhat fibrilated, their walls become greatly thickened as a consequence of the recoil, and their lumen becomes virtually eliminated. The recoiling artery drags the loose perivascular connective tissue with it, invaginating the fibrous mass to form an intricate entanglement which serves as an impassable barrier to blood. A few drops of blood, and only a few, escape from the broken ends of the arteries, to constitute a very limited extravasate. The broken arteries then rest far afield from any threatening infection . . . The fetal end of the urachus, flanked on the right and the left by the umbilic arteries, retracts with them into the peritoneal cavity and comes to rest two or three inches above and behind the umbilicus. The behaviour of the urachus is parallel to that of the arteries; no urine escape from it physiologically. Pathologically, if the urethra is not open, the pressure of urine within the bladder forces open the recently ruptured tube, and the urine escapes through the navel. This is exceedingly rare . . . Not infrequently when the cord is ligated and the urachus held in the decaying umbilic stump—less commonly when the umbilic stump is let alone—the urachus reopens, similarly to the secondary hemorrhage of infection.

“The umbilic vein, without material retractile power, remains in its original position after its rupture. Immediately after its rupture, most of the blood contained in it at the moment falls away exteriorly. Perhaps some of its blood—how much is unknown—is drawn into the auricle and remains a part of the living blood mass. The absence of valves in the vein permits an almost perfect drainage. As soon as the chief volume of blood has escaped, the thin-walled vein collapses, retaining only a very small amount of blood. If, however, the vein is ligated prior to the escape of the blood, it becomes imprisoned, necrotic, and subject to the same laws of decay as a hematoma in a wound. After the vessel has collapsed, its walls adhere, and it remains in the adult as a fibrous vestige constituting a small ligament passing from the umbilicus to the liver. This behavior of the umbilic stump is highly important in relation to the well-being of the young, since through this portal serious infection frequently occurs to constitute the disease known as navel infection, or omphalo-phlebitis.

"The lymphoid Wharton jelly, which fills and rounds out the space between the amniotic sheath of the umbilic cord and the vessels, is determined feebly by a very loose, frail connective tissue. Following physiologic rupture, the jelly quickly oozes away. There remains in the umbilic stump the vein, the amniotic sheath, and any remnant of Wharton jelly not yet escaped. The circulation in the stump ceases at once; the lymph, serum, and other liquids in the necrotic stump ooze away; the stump desiccates and hardens; and the body tissues beyond are hermetically sealed. Beneath the desiccated stump, healing proceeds rapidly and perfectly, and within a few days the necrotic mass drops away, leaving an intact surface.

"Occasionally there are variations in promptness and exact position of the rupture of the umbilic cord. Cases have been recorded where it has given way immediately against the umbilicus, but these accidents are very rare and apparently accompanied by little, if any danger. A commoner deviation from the normal rupture of the cord is its giving way at a point too remote from the abdomen, so that in some cases we find the navel stump of the foal . . . five or six inches in length. This leads to two dangers. The extra length of the cord prevents the rapid escape of the Whartonian jelly and the retraction of the umbilic arteries from the exterior; infection and putrefaction occur in the cord, which may lead to an inflammation of the veins, arteries or urachus, thereby imperiling greatly the life of the fetus. In other cases, when the cord is too long, it may be trampled upon or become otherwise caught, and the fetus, in struggling, may tear it away too close to the umbilicus, and make a fresh wound, inviting infection.

"Two conflicting courses in the care of the navel stump are advised by veterinary obstetrist, with and without ligation. I prefer either to allow the cord to be ruptured naturally or to imitate and supplement nature with antiseptics and artificial desiccation. If the cord has not ruptured spontaneously, or if the stump is too long, it is to be ruptured at the proper point by linear tension. The cord is grasped at the point where it is desired to sever it, with the thumb and index of each hand and, by drawing the hands apart, is torn asunder between them. If the cord is too strong, one may facilitate the rupture with the thumb nail, or by scraping the cord in two with a dull scalpel.

"After the cord has been divided, the Wharton jelly and all fluids should be pressed out of the remaining stump as completely as possible, by grasping it close against the umbilicus, between the thumb and finger, and then drawing downward, forcing the fluids out from the broken end. This operation is to be carried under strict antiseptic precautions, and as soon as completed there should be applied a desiccating antiseptic powder, consisting of almost any reliable antiseptic of a character which will not prove caustic to the surrounding parts. Such an antiseptic powder may be composed of equal parts of alum, tannin, and oxide of zinc, or of equal parts of tannin and iodoform. A variety of antiseptics may be selected . . . The essential point is thorough antiseptics and prompt desiccation of the stump. It is aimed simply to second the efforts of nature to bring about aseptic desiccation of the stump. The application of the desiccant antiseptic powder is advised as soon as possible after birth, to be repeated every hour or two until the desiccation of the stump is complete.

"Many veterinary obstetrists advise that the cord be ligated then divided beyond the ligation; others advise that two ligatures be applied and the division be made between the two. Some suggest that the ligated fetal stump should later be frequently washed with a liquid antiseptic, and thus guarded against serious infection. It is evident that, if antiseptic solutions are applied with sufficient frequency and thoroughness, they may accomplish their purpose of preventing putrefaction of

the cord, with its accompanying dangers. This is neither as efficacious nor as convenient as the preceding plan. The presence of the ligature tends to prevent the retraction of the stumps of the umbilic arteries, and keeps them in a position where they are far more exposed to the possibilities of infection. Ligation is wholly superfluous as a protection against hemorrhage. I have known of but one fatality from umbilic hemorrhage. This occurred in a foal in which the cord was ligated and excised. One must recognize clearly the far greater tendency toward hemorrhage from an artery when it has been divided by cutting instead of by linear tension, scraping or other kind of mutilation. If, in addition to this the artery is not allowed to retract or its proper retraction is interfered with, the tendency to bleeding is greatly increased.

“Ligation of the umbilic cord by an ignorant layman or careless veterinarian is one of the most dangerous interferences with a wound known to surgery . . . The Whartonian jelly is imprisoned by the ligature within the almost impervious amniotic sheath of the cord. The ligature also imprisons the blood in the umbilic veins. The imprisoned fluid furnishes an excellent culture medium for decomposition bacteria; the dirty hands of the operator, the dirty ligature, or the flies attracted by the moist cord furnish the infection. The ligature may detain the arteries, veins, and urachus in the infected area, and eventually these may be involved in a more or less extensive infection causing a series of highly fatal maladies.

“. . . In the foal, with the long cord, the meddler may tie the unbroken cord, incarcerate and detain the urachus and umbilic arteries, and imprison the Whartonian jelly and the blood within the umbilic vein or elsewhere. Consequently umbilic infection is far more common in foals than in other newborn animals.

“. . . The urthra, anus, and other external openings should be observed, to see whether they are normal.

“. . . It should be learned whether the various excretions are taking place normally. It must be learned that the intestinal contents are being expelled normally. The chief concern is with the accumulated fetal feces, or meconium, in the large intestines. Normally, much of this should be expelled very shortly after birth and the evacuation repeated at frequent intervals until all has escaped. In some cases this does not occur . . . and symptoms of retention of the meconium follow. The early discharge of the meconium is also important because in many cases infection has existed in the uterine cavity, penetrated the amniotic cavity, been swallowed by the fetus, and stored up as a part of the meconium as in a cesspool. After birth, the accumulated infection tends to become active and cause scours and other serious affections of the newborn. It is highly important that the caretaker should see that the meconium is promptly expelled. If necessary, this should be favored by means of enemas of warm water, warm normal salt solution, or soda bicarbonate solution. The enemas should be continued until all hard pellets of meconium have come away and there follows instead a soft, pasty mass. The enema is best given by means of a hospital irrigator with a pure gum horse catheter attached. The catheter is gently insinuated into the bowel for a distance of eighteen to twenty-four inches, while the enema is flowing, and the enema continued and repeated until the object has been accomplished.

“The question of food for the new-born animal should be considered early. It has been believed and taught that a weak foal . . . unable to get up, should be helped to its feet very promptly and assisted to the teat, or that milk should be drawn and fed to it. Such a young animal is sick and needs physic more than milk. A good rubbing, a comfortable place, and enemas to unload its bowels are worth far more than food. There should be no haste in getting the young to feeding. A pound of

milk two or three times a day to a foal . . . is ample until the meconium is all out of the alimentary canal and it is seen that the young animal is really well and in fit condition to digest food.

"The young animal should not be allowed too much milk, since it will frequently overfeed. This is especially true of the foal, which sometimes shows an inordinate appetite and seems to consider it incumbent upon it to take all the milk which the udder of the mother contains, thereby seriously overfeeding, which may end in more or less severe indigestion. It is consequently advisable, in many instances, to milk out a portion of the milk for the first few days in order to prevent the overfeeding of the foal.

"Some writers insist that it is highly essential for the young animal to receive from the mother the first milk, or colostrum, because, they say, this acts as a laxative and brings away the meconium which has become accumulated in the intestinal tract. Clinically this theory is apparently not so important as some persons would have us believe . . . In young animals which get all the colostrum, retention of the meconium is just as common as in those which get none of the colostrum . . . A good enema will clean out more meconium in fifteen minutes than colostrum will in a week.

"The young animal should be placed and kept under comfortable and favorable conditions, free from extremes of temperature. Although it may withstand quite high and low temperatures without serious injury, if the temperature be extremely low the extremities of the new-born, especially the ears and tail, very readily freeze, or its life may be quickly imperiled under such extreme conditions. In very hot weather flies may be exceedingly troublesome and annoying. They may carry putrid infection to the navel of the young animal, causing serious and fatal diseases.

"Exercise is quite essential to the new-born animal as to the adult. But the young of the larger herbivora is ready for considerable degree of exercise within a few hours after birth, which should be promptly provided in all cases. When the mare is allowed to run at pasture, the foal has plenty of exercise. With work animals it is not injurious, but rather beneficial, for the foal to follow the mother if she is engaged in slow, light work."

Kennedy⁶¹ writes in regard to the care of the foal as follows: "The colt's belly and cord should be cleaned immediately with some good disinfectant. A good way of doing this is to cut the umbilical cord about an inch and a half long, and completely immerse the same in an iodine solution, also washing the immediately surrounding parts of the belly with the solution. It is important that this gets on the inner parts, as well as on the external surface of the cord. The cord should later be treated with some drying powder. A suitable powder is made of two parts each of tannic acid, boracic acid, and zinc oxide, with one part of iodoform. Formerly it was thought well to tie the cord, but it was found that this has a tendency to keep a jelly-like substance within the cord, forming a good medium for the action of bacteria. The proper treatment is to use some material that will tend to dry up the cord as quickly as possible, and at the same time keep out bacteria. The whole process is to prevent putrefactive germs from entering the raw navel, although it may happen that the germs entering through the mouth may cause the same effect. Scours is another disease that often comes from getting disease germs into the system.

"Another trouble that often affects foals during the first 24 to 48 hours is constipation. If the colt does not receive the first milk, known as colostrum, which is nature's laxative provided to start the passage of the bowels, he may have serious difficulty. Many breeders do not notice that there is anything wrong with the colt until he begins to weaken

and fails to take nourishment. When the trouble has progressed thus far it is often hard to treat successfully. The simplest treatment, if the colt fails to make the proper passage of the first excreta, which is dark brown in color, is a solution of soapsuds injected into the rectum. This treatment should not be given unless necessary, which will seldom be the case when the mare's milk is normal and the colt healthy."

It is further pointed out that the best place for both the mare and colt is in a rich good pasture where digestive troubles are seldom contracted. In starting the mare to work she should be brought in during the middle of the forenoon and afternoon for the colt to suckle. As soon as the colt is accustomed to be away from her mother and without milk, the mare may be brought in at half day periods as long as the days are not too long. With heavy milkers or if the mare is warm, part of the milk may first be drawn or else scours and indigestion may result in the digestive system of the colt. When the mare is warm she should be cooled off before the colt is turned to her. Colts should never be nursed from hot mares. It is also advised that colts should be taught to eat early because in so doing they will hardly miss the dam at weaning time.

Carlson⁶ hints that the first three days following parturition is a trying time for the foal. He recommends that as soon as the foal has been born the first thing to be done is to disinfect the navel with any of the coal tar preparations in five per cent strength, or a 1-500 of one per cent solution of corrosive sublimate may be used. Lysol, which is considered good, may be used in a solution of one teaspoonful to one pint of water. He dislikes the practice of tying or ligating the umbilicus for, he says, it leads to the formation of pus which later has to be absorbed. It is claimed that in nine cases out of ten the umbilicus will tear off naturally. Where, however, it has to be cut this should be done six inches from the body. Should there be excessive hemorrhage, the umbilicus may be ligated with a disinfected cord and in a few hours this may be removed followed by a thorough emptying and disinfection of the umbilicus. During the early part of the season it is said that the danger from infection is more than late in the spring and during the summer months. Hence, the necessity of proper precautions to be taken during such time.

As to the feeding of the new-born, Carlson⁶ emphasizes the need of supplying colostrum the first time, whether the foal is to be naturally or artificially fed, on account of the purgative effect which this first milk gives to the system. Should the foal be weak to find its mother's teats it is advisable to milk the mare and the milk given to the foal when still warm. This could be accomplished better, it is claimed, by means of a dessert spoon. After doing this once or twice the foal is said to acquire sufficient strength so as to look for the mother's udder.

During the first twelve hours of the foal's life the foal should have had its bowels and kidneys working normally. Should these fail, which may be seen in the foal standing with the back arched, the tail erect and afterwards with the head and ears drooping, proper measures should be adopted to render bowel movements normal. At first a little olive oil may be injected into the rectum, which generally would start the evacuation of feces. But in case this fails after several hours an ounce of castor oil may be prescribed and the rectum irrigated with warm soap suds. Castile soap is recommended.

For the well-being of the new born it is advised that the mare be fed lightly until the foal is eight or ten days old. Then afterwards the feed may be increased gradually and both mare and foal may then have access to good grass. When three or four weeks old the foal may be started on good clean oats, giving a little at first and later on gradually increased so that the foal may eat at will until weaning time.

Cases are known of some mares giving no milk for the foal. Notwith-

standing, it is advised that the foal should be allowed to suckle regularly every two hours or oftener and eventually in many cases the milk flows before the third day passes. Meantime the foal should be fed cow's milk until enough milk may be gotten from the dam. The manner of preparing and feeding the cow's milk as indicated by Carlson should be: "Into a pint jar which has previously been sterilized with boiling water pour water to one-eighth full add one teaspoonful of granulated sugar, and fill with new milk from a fresh cow if possible. This should be fed warm, at the body temperature, and the pint will be sufficient quantity for one feed, but it should be fed as often as every two hours . . . A nipple over the spout of a teapot is the best thing to use for feeding a hand-raised foal."

Dysentery in foals, Carlson⁶ believes, may be due to the mare eating moldy hay or grain, or that the milk is too rich and too copious. In the latter case, it is recommended that the milk be drawn out to a large extent and the foal given a teaspoonful of lime water in a few teaspoonfuls of milk every two or three hours. The grain feed of the mare should also be reduced for a time. This has reference to non-infectious dysentery only.

According to Harper,⁹⁵ the foal should be fed oftener than three times daily during the first few weeks of its life and so accordingly, it is advisable to let him go with the dam in the field. Later he may be kept in the barn and the dam brought in at intervals for the foal to suckle but not when the mare is tired and warm. When the colt is two months old supplements may be added to the mother's milk. Such grains as oats, shorts, peas, and perhaps some corn are advocated for growing colts, while for roughage alfalfa, clover and mixed hays may be given. At teething periods give steamed crushed oats or bran.

Diarrhoea is claimed to be due to an over supply of milk, according to Harper.⁹⁵ So in this case some of the dam's milk should be drawn, but it must be born in mind that the last milk is the richest in fat and therefore the part causing the ailment. To check this disturbance parched flour, rice meal gruel, boiled milk and whites of raw eggs are recommended. On the other hand, if the food is constipative, Harper prescribes the use of castor oil and the injections of warm water with soap added to it previously.

Burkett⁶⁴ holds that the colt should not have access to a wet or damp bed until about a month old. He is of the opinion that the colt should be left in the barn from morning until noon in case the dam is worked and that the dam should cool off before the foal suckles.

In a detailed way, Carter⁸⁷ presents the care and feeding of the foal in the following words: "When the colt comes don't be anxious to have the navel break. Sometimes it wouldn't break for an hour but even if it doesn't do not attempt to cut, for you couldn't cut in the right place . . . When it breaks it will break where nature intended it to. A navel that is cut will rot off to that point where it was intended to break and it will take from ten to fourteen days longer to heal. As soon as it breaks it should be dressed . . . I have had good results by dressing the navel in a solution made up of one tablespoon full of carbolic crystals dissolved in a pint of warm water. I then apply powdered boracic acid and every day thereafter until the surface of the navel is entirely dried up. The navel should never be tied up. Don't be alarmed at bleeding . . . Some people use iodine for treating the navel . . . and found that it is too severe. The irritation from iodine causes the colt to gnaw and rub the navel which only makes it worse . . . Milk the mare after the colt has nursed and if there is any milk the colt is getting too much. Too much milk causes scours in colts. Colts should be kept hungry. Heavy milkers should be given light feed for a few days and should be milked to keep the colt hungry. Medicine on colts two days

old is fatal. Clover and alfalfa hay are good for poor milkers. The first four months of a colt's life is the period it should be tended to carefully. After two weeks of age colts seldom get too much milk. When the colt is a month old ground oats and bran should be kept before the colts all the time. Colts never eat too much. This feeding should be continued until weaning time—6 to 8 months of age."

Rutherford⁹⁸ directs that "As soon as the foals has emerged, free the head from the envelopes, see that the air passages are clear of mucous or other fluid, and lay the little animal on his right side. If the umbilical cord or navel string is not ruptured at birth, it may be tied with a stout cord a couple of inches from the navel and cut off below the ligature, and to prevent blood poisoning, or the absorption of septic germs, it may be dressed with a strong solution of carbolic acid, care being taken not to injure the surrounding tissues, or it may be temporarily smeared with carbolic oil.

"Gruel is advocated after parturition for the mare. Watch the foal for symptoms of constipation, which will be manifested in the first place by continued elevation of the tail accompanied by straining without the passage of feces. This will be succeeded by dullness and then by evidence of pain, the abdomen will become bloated; the little animal will show great uneasiness and begin to perspire and the pulse and respiration will be accelerated. In the early stages, a few ounces of soapy warm water or a little raw linseed oil introduced by a syringe into the rectum will generally afford relief, but should acute pain and distress make their appearance, the administration of two or three ounces of castor or linseed oil with twenty or thirty drops of laudanum and half a teaspoonful of turpentine well shaken up, will be in order; a small enema should also be given from time to time, and the abdomen covered with woolen cloth wrung out of hot water. These are much preferred to physics."

Wallace⁴³ says in regard to the care of the foal: "After a prolonged delivery the mouth of the exhausted foal should be cleared of slime, and air blown down its throat, to aid the first inflation of the lungs. In nature the tearing of the umbilical cord as the mare rises prevents after-bleeding, but, when aid is necessary it is usual to tie it in two places and sever it with a knife between the knots rather than to attempt to imitate nature by breaking it. If the mare be slow to lick the foal, it should be rubbed dry to prevent it growing cold, and, if weak on its legs, it should be supported and held in position to encourage it to suck as soon as possible. If this is unsuccessful, half a teacupful of milk should be drawn from the mare's teats, warmed, by dipping into hot water and poured into foal's mouth by means of a tablespoon; as a new-born cannot long survive without food. If everything has gone well and the foal is strong and warm and only awkward on its legs, some breeders think it best to leave nature to its own course, and the foal by instinct soon finds its way to the teats . . . To see that the anus of the foal is not by chance closed by an adventitious skin or membrane which requires to be broken . . . is all the further treatment necessary."

Wallace goes on to say that, "A foal that gallops till it perspires copiously on being put out for an hour or two after it is, say, ten days old, should not be allowed to lie on the cold ground or in a draught, else it is liable to scour and swell at the joints and become worthless.

"An ancient practice in Norfolk after the foal is two weeks old, is to feed it on skim milk, boiled linseed, and bran meal, getting gradually up to 2 gallons of milk."

Roberts⁵⁹ asserts that two of the critical periods in the life of the foal are during the time when the food is changed from the milk of the dam to a partial or entire ration of solid food, and during the teething time in which the temporary set is changed to permanent ones. He recom-

mends the feeding of a narrow ration, say one to five or one to five and a half, to colts up to the time they are ready for work. When the dam becomes pregnant the foal should receive additional ration, besides the mother's milk. Watering should be given twice in winter and three times in summer. It is claimed that during winter water which has been heated to 98° F. is most acceptable.

Regarding the separation of the mother from the foal when she is to be put to work, Roberts⁵⁹ states that "At first she should not be separated from her offspring but for a few minutes at a time; the time of each successive separation may be increased until it will be safe to use the mare for two or three hours at a time. The blood of the mare should not be overheated, nor should the foal be allowed to nurse when the mare is over-warm. A good plan is to allow the mare a liberal breathing spell at the far end of the field, with her head away from the barn, a half-hour or so before she comes to the stable. If this does not result in her cooling off, then it will be better to relieve the udder of some of the milk before returning her to the stable and her foal."

Sanders⁴⁶ advises the use of boiled beans as grain feed for foals. Precautionary measure is enjoined so that mares are first cooled off and the udder washed with lukewarm water before the colt is permitted to suckle. Should the foal become constipated the administration of a full dose of castor oil together with frequent application of warm soap and water enema are recommended. In some instances in which constipation is expected by previous indications foals should have a dose of oil shortly after birth. It is hinted that young foals often suffer from constipation as a result of feeding the dam on dry and indigestible foodstuff, particularly during the later period of pregnancy, and indeed so, with mares affected with dyspepsia at the end of gestation.

In a lengthy and comprehensive way, Dimon⁴⁰ gives account of the management of the foal: "When the foal is once firmly on his feet the first thing to do is to get him to suck, as he requires nourishment at once, and there is nothing equal to the first milk of the mother . . .

"It sometimes happens that the foal has not sufficient strength to break the blanket in which he is enveloped; then, unless some one is at hand to do so, the young thing will soon smother to death.

"When it is difficult to get the youngster to help itself, try to stream some milk from the teat of the dam into its mouth, and rub some of the milk on its nose. Continue this until it gets a taste of the milk, after which it will be more eager to help itself.

"Close watch should be kept to see that there is an evacuation of the bowels . . . If the foal exhibits symptoms of distress or much uneasiness, and especially if the hind legs are drawn forward and the head drooped and the little thing stumbles about the stall or paddock as if trying to stand on its head, or turn a somersault, give it at once an injection of half a pint of blood warm water with just enough soap in it to make it feel slippery to the touch. Glycerine may be added to the water in proportion to one part glycerine to two parts water. This may be administered by a common rubber bulb syringe suitable for family use, or by any other style of syringe not too large.

"It may be necessary to follow up the injection for a day or two. A dose of castor oil may be given if required; care should be taken not to give more than is necessary lest purging may be induced.

"More can be done for the foal in the first six months of its life than in any year thereafter, consequently the mare should be extra well fed during the time of nursing the colt, and then, if she proves to be a poor milker, as is many times the case, the foal should be fed in addition to what it can get from its dam. It should be taught to drink sweet skim-milk, which is very good for young foals. Do not feed whole, or new milk as cream is unnatural to the foal; there is none in mare's milk.

"When the colt gets to be three months old he will eat considerable food in addition to what he can get from the mare, and he should be liberally supplied with oats in a separate feed trough where he can help himself and where the mare cannot get to them to drive him away.

"When the mare is used on the farm or road in hot weather so as to heat her blood, the foal should not be allowed to suck until she has cooled off. Let him fill himself before the mare is put in the harness. Colts injured by heated milk seldom recover from it for a year or two, and sometimes never."

According to Roudebush⁷⁶ the colt should be allowed to nurse at will until two weeks old; afterwards, three times a day until the age of four weeks; and then gradually reduced so that at weaning time none is given at all. He disfavours the practice of allowing foals to follow their mothers in the field or on the road. Equal parts by weight of crushed oats and corn with a little bran are advocated to feed the nursing mother. Good suckling dams need but very little grain until the young is ten weeks of age.

According to Axe,³⁸ the meconium at times is retained in the body, manifested by the foal which keeps raising the tail, the back being arched and the position held is such as if to dung, and now and then straining is noticed without any result. To remedy this condition an enema of warm glycerine and water is indicated, which may be repeated, if necessary, two or three times daily. Or, failing on this a small dose of castor oil in a little warm fresh milk should be given immediately. Should constipation become habitual in the foal, it is advised to give an extra supply of carrots or green food to the dam, and besides a couple of ounces of sulphate of magnesia may be mixed with the food every day for three times.

Henry and Morrison⁵³ very comprehensively presents the procedure to be followed in feeding the foal and are here quoted at length: "By placing the feed box low, when 3 or 4 weeks old the foal will begin nibbling from the mother's supply and will soon acquire a taste for grain . . . Crushed oats or oatmeal, with bran are excellent feeds, as is a mixture of 4 parts of crushed corn, 3 of bran, and 1 of linseed meal. Colts should be given good clover, alfalfa, or other legume hay as soon as they will eat it, and all the clean, pure water they want . . . Diarrhoea brought on by overfeeding or exposure must be checked by giving parched flour, rice meal gruel, or boiled milk; and constipation, the other common evil, may be relieved by castor oil and injections of warm water, flaxseed tea, sweet oil, etc., administered preferably with a fountain syringe having a small hard rubber nozzle. Harm may be done by injecting a large quantity of strong soapy warm water with an ordinary 'horse' syringe. In all cases of derangement the food for both dam and foal should at once be lessened since nothing aids nature more at such times than reducing the work of the digestive tract.

"When the mare is worked, the colt should be left in a cool, dark stall during the day, where he will be safe and not bothered by flies, rather than allowed to follow the dam about the field. The mare should be brought to the barn to suckle the colt in the middle of the forenoon and afternoon. The colt should not be allowed to drain the udder when bursting full of hot milk, as indigestion and scours are apt to follow. Allow the mare to cool off, and perhaps draw some of the milk by hand before turning her into the stall with the foal . . . If the mare is worked during the day it is well to turn both dam and foal into grass pasture at night, and in addition feed a liberal allowance of grain.

"If flies torture the foal, it is better to keep the mare and foal in a darkened stall during the day and turn to pasture only at night.

"The foal may be taught to drink cow's milk by pouring it upon meal. The young thing readily eats the moistened feed, and by tipping the pan

it soon learns to drink the milk. At the Iowa Station Wilson and Curtiss successfully fed whole milk, and later separator skim milk to imported Percheron, Shire, and French-Coach weaning fillies shortly after their arrival from abroad and while out of condition . . . Grattan reports favorably on the use of skim milk for foals, even when the milk is sour or clabbered. MacNeilage objects to the use of cow's milk for foals, claiming 'no better means of manufacturing windsuckers was ever devised, and it is rare that yearlings so brought out count for much as 2-year-olds and 3-year-olds'—a timely warning against the too free use of this food."

For the care and management of the new born, Thomas and Shields⁸⁹ write: "The first attention to the colt should be to the umbilical cord (navel string) . . . The older horsemen and some younger ones, prefer to tie up the cord about a half inch from the body, and then cut it off, just below where it has been tied. The younger horsemen and many veterinarians advise against the tying up of the umbilical cord, since it has been found in some cases to imprison the germs of navel disease which have gained entrance to the navel before being disinfected.

"As soon as possible after the colt is born squeeze out the gelatinous contents of the umbilical cord, tie it up if you will but in any event paint it with an antiseptic solution, or, better still, dip it into such a solution. Dr. A. S. Alexander prefers an antiseptic solution containing 2 drahms of powdered corrosive sublimate to a pint of boiling water, to which when cold has been added, 3 drahms of tincture of solution of chloride of iron . . . Use this solution twice a day until the cord drops off. Dr. W. A. Barber of Springfield, Ohio, uses 'a solution of 9 parts of carbolic acid, dissolved in 1 part of alcohol, with 25 parts of camphor added, giving a clear oily solution that may be applied without fear of cauterizing and many times more efficacious, I think, than corrosive sublimate.'

"Dr. R. R. Dykstra recommends: Tincture of iodine is first applied to the cord and the area immediately surrounding it. After this apply a drying powder every half hour for a period of three or four hours, or until the cord is thoroughly dried up. This drying powder is composed of equal parts of powdered gum camphor, starch and alum.

"After the navel is attended to the next thing . . . is to inject some warm water into the colt's rectum so as to start the bowels working regularly. Some men use an injection of one ounce of sweet oil in a quart of warm water. Others use castile soap suds in warm water, but this is not widely recommended as the soap is thought to be too irritating. Users of soap suds injection claim it is not irritating, especially if glycerine is added. Olive oil makes a satisfactory injection. In extreme cases give an ounce of castor oil. A horseman writes 'For enemas would suggest the use of a few tablespoonfuls of liquid soap instead of castile soap-suds. It is non-irritating, and being of an oily nature serves a double purpose.'

"Dr. S. R. Howard says: 'The best rectal injections, in my opinion, are emulsion of slippery elm bark or warm cow's milk. No harm can be done by any amount used as they are natural in their action'."

Thomas and Shields⁸⁹ further point out that soon after the colt is strong enough, and weather permitting, both dam and foal should be turned in a paddock an hour or two, morning and afternoon. The time is gradually increased until eventually the colt is out the whole day. But at night they should be brought in. When warm weather is on both mare and colt should be turned out in pasture.

It is claimed that the foal may be troubled with diarrhoea when the mare comes in heat in 30 days, and although the former may resist the effects of this ailment, nevertheless, under conditions in which diarrhoea persists, Thomas and Shields⁸⁹ recommend the removal of the mare from pasture, keeping her in a cool and quiet place and subsisting her on

hay or grass, without any grain at all, for 5 to 8 days, until the colt's system returns to normal.

When the middle of summer comes the colts are said to need additional feed. Thomas and Shields⁸⁹ advocate the setting aside of feeding paddocks in pastures in which only the colts will have access to troughs placed 2½ feet from the ground. The colts may receive one feeding or two daily, according to the condition of the animals, but it is pointed out that enough be supplied as the colts will clean up. Some horsemen, it is said feed a concentrate mixture consisting of two bushels of oats, one of wheat, one-half of cracked corn, fifty pounds of bran and twenty pounds of oil meal (not oil cake but ground flaxseed meal). They should be salted once or twice a week, or in lieu of this have access to rock salt. In districts where the soil is deficient in lime a piece of fresh-burned lime of about a hen's egg in size should be placed in water troughs once or twice a week.

According to Alexander,⁹⁹ certain preparations are necessary if navel and joint disease of foals is to be evaded. This "consists in removing every particle of bedding, litter and dirt (from the maternity box stall). Saturating the floor with a strong solution of disinfectant, such as four ounces of sulphate of copper to one gallon of water, should be the next step and the walls, ceiling and partitions are to be treated in the same way. Then whitewash everything. In the fresh made lime wash mix a quarter of a pound of chloride of lime to each pailful and if possible apply by means of a spray pump which forces the wash into every nook and cranny of the wood or stone work. Put in fresh bedding when the above measures have been carried out. This is to be done each time the box stall is to be used by a mare about to foal." Alexander goes on to say that two box stalls should be provided. These should be built apart from each other and prepared in the same manner as indicated above. As soon as the foal is born and the mare has "cleaned" and washed both mare and foal should be moved to the second box stall and immediately the used one may be prepared for the next mare.

In regard to handling the new-born Alexander⁹⁷ writes: "When the foal comes, immediately wet its navel with a solution of half an ounce of corrosive sublimate in one pint of boiling water aciduated with one dram of hydrochloric acid. When cool, color this solution with a couple of drams of tincture of iron and label "poison." After applying the medicine to the navel, wash the foal's belly with a 2 per cent solution of coal tar disinfectant and use the same strength wash for the udder and genitals of the mare before the foal is allowed to suck. Repeat the applications of strong solution at least twice a day until the navel cord dries up, drops off and there is no raw spot left. The applications to the udder and genitals of the mare should be repeated twice daily until all discharge from the vagina subsides. The strong disinfectant solution applied to the navel at birth destroys any germs present and the after applications keep the part absolutely free from germs besides having cauterizing and astringent effects which are highly beneficial. As it is often necessary to tie the foal's navel at birth always be careful to use a cord that has been kept soaked in 5 per cent solution of coal tar disinfectant, carbolic acid, or 1-2000 solution of corrosive sublimate solution as above prescribed." This treatment does not only prevent the occurrence of navel disease but besides it prevents scours. Alexander⁹⁹ says that "Where personal attention cannot be given several times a day the work may be lessened by covering the navel with antiseptic cotton on which has been freely sprinkled a mixture of one dram of iodoform and seven drams of boracic acid. This should be used after wetting the navel with the strong corrosive sublimate solution and is to be held in place by a wide bandage around the body. The dressing should be removed once daily until the navel has healed."

Ogilvie⁹¹ discusses at length the method of feeding and handling foals, thus: "I would not advise taking the foal away from its mother during the working hours through the spring seeding time. They can do no harm to crops by running with their mother in the field, while at work during this period. The occasional nursing that can be given the foals during the day, if following their mothers in the field, will be very helpful in giving them a good start in life, and the foals may be depended on to take better care of their mothers' bags during the first month after foaling, than the average farm hand will give them.

"When foals are four weeks old, you can begin to feed them with a grain ration of bruised oats, with fresh wheat bran, moistened with cow's milk, even though you use skimmed milk. If you are unable to provide milk, moisten their grain with water sweetened with . . . 'black strap' molasses. A double handful of grain, mixed as above, will make a good ration for each foal three times daily for the first month, you can increase this 50%, and after the second month double it, and continue this ration until weaning time."

"Later in the season when foals by running with their dams might be destructive to growing crops that are being cared for I would advise keeping them in a small paddock, near barns, if you have one; if not, keep them in a barn during the day allowing them to nurse just before the mares leave the stable in the morning, after dinner, at noon time, and not until after supper, in the evening. But not allowing the foal to nurse immediately upon the arrival of its mother at the barn at noon, and in the evening, it will give her time to cool off, and the foal will do much better thereby, than if allowed to nurse its mother while she is in a heated condition, for we all know the result of scalded milk given to a nursing foal.

"If you have more than one foal, give them the freedom of a paddock, or house them together in one box stall, or pen. The equine family . . . will be more contented and thrive better if kept together, than if tied in separate stalls. The exercise that they will receive by being kept in paddocks, or loose boxes will in itself be beneficial to them.

"During the first winter, I would advise allowing foals to run together in an enclosure that will give them shelter from the winter storms, and at the same time plenty of exercise during the day. A feed of boiled oats, and roots . . . with bran sufficient to absorb the liquid in the boiled feed, will make a good feed for them, at least once a day. At other feeding times continue the ration above prescribed, only in an increased quantity."

In regard to the care and feeding of foals, Reese⁸⁹ says that "It is best to turn the mare and colt in a lot where they can exercise and yet be quiet, but care should be taken at first to see that the foal is not chilled by staying out too long in cool, disagreeable weather or by lying on cold, damp ground. They should not be on grass if the mare has not been on grass before." It is also advised that in case the mare is being worked, which should be in a little over a week if she has been worked previously, "If the foal is left in the stall, the mare should be brought to the stable, in the middle of the forenoon and afternoon in order that the foal may get its food, but in no case should a foal suckle a mare that is very warm, as digestive disorders are likely to follow. If possible, do not use the mare for purposes which will keep her away from the barn for a long time, as the foal will either go too long without nursing or else will be worn out by following the mare. When left at the stable the foal should be kept in a roomy clean box stall in company with another one of about the same age if possible." Later on, Reese continues, "At about 2 months of age the foal will take dry feed, which should be supplied through the dam's grain box. This makes it necessary to furnish her with such feeds as ground oats, corn meal and bran. A little later

on a 'creep' should be built in the stall or pasture, inside of which the foal can be supplied with grain without having to share it with its mother . . . A handful of ground oats should be given at first, and the quantity should be increased slowly as the foal grows. The maximum amount should be about 1 pound a day till weaning time."

McC Campbell⁶³ states that "If the mare is worked, the colt should be left in a cool, dark stall during the day. For the first few weeks the mare should be brought to the barn and the colt allowed to suckle in the middle of the forenoon and the middle of the afternoon, as well as at morning, noon and evening. The colt should be left with the mare at night. Encourage the colt to eat as soon as possible, preferably crushed oats with bran. If oats are not available, the following ration may be substituted: crushed corn, four parts; bran, three parts; linseed meal, one part; these proportions being by weight. Let the colt have alfalfa or clover hay as soon as he will eat it. See that he has access to clean, pure water at all times, if possible." McC Campbell also remarks that "If the mare and the foal are running in the pasture, a 'creep' should be made where the colt can have access to grain. To raise high-class horses one must feed them liberally and keep them continually growing and developing from the very first . . . The stunted colt never fully recovers. The feed and the care a colt gets during the first year and a half of its life determine largely what that colt will be at maturity."

In an elaborate manner Johnstone⁵ presents the procedure by which the management and feeding of the new-born may be carried out, and writes: "During the closing period of its fetal existence there collects in the intestines of the foal the fecal substance known as meconium. This must be gotten rid of shortly after birth and usually is, the milk in the mare's udder at parturition, known as colostrum, having an aperient action . . . Its chief peculiarity physically is that its fat globules are very large. Its aperient action is due, probably, to its long retention in the udder and to the milk fermentive process which has been going on in it for some little time prior to its withdrawal. The milk which is secreted within an hour after the withdrawal of the colostrum has no aperient action to speak of, and hence it is believed that the action so necessary to the foal is derived from some principal evolved during the retention of the colostrum in the udder, which sets up a mild form of indigestion and so induces the peristaltic action of the bowels which removes the meconium.

"If the foal gets his first hold on the maternal dug within an hour from birth, that will be all right. Usually the meconium will pass away easily within five or six hours, but sometimes it will not. If it does not come within twenty-four hours and the foal presents a droopy, listless appearance, eye not bright, ears lopped over, then the first thing to be done is to give him two ounces of castor oil. In five hours more relief will usually have been gained and the appearance of the youngster will change greatly for the better. Peristaltic action will be caused and the fecal matter will be removed. At the time of administering the castor oil give also an injection of water at blood heat and a little glycerine—a teaspoonful of glycerine and enough of the warm water to make two ounces—not more. Inject this gently into the rectum with a common two-ounce hard rubber syringe and go slow. This will lubricate the passage and induce the foal to endeavor to pass the fecal matter. The meconium is in such cases a yellowish, rather hard, waxy substance. If given as directed the injection cannot do any harm and may be repeated every hour.

"There is, of course, no digestive action in the new-born foal. The entrance of something into the stomach is necessary to start the machinery into motion. If this is not affected by the colostrum, there is nothing so good as castor oil and the injection described. Never try to

fill the little foal up with copious douches of soapsuds or even plain warm water. Only a very little is needful. To discover if peristaltic action . . . is going on, hold the ear close to the left flank of the foal. If all goes well the noise heard there will indicate that the small intestines are in working order, which is the first object sought. The noise on the right side will indicate what is going on in the larger intestines. If the meconium is not passed in six hours after the administration of the castor oil, the dose should be repeated."

To prevent the entrance of joint-ill organisms Johnstone³ recommends the ligation of the navel or umbilical cord. "Being easily destroyed, these germs are readily combated by the application of any good anti-septic, but corrosive sublimate is to be preferred, using a 1-500 solution to swab the small portion of the cord left pendant from the body of the foal immediately after ligation—which means tying a string around the cord. Ligation should be as close to the body as possible, and the string should be surgeon's silk. The corrosive sublimate solution should be applied twice daily to the pendulous portion of the cord until it drops off . . . always clean out the stall after the mare has foaled and burn the litter. The fluids incident to foaling seem to promote germ production in an amazing degree.

"Foals to develop to their best should have about all the grain they will eat, and their dams should be well fed also. If the mares are worked their feeding need not bother any one. Their foals should have oatmeal and bran as already described to eat at will, only a little at a time, and the supply renewed often so as to keep it always fresh and sweet When the foal gets old enough he may eat grass if he wants it and his grain as well, but the milk he sucks should always be the same. Hence let the feeding of the mare be uniform."

With mares that are to be worked, Johnstone⁵ advocates to leave the foal in the boxstall when the mother is to be taken out to work. At first the colt will fret but soon afterwards he will get accustomed to being alone. The plan suggested is to work the mare for half a day the first time. It is claimed that she will worry greatly and be soft so that she may become heated badly. It is recommended on coming to the barn at noon from work to milk the mare almost dry and then to put her in the stall where she could have little hay and at the same time cool off. After cooling off she is watered and then turned in with her foal in a boxstall where she also gets her grain. The mare is gradually hardened in her work until finally she is harnessed to do her regular job. Johnstone directs not to let foal suckle from a warm mare as, he says, it causes indigestion and scours. A bucket of water should be available in the boxstall for the foal.

According to Gay⁴ the new-born is perhaps most commonly affected by impaction of the meconium in the bowels. This excrement is, however, naturally removed by the purgative properties of the colostrum, the first milk suckled by the young. But if for some reason meconium has not passed out within twenty-four hours, it is advised to resort to the administration of a tablespoon of castor oil and a warm water injection. Navel infection is mentioned as another common cause of the death of foals. To prevent the foal from this affliction, Gay recommends the removal of mares that are to foal from infected quarters to clean and non-infected sites. It is also claimed to be a safer practice that the stump of the cord be washed with a saturated solution of boracic acid and dusted with boric acid powder. Gay is of the opinion not to cut or ligate the umbilical cord but instead it should be allowed to break naturally.

Regarding some precautionary measures to be observed and the method of handling the suckling colt, Gay⁴ writes: "The milk flow must be maintained by succulent forage, the colt must be fed often, and the dam

must at no time be in such a condition as to render the milk injurious to the foal.

"Most breeders advise leaving the colt in the stable while the dam is at work, but others allow the colt to follow the dam to the field. The objection to the former method is that unless the mare is returned at least once during each half day the colt becomes very hungry and when the mare comes to him sweating he gorges himself on the milk with which the udder is distended. This milk is often rendered injurious by the heated condition of the mare, and it thus becomes a cause of serious digestive disorder, especially when so much is taken. It is a good thing to encourage the colt, as it grows older, to take a few oats, preferably crushed, from its mother's allowance, or a creep may be especially constructed for the foal to feed in. If two mares and foals are allowed together, the youngsters will form an attachment for each other which will prove of great service in reconciling them to the weaning process."

2. RAISING THE ORPHAN FOAL

Alexander,¹⁰⁰ in presenting a system by which orphan foals may be raised, writes: "Choose the milk of a cow that has recently calved, preferably one which gives milk low in butter fat, for mare's milk while rich in sugar, is poor in fat. Sweeten the milk with molasses or sugar and dilute with warm water. Give a little of this modified milk, from a scalded vessel, at short intervals. Add an ounce of lime water to each pint of the prepared milk and allow half a cupful once an hour at first.

"As the foal grows, gradually increase the amount of milk fed and lengthen the intervals between meals. In a few days food may be given six times a day and, later, four times daily. The foal will soon learn to drink from a pail, if allowed to suck the attendant's fingers at first. Keep the milk utensils scrupulously clean.

"Until the bowels move freely, give rectal injections night and morning. If the foal scours at any time give the treatment . . . on diarrhoea, and stop feeding milk for two or three meals, allowing sweetened warm water and lime water instead. Let the foal eat oatmeal as soon as it cares to do so and gradually increase the amount and add wheat bran. In five or six weeks some sweet, skim milk may be given and the amount gradually increased daily until, in three months or so, it may be given freely three times a day in place of new milk. The foal at this age will be eating freely of grass, grain, and bran.

"Supply pure water as soon as the foal cares to drink. Let the foal run out in a lot or grass paddock for exercise. Accustom it to be handled daily. Feed small quantities of nutritious food often, keeping all food vessels clean, and the foal should thrive and develop well . . . Practically half of the full weight of a horse is gained during the first 12 months of its life. If stunted during this period the colt never develops properly; it therefore pays to feed generously."

Johnstone's⁵ desideratum in regard to orphan foal management follows: "In rearing a very young orphan foal get the milk of as fresh a cow as possible and the poorer in butter fat the better. Do not use Jersey milk for this purpose. Take a dessert spoonful of the best white granulated sugar and add enough warm water to dissolve it. Then add three tablespoonfuls of lime water and enough new milk to make a pint. A costless apparatus for feeding the foal is thus contrived: Get an old teapot and scald it thoroughly. Over the spout tie securely the thumb of an old kid glove, and with a darning needle pierce holes in the kid. Warm the milk to blood heat, pour a part of it into the teapot, and when it flows through the spout into the glove thumb, an excellent imitation of the maternal teat will be formed, which the foal will suck promptly. Let him have half a teacupful every hour at first. It is a bothersome chore, but it must be done. If scours supervene, give a dose of two ounces of

castor oil and discontinue the milk for a couple of feeds, giving the sugar and limewater as before but substituting plain water for the milk, or feed nothing at all. Foals reared by hand will scour more or less, but the castor oil will generally fix them up all right.

"As the foal grows older day by day the quantity of milk fed may be increased and the number of feeds decreased until according to his thrift he may be fed first six times a day and then four times. If he is carried along nicely he may at the end of three weeks be fed the milk and limewater or milk alone from a bucket, eliminating the sugar, but he should never be given all the milk he will drink at that age. Watch closely for signs of scouring, which are a sure sign of indigestion, and cut down on the quantity of milk fed for a day. Give castor oil as before only in three or four-ounce doses. Always have fresh water so the foal may drink if he is thirsty.

"A foal should begin to nibble at grain when he is around a month old, sometimes earlier. His first food should be oatmeal. He should be allowed such trifling quantity of this as he will eat. It will only be a very little at first. When he is six weeks old a little bran may be added. At two months old some sweet skim milk may be substituted for part of the new milk and so on until when he is three months old the orphan foal may have about all the sweet skim milk he wants three times a day. He will then be eating plenty of grain and grass and he should have hay if he wants it. Let him have grass as soon as he will eat it. Never feed sour milk or sweet milk from unclean vessels. Keep him in a lot near the house and give him company if it is only a runty calf. Pet him and coddle him all of the time that can be spared and in general treat him as every orphan should be treated—with loving kindness and care. Never confine him closely in a stall. Let him run. The rearing of a motherless foal is mostly in the man or woman who essays the job."

Wilcox¹⁰¹ makes the following remarks regarding the raising of foals by hand: "Colts to be raised by hand should receive fresh, warm cow's milk with a tablespoonful of sugar to each quart of milk. This addition of sugar is desirable on account of the fact that mare's milk contains more sugar than cow's milk and less fat. For this reason it is not best to use milk which contains more than four per cent of fat. Colts may be given a pound or less of suitable cow's milk five to ten times daily. Fresh separator milk may be substituted as with calves and some grain may be fed. Colts may be taught to drink in the same manner as calves within two months. Some feeders recommend the addition of one fresh egg stirred into the milk daily for the first few weeks. If the colts are to obtain their greatest development they should be fed grain as soon as they will eat it. For this purpose oats and bran are the best. Corn is not desirable for young colts since it does not contain sufficient protein."

Axe³⁸ says: "The most suitable milk for this purpose [for orphan foal raising] will be obtained from a heifer a week after calving, or if the foal has not sucked its dam it would be an advantage to procure a supply for the first 36 hours from a cow just calved, in order to awaken the bowels and provoke discharge of their contents.

"At first the proportion of water to cow's milk should be one part of the former to two of the latter, but as time goes on one part to three will be found more to the purpose, and later water may be excluded altogether.

"To maintain natural temperature (100° F) it should be drawn from a cow into a vessel previously warmed, and afterwards diluted with water raised to 100° F. At first half a pint should be given every half hour, and gradually increased as time goes on, while the intervals between meals may be extended accordingly."

Sanders's⁴⁶ dictum in the raising of the orphan foal also supports the

use of cow's milk. But this, he says, should be sweetened for the first time in order that it would approximately correspond to the mare's milk in composition: "A half pint is quite sufficient for a colt two or three days old; but the ration should be repeated often—not less than six times a day. As the colt grows older the amount should be increased and grass, with oats, should be added as soon as the colt is old enough to eat. After the colt is two months old skimmed milk should be substituted for fresh cow's milk. Should there be any trouble from constipation it will be well to add one pint of oil-meal per day to the ration; in fact, I would recommend the use of oil-meal in all cases. If oil-meal is not obtainable flaxseed may be used. A half-pint of flaxseed boiled with two quarts of bran will make two good feeds for a colt, and this ration may profitably be alternated with the other foods. Indeed, it will be well in all cases where, from lack of an abundance of milk of the dam, or from scanty nutrition of any kind, the foal is low in flesh, to early supply the deficiency with a good allowance of cow's milk in addition to what it gets from the dam . . . A quart of milk morning and evening, in addition to the grain ration, will be sufficient, and if it be sweetened a little at first the colt will take to it all the more readily."

According to Harper,⁹⁵ "Cow's milk, if modified with at least one-fourth its volume of water, together with some sugar, makes a fair substitute for mare's milk, but should be given at about the same temperature as mare's milk. Gruels made by boiling beans or peas, and removing the skins by pressing the pulp through a sieve, or oil-meal and shorts made into a jelly by boiling are excellent for the motherless colt."

Hughes⁹⁰ likewise considers milk which is low in butterfat and obtained from a fresh cow as being fitted to feed the orphan foal. His method of feeding follows: "To a dessert spoonful of granulated sugar should be added enough water to dissolve it. To this three tablespoonsful of lime water and enough fresh milk to make a pint should be added. A small amount, one-half pint, should be given each hour. In a short time the amount should be increased and feed should be given every two hours, more being given gradually and the time between feeding lengthened."

Kennedy⁹¹ gives a lengthy discussion on the raising of the orphan foal, and writes: "Cow's milk is the best substitute for that of the mare, although the latter has more sugar and less fat than the former . . . Milk low in butterfat is best for this purpose. One pint of cow's milk diluted with one-fourth pint of lime water, and to which a teaspoonful of sugar is added, approximately approaches the consistency of mare's milk. Lime water helps to prevent the milk from forming into hard curds. A nursing bottle with a rubber nipple is about the best means of giving the milk, but some prefer to use the spout of a teapot, with the finger of a kid glove on the end of the spout, with a hole punched in the same so that the milk can flow through it. The instruments should be thoroughly cleaned and sterilized with boiling water each time before they are used, and the milk should be warmed to a temperature of about 100° F. before feeding. At first the colt should be fed every hour, giving it about one-half pint at each feeding. It is advisable at the start to feed the colt two or three times at night, but after a short time, he will be able to consume enough milk to carry him through the night. As the colt grows older, the quantity of milk should be gradually increased and the number of feeds decreased, until he is about a month old, when, if he is doing nicely, he may be fed only four or five times a day and the sugar and lime water omitted. He should also be taught to drink out of a pail by this time, and the feed gradually increased, although great care must be taken that too much milk is not given, as the result will be scours. Many orphan foals are fed more milk than they need rather than not enough. The orphan foal should be taught to eat grain as early as possible. If a little is added to the bucket with the milk, the colt will

soon be munching at it when the milk is gone, and in this way will soon be eating grain. Unless the foal is early started on grain, he will generally become pot-bellied, and after such an appearance is acquired, it takes considerable time, good feed and care to overcome it."

3. COMMON AND INFECTIOUS DISEASES, AND OTHER AILMENTS

Purulent Infection of the Navel

"Purulent infection of the navel is greatly favored by many of the circumstances attending the birth of the young animal. When it is born in a stable or barnyard, or in surroundings where filth and dirt are abundant and omnipresent, there is constant exposure to infection of the new-made wound. Whenever the animal lies down, especially in sternal recumbency, the new-made wound comes in direct contact with infected bedding, decomposing feces or urine, or with other filth which may chance to exist at such a point.

". . . The herbivorous mother habitually cleanses the broken cord by licking, and thereby withdraws from it a large part of the Whartonian gelatine, thus favoring the early desiccation of the stump. It appears that in spite of the fact that the mouth usually abounds in pathogenic bacteria, the process of licking the navel is, according to clinical observations, comparatively safe and tends to protect the navel against infection. We observe infection of the navel most frequently in the foal, whose mother pays less attention to the navel than do other domestic animals.

"Purulent infection of the navel very frequently arises, also, as an indirect result of ligating the umbilical cord. The danger from ligating the cord consists usually of two principal elements—the infection of the wound by careless ligation, and the providing of a breeding ground for bacteria by the inclusion of the Whartonian gelatine."

"From a surgical standpoint, nothing can well be more dangerous to the new-born than the careless or filthy ligation of the umbilic cord by a layman or a veterinarian with dirty, infected hands and an unclean ligature

". . . If the cord is tightly ligated, the gelatine is firmly enclosed, and its fluid portions cannot escape readily and permit proper desiccation of the stump. Even if the ligature has been applied under other antiseptic precautions, but retains the Whartonian gelatine, the procedure is at once in conflict with surgical practice, because this substance constitutes an excellent medium for the growth of pathogenic bacteria The danger from infection is further emphasized if the ligature is placed at a point too distant from the umbilicus, thus increasing the amount of tissue in the cord which must undergo desiccation or putrefaction. The greater the amount of moist-tissue, the more probable is putrefaction, and the less likely is desiccation to occur.

Ligation possesses yet another danger, in the possible incarceration of the two umbilic arteries and the urachus. If the ligature is applied very tightly before the cord is severed, the retraction of the arteries and urachus into the abdominal cavity may be prevented. Being retained in the navel, the open ends of the arteries and urachus are freely exposed, and rendered more subject to infection during putrefaction of the tissues.

". . . When a ligature is applied to a dormant or dead tissue like the umbilic stump . . . the stump goes on to putrefaction or desiccation, as circumstances may favor. The application of a ligature about a mass of dead tissue cannot prevent infection of the necrotic mass on either side of the ligature, but may greatly favor putrefaction by confining fluids within the parts. When such bacterial infection and decomposition occur in the necrotic tissues of the cord, the more or less dor-

mant vessels incarcerated in the decomposing tissues are seriously exposed to bacterial invasion.

"It is thus a common clinical observation that purulent infection of the navel is greatly favored by the process of ligation, and the more improperly ligated the greater the danger. Admittedly a navel cord may be safely ligated. If the cord is divided at the proper point, the Whartonian gelatine thoroughly pressed out and the stump ligated under perfect aseptic precautions, followed by the application of an aseptic covering, and its retention in position and in an aseptic state (a very difficult task with domestic animals), the operation is safe.

"Another method by which infection apparently takes place is through the medium of flies, which are attracted to the cord while it is yet moist after birth. These filth carriers, having previously been in contact with infected wounds or putrid organic matter, carry the infection to the navel. Foals born during fly time very frequently suffer from navel infection.

Handling . . . We provide the breeder with a desiccating antiseptic powder for application to the navel cord as soon as the foal or other young animal is born. This powder may be variously compounded, but should consist of reliable antiseptics having a distinct desiccating power. We would suggest, for such a powder, equal parts of iodoform, tannin, oxide of zinc and starch, all finely powdered and mixed. The oxide of zinc might be displaced by calomel, or the latter might be added to the compound suggested. Quite as good, or perhaps even superior is a powder consisting of equal parts of desiccated alum, gum camphor and starch finely powdered and thoroughly mixed. The latter mixture is especially efficient in keeping flies away from the moist cord.

"For the application of such a powder, the owner or veterinarian should first thoroughly cleanse and disinfect his hands. If the navel has become soiled, it also should be cleansed and disinfected. The navel cord should not be tied. We have already stated our objections to ligating the cord. If it is unruptured, the caretaker, after disinfecting his hands should pull, tear or scrape the cord in two, under antiseptic precautions, at a distance of about two or three inches from the navel, after which, with the thumb and finger, he should press out from the stump the Whartonian gelatine and fluids. After this has been well done, the powder should be dusted over the stump of the navel very freely and repeatedly, until the remnant of the cord has become completely desiccated and the navel hermetically sealed.

"If the application is repeated three or four times at intervals of one-half hour, the stump of the cord is well mummified within two to four hours and the danger from infection is eliminated. The horse-breeder should be impressed with the fact that the efficacy of the remedy depends wholly upon the early and thorough application, and that any delay or carelessness is liable to vitiate the result.

"Antistreptococcic serum has been heralded as a valuable prophylactic against this infection, but is wholly needless. Local cleanliness is ample, and other means superfluous or worse. Few diseases of animals are more subject to safe, convenient and economic prevention than navel infection of the new-born. Its success calls for fidelity to cleanliness on the part of the owner, preceded by timely and intelligent advice by the veterinarian." Williams.⁴⁸

Imperforate Anus

"In considering the development of the embryo, we have learned . . . that at an early period in its history the posterior gut ends blindly, and opposite to it upon the external surface, there appears a depression in

the ectoderm known as the proctodeal pit, which gradually becomes deeper while the wall between it and the end of the gut becomes more and more attenuated, until finally it disappears and the gut opens posteriorly as the anus. In some cases the attenuation and disappearance of the walls of the proctodeal pit fail to occur, and as a result the young animal is born with an imperforate anus.

"In other cases, not only is there an arrest of the development in this part, but the entire posterior gut, or any portion of it, may fail to form or may become obliterated early, so that there is an absence of both the anus and the rectum.

"The diagnosis of imperforate anus is comparatively simple, since it depends upon the absence of that organ. Upon examination no posterior opening of the gut is discoverable. If only the anus fails, the meconium may be pushed back against the thin membrane, to form a tumor in the anal region: while if the rectum itself is absent, no such tumor occurs.

". . . If the rectum is absent, so that the accumulation of meconium in the anal region does not occur, the animal should be destroyed as valueless.

"In some instances in new-born females, there occurs an imperforate anus, accompanied by an imperfect vulvoanal partition, and the feces drop downward into the vulva through the defective partition, and escape therefrom involuntarily . . . However, because of the difficulty of bringing about the closure of an opening in this place, it would be better as a rule to destroy the young animal, unless it is of unusual value for work purposes. An animal with such a defect should not be used for breeding." Williams.⁴⁸

Imperforate Vulva

"Imperforate vulva is fundamentally referable to the same causes as we have already described as operating in imperforate anus. The vulva is formed in the same manner as the anus, that is, it originates from the lower portion of the proctodeal pit. The atresia or closure may not end the vulva is completely closed, it prevents the discharge of urine through with the vulva, but may include other parts of the urinogenital canal. If the normal channel, and forces it to continue to pass through the urachus.

"The handling of imperforate vulva cannot as a rule be successful, because it is difficult or impossible to discover the urethra and open it in a manner which will prove effective. The animal may continue to live indefinitely with an open urachus, but is of no value. When the vulva is only partially closed, and there is room for urine to escape readily, there is no occasion for surgical interference. As a general rule, such partial atresia or absence of the vulva in reality depends upon an asexual state, as is observed in freemartins, so that the animal is incapable of breeding. Consequently, there is no object to be gained by any surgical attempt at dilating the vulva." Williams.⁴⁸

Diarrhea

". . . In the present section we propose to deal with what is probably one of the commonest affections in foals from one to two weeks old. In a breeding district the practitioner meets with a large number of cases of what is popularly known as 'scouring' in foals, the leading symptom of which is the presence of diarrhea in various degrees of severity. Mild cases readily yield to simple treatment, but when such are neglected or irrationally treated, or occur in animals of a weak constitution, colicky pains may be manifested, with marked depression, and death may result from exhaustion.

". . . Various causes have been suggested, such as defective sanitary surroundings and alterations in the lacteal secretion of the dam, so that

the milk is unfit for digestion, and sets up irritation of the intestinal mucosa. But we know that the condition may arise in the absence of such causes. Certain foods given to the dam may produce changes in the milk, which cause diarrhea in the foal. One etiological factor we are fully acquainted with—viz., the custom of separating the foal from the dam for long intervals while the latter is kept at work. In such instances the mare may return to the foal in a fatigued condition, the milk probably long retained in the udder (unless the attendant has sufficient common sense to draw it off) may undergo alterations, rendering it unfit for digestion. Again, the foal being kept without nutriment for a long period, generally ingests more milk than his stomach, weakened by the enforced abstinence, is able to digest. Dyspepsia results, and the irritating products formed induce diarrhea. Unhealthy foals in weak condition are specially predisposed to diarrhea, and the latter may be associated with joint-ill in some cases. When a foal has to be reared on cow's milk, owing to the death of its mother, diarrhea is not uncommon. In such instances a little water and sugar should be added to the milk as a prophylactic measure.

“. . . In mild cases the prominent symptom is the frequent passage of liquid faeces of a yellowish-white appearance. If the cases be neglected, or if the affection be severe from the outset, the faeces are very fetid, the skin around the anus and posterior aspect of the thighs becomes soiled and irritated, constitutional disturbance is present and in some instances colicky pains appear. The animal loses condition rapidly, refuses to suck the dam, exhaustion supervenes, and death takes place in a variable period. Pneumonia is sometimes observed as a complication, but this is probably due to careless drenching in many of the cases met with.

“. . . In mild cases subjected to early and rational treatment the prognosis is favorable; but if neglected, or if the affection be severe from the commencement, the mortality is high. In some country districts the annual loss from this source is a very serious one to breeders of horses. A number of the cases perish from inhalation pneumonia, owing to careless administration of medicines.” Hoare.⁹⁷

Umbilical Hemorrhage

“Umbilical hemorrhage in the new-born animal is very rare. We have not had occasion to observe this accident in any case. Under normal conditions, when the umbilic arteries rupture they retract within the abdominal cavity and in so doing withdraw with them, in an inverted manner, the connective tissue surrounding them, and thus form a network of fibers, which serves to cause the blood to coagulate and make hemorrhage extremely improbable. The retraction of the arteries also causes a thickening of their walls, and a distinct decrease in their caliber, thereby so narrowing the lumen that it is exceedingly difficult for blood to escape from their divided ends. In addition to this, there is a general physiologic law that the blood pressure is decreased whenever the blood is no longer required by the tissues. Since the function of the umbilic arteries has ceased, the blood pressure within then becomes suddenly decreased.

“Fleming states that hemorrhage may take place from these arteries in foal, because they are firmly attached to the umbilic ring. After repeated autopsies, we have failed to find an instance where such was the case, except the umbilic cord had been ligated, and the arteries thereby held so firmly that they could not retract. In addition to this, when the cord is ligated it is usually divided at an abnormal distance from the umbilic ring, so that its retraction is difficult. In all foals which we have examined, where the navel cord had been allowed to rupture normally, the arteries had promptly retracted . . . In the foal, the cord is

very long and does not spontaneously rupture so promptly. It consequently affords an opportunity for mischief-making for attendants, who may so fix the arteries with a ligature that they cannot retract.

“ . . . Zundel claims that in some individuals a predisposition to umbilic hemorrhage exists. Fleming alludes to the possibility of hemorrhage occurring from the umbilic cord when the animal is several days old. Perhaps in this case he is dealing with secondary hemorrhage due to an infection of the artery, probably as a result of ligation of the cord without proper antiseptic precautions. It is claimed also that hemorrhage may be caused by the umbilic cord rupturing too close to the umbilic ring, though why this should be so does not appear.

“Whatever the cause of umbilic hemorrhage, such cause needs be removed if possible, in order to control the escape of blood. If the cord is too long, and perchance has been ligated, it should be divided at the proper point by scraping or tearing. In the foal, the point for division is about two to three inches from the umbilic ring. After the division of the cord, the Whartonian gelatine is to be pressed out, the arteries permitted to retract into the abdominal cavity, when hemorrhage must necessarily cease. If for any reason the artery does not retract, it should be separated from the surrounding tissues and carefully ligated under antiseptic precautions. Should hemorrhage from the umbilic vein occur, it is advisable to search for the vessel and place a ligature about it. The ligation of the cord itself as advised by some, is not sufficient, because the arteries or vein may not be included, as they may have broken at a point higher than that at which the ligature is applied. In such cases ligation would tend to favor, rather than prevent the hemorrhage, because it would simply prevent the blood from escaping from the amniotic covering of the cord, which has been converted into blood, causing the ligature to be pushed off.

“In a general way we may best avoid umbilic hemorrhage by permitting the cord to rupture spontaneously, or by rupturing it at the proper point by linear tension, laceration or ecrasement. We should avoid dividing the cord by cutting.” Williams.⁴⁸

Rupture of Intestines

“In rare instances, rupture of the intestines may occur during parturition, either because they are over-filled or weakened at the time, or because an intentional loop becomes engaged between the pelvic inlet and an unyielding portion of the fetus as it advances along the birth canal. Fleming cites Schaack as having observed one instance of a rupture of the intestine by its becoming compressed between the fetus and the pelvic bones.

“The symptoms of such an injury, especially in the mare, would be those common to rupture of the intestine, and would consist chiefly of collapse, with very feeble or indistinguishable pulse, trembling and cold sweats. It is well-nigh impossible to make a positive diagnosis of this condition during the life of the animal, and it can merely be suspected from the general symptoms. It is not possible to apply any effective method of treatment.” Williams.⁴⁸

Prolapse of the Intestine through the Ruptured Walls of the Uterus or Vagina

“When a perforating wound or rupture of the walls of the uterus or vagina occurs at any point, it is possible for a protrusion of the intestines to follow. This prolapse, however, does not ordinarily follow when a wound is made through the walls of the vagina or uterus in the non-pregnant animal. The prolapse is probable only in those cases where

there is violent straining, as seen in parturition or immediately following it . . . In uterine or vaginal rupture in difficult parturition, where the intra-abdominal pressure is enormously increased by the straining, a portion of the intestine frequently passes into the uterus or vagina, and finally behind the vulva.

"The indications usually are to at once destroy the patient, since the prognosis must necessarily be extremely bad. The protrusion generally occurs before the expulsion of the fetus, and it then becomes almost impossible to extract the fetus without incidental injury to the intestine and infection of the peritoneal cavity. If it be possible to return the intestines with hope of saving the life of the patient, this should be done, and measures taken to keep the intestines out of the way until the fetus has passed beyond the point of injury. After the fetus has been removed, it may in some cases be possible to suture the wound in the uterus or vagina in order to guard against further prolapse and decrease the danger of infection." Williams.⁴⁸

Umbilic Hernia, Exomphalus, Omphalocele, Navel Hernia

"Umbilic hernia consists of the non-closure of the umbilic ring in the abdominal floor, while the skin closes over the region in the normal manner.

"During the earlier periods of fetal life, the abdominal cavity is comparatively small, while the abdominal viscera are so voluminous that there is not sufficient room within the cavity to accommodate them. They consequently press, or grow outward through the wide umbilic ring into the navel cord, so that, in fetuses of an early age, a large part of the intestinal mass, omentum and liver, may lie outside the abdominal cavity, lodged in the umbilic cord. As the fetus develops and approaches maturity, the abdominal cavity increases in size, while the umbilic ring gradually contracts, until finally the opening becomes virtually occluded and the margins of the ring adhere closely to the umbilic vessels. For reasons unknown to us, the normal closure of the umbilic ring may not occur and when the young animal is born there persists a variable sized opening through the abdominal floor, usually elongated from before to behind as an oval slit, wider at the anterior end. In some cases the opening is almost circular in form. The diameter of the opening may vary from so small a size as to be barely distinguishable, up to six or eight inches. The resulting hernial sac corresponds in size.

"Some writers recognize a congenital and acquired umbilic hernia. Only the congenital defect is of interest to us . . . We have observed from time to time that umbilic herniae, which were comparatively inconspicuous at the time of the birth of the young animal, later became more conspicuous, and were increased in size to such a degree as to attract attention. When umbilic hernia exists at the time of the birth, anything which may increase the ultra-abdominal pressure, such as severe expulsive efforts due to the retention of the meconium, or to constipation of the bowels, may cause a marked increase in the size of the hernial sac. The same increase in size may be caused by the allowance of large quantities of bulky food.

"Fleming cites Zundel and others in support of his belief that environment, and especially the character of food, tends to induce the disease. He believes that the young of animals kept upon low and marshy pastures, or subsisting upon soft, luxuriant herbage during a rainy season, are especially subject to herniae.

"The majority of writers with whom we are in full accord, consider the defect to be chiefly hereditary.

"*Symptoms.* There is present at the umbilicus, a tumor, which may be either spherical or pyriform or may be more or less elongated from

before to behind. The size of the hernial ring varies greatly according . . . individual; . . . in the foal 1 to 6 inches in diameter.

"In some cases the intestine occupying the hernial sac may contain hard, firm masses of feces, which render the hernia hard and firm. Such fecal matter is not readily pushed through the ring into the abdominal cavity.

"The contents of the hernia may become incarcerated or strangulated, and induce thereby symptoms differing very materially from those which have already been described. If the hernial contents consist of intestines, and strangulation occurs, the tumor at once becomes very tense and hard, and is more or less enlarged as compared with its previous condition, and the animal shows severe pain, expressed by violent colic. The hernia may also be sensitive to the touch.

"When the hernial contents consist of omentum, and it becomes incarcerated, the tumor becomes tense and indolent, cannot be reduced, and induces no pain upon palpation.

". . . The prognosis of umbilic hernia is favorable. Many cases especially small herniae in foals, recover spontaneously, and the others may be surgically overcome with comparative certainty and safety. If left undisturbed, umbilic herniae rarely become incarcerated or otherwise interfere with the well-being of the animal. If the hernial ring is small, when the animal develops and the intestines increase in size, they cannot pass through the opening. If the hernial contents consist of omentum, when the animal grows older, the omental expanse becomes comparatively retracted and no longer reaches the open umbilic ring. Although the ring may persist throughout the life of the animal, the hernial sac no longer becomes filled and is not noticeable. The greatest loss attributable to the defect, is the decreased value of pedigreed animals for breeding purposes, because of the well-marked tendency to transmission." Williams.⁴⁸

Persistent Urachus

Causes. "Somewhat rarely the urachus remains open after birth; how rarely is not clear. We have not personally observed this condition. It is probably very rare.

"A more common condition is the reopening of the urachus in cases of umbilic infection owing to a destruction of the tissues which has occluded the ruptured end of the canal at the time of birth. This condition we have observed only in the foal. Fleming asserts that persistent urachus is most frequently observed in the foal, because the vessel is closely attached to the umbilic ring and does not become retracted. However, so far as we have observed, the urachus retracts promptly when the cord is ruptured, and does not protrude beyond the umbilicus except in the cases where the cord has been ligated and then excised.

Symptoms. The symptoms of perforate urachus may be divided into two groups, according to causes.

"1. In cases where the urachus is for some reason abnormally open, or has become in some way abnormally divided, or if the meatus urinarius is constricted or absent, the young animal, in urinating, discharges a large part or all of the urine through the navel. If the urethra is closed, the entire amount must flow through the navel; while, if the normal passage is open, a part of the urine may flow from each opening.

"2. When the urachus becomes secondarily re-opened, as a consequence of umbilic infection, the discharge of urine through the navel is not very great in amount, but dribbles away or flows in a very small stream during urination, and perhaps oozes somewhat continuously from the navel, keeping the region soiled, moist and fetid. In some cases the navel is inflamed, and may be swollen, or the patient may show well-defined

symptoms of phy-septhaemia or inflammation of the umbilic vessels. In these cases the foal or other young animal has remained apparently well for some days after birth, and no discharge of urine from the navel has been noted during this period. After infection of the umbilic takes place, perhaps three to five days after birth, the dribbling of urine from the navel appears. This condition is by no means a rare one in foals, and in our observation has been most frequently seen when the cord has been ligated and cut long, causing the stump to undergo putrid decomposition and the urachus to re-open." Williams.⁴⁸

Scrotal Hernia; Inguinal Hernia

"Inguinal hernia is virtually a defect of the male, though very rarely it exists in the female.

". . . the glands are usually in the scrotum at the time of the birth of the young animal. In some cases the inguinal ring in the fetus is abnormally large, and the intra-abdominal pressure during early fetal life may cause portions of the viscera to be forced out through the ring, and remaining there, prevent the latter from normally closing, or narrowing to such a degree as to prevent the escape of viscera from the abdominal cavity. In all domestic animals, the inguinal ring normally remains pervious throughout life, and consequently inguinal hernia does not depend upon the normal existence of an opening, but merely upon its abnormal size.

"In new-born foals, especially among the draft-breeds, scrotal hernia is very common at birth, but is usually of a temporary character, and spontaneously disappears. However, this does not always occur, and in some instances the internal inguinal ring is excessively large, so that portions of viscera protrude through it, which, by their weight, tend to render the abnormal dilaton of the ring permanent and to cause the hernia to persist throughout the life of the animal unless surgically handled.

"The size of the hernial ring shows every possible variation . . . The contents of the hernial sac may consist of either intestine or omentum.

"The symptoms of scrotal hernia in the new-born are usually very apparent, and consist essentially of an increased size of one or both halves of the scrotum. Upon manipulation, it is usually found that the herniated intestine or omentum can be readily returned into the abdominal cavity, especially if the patient is placed upon its back. After the contents have been returned, the enlarged ring can be discovered by digital exploration.

"The course and termination of scrotal hernia vary . . . In most animals scrotal hernia tends to persist, and to increase rather than decrease in size, as the patient grows older. In the foal, when the scrotal hernia is small, it tends to disappear spontaneously with age. In probably 90%, or even more, of foals born with scrotal hernia, the defect becomes spontaneously remedied, so far that they may be safely castrated by the open operation when one year old. The contents of scrotal hernia very rarely, if ever, become adherent, except because of some ineffectual surgical handling.

"The defect is markedly hereditary, and its existence in the young animal serves to render it of diminished value for breeding purposes. In the foal it has yet another significance, from a clinical standpoint, in that, even though the defect may be apparently overcome in a spontaneous manner, it may yet lead to serious or fatal accident in later life. If such an animal is castrated after apparent recovery, without unusual precautions having been taken, protrusion of the omentum, or still worse, of the intestine, is liable to occur, and lead to serious or fatal results. If the animal is retained for breeding purposes, it may, at any time after reaching adult life, suddenly develop strangulated hernia, owing to some

accident or exertion which may cause a sudden increase of the intra-abdominal pressure, such as jumping, rearing, or copulating with a mare." Williams.⁴⁸

"Other defects that may occur in the new-born may be atresia of the posterior nares, atresia of other body openings—such as imperforate prepuce, opispadias, occlusion of the eyelids, occlusion of the auditory canal, fissure of the palate, persistent foramen ovale, or cyanosis, tongue-tie, hernia of the brain, odontomes, or rupture of the extensor pedis tendons in the anterior limbs of the new-born." Williams.⁴⁸

Tetanus Neonatorum, Tetanus of the New-born

"Tetanus of the new-born acquires special significance because of the avenue of entrance of the tetanus bacilli. While tetanus may appear in any new-born animal from the same causes which induce it in the adult, it is of special interest to us when occurring as a result of navel infection. Owing to the method of infection, the malady acquires a distinctive name, though differing in no essential respect from the ordinary disease, except perhaps that it is more virulent because the toxic substances enter more freely and directly from the umbilic vein into the general circulation. In domestic animals, tetanus of the new-born is chiefly confined to the foal.

"The symptoms of tetanus of the new-born are identical with those observed in the adult animal, except that in our observation the outset is more sudden, the course more violent, and death more certain. We have not observed a recovery, but in the few instances which we have seen the course of the disease has been especially brief and stormy. As a general rule the foal goes down and is unable to stand within 24 hours after the first symptoms are noted.

"If the navel is examined in these cases, so far as we have observed, there is found in each instance a well-marked purulent discharge emanating from the navel vein.

"The disease is handled the same as other cases of tetanus, but so far as we have observed, is hopeless from the outset.

"Tetanus of the new-born may be safely and readily prevented by the same precautions—for ordinary purulent infection of the navel." Williams.⁴⁸

VIII

MANAGEMENT OF THE WEANLINGS

1. WEANING AND MANAGEMENT

Johnstone⁵ advocates the weaning of colts at the age of five months. The colts are separated from the dam once and for all, at which time the dam is fed with a reduced grain ration and her milk is drawn off three or four times the first day and less often as time advances until no more milk could be extracted. The mare is worked as usual, or if she is not worked the grain is eliminated altogether and instead hay only is to be supplied her and when dry then light grain feeding is resumed again. As to the management of the weanlings the same authority writes: "Weanlings should have snug quarters during their first winter. Put them preferably two in a boxstall and feed them good oats and bran—one-fifth bran by weight—all they will clean up nicely and come hungry to their next meal. Feed them the choicest hay on the place, always free from dust and mold, and feed them often—a little at a time. No one can rear young horses properly without grain—winter and summer they should have good grain feeding . . . Keep their feet level and their toes short.

"In pasture yearlings and two-year-olds should have grain according to the growth of the grass and the season. Keep them growing and fat, and always see well to their feet. Give them shelter into which they may escape from the attacks of the awful flies . . . Do not close young horses in a field with cattle, sheep and swine, if it can be avoided. They do best by themselves or with cattle—always, poorly with with sheep and pigs. House them early in winter and always keep them growing and fat.

"Stallions will, of course, have to be taken up and kept by themselves the summer after they are a year old. Many a foal has been got by a yearling. Regarding the best time to castrate colts men always have differed and always will. As a rule it is best to order their castration when they are about a year old. If one is undeveloped about the head and neck he may be allowed to run entire for six months or a year longer.

"Regarding the growth of horses, it may be said that roughly speaking a colt which is properly reared will make rather more than half his growth in his first year . . . The draft-bred that does not weigh 1200 lbs. or over the day he is twelve months old will have a slim chance to fill a drafter's bill. The best plan is to give them always what grain they will clean up nicely and let it go at that. It is bad at any time to let colts get thin. It is worst of all to let them lose the flesh that was born on them. It is very nearly as bad to let them get thin after weaning. Loss sustained at such times will never be regained."

According to Carlson,⁶ "Weaning the foal can be done with no loss of growth. Simply dry the mare up by letting the foal suckle less often all the time. I never milk a mare in weaning a foal. The mare will cease to secrete milk after a time, if the foal be permitted to suck but twice a day for a few days, then once only until the mare is sufficiently dry to have the foal taken away from her. During the weaning process the foal can be tied in a stall at the side of the mare at night. By this way of weaning the foal is more contented, and does much better than if taken away from the mare at once. After the weaning process has passed, the foal should never want for either pure water or wholesome

food. No grain food alone will equal oats. If timothy or prairie hay is used for roughage, bran can be added to the oats, about half of each by measure. If alfalfa or good clover can be secured the bran will not be needed." The use of automatic feeder is advocated by Carlson on the ground that with it the weanlings could have access to feeds at will and yet not waste nor soil the feed. And too, the automatic feeder is claimed to retard the act of feeding so that the feed is thereby more thoroughly masticated.

Kennedy⁶¹ advises weaning the colts as late as possible, which usually is late in fall. He says that "After the colts are weaned from the dam, it is difficult to keep them in good condition, and at such times special care and feed should be given them. Feed is seldom made too liberal, as this is the time to show the cold if exceptional growth is desired. Horsemen agree that if you stunt the colt you stunt the horse, and that if you have stunted the yearling you seldom obtain a good mature horse. On the other hand, a growthy yearling does not need the feed nor care afterwards that the stunted one demands. In order to get this growth in the winter, it is necessary that the colt be fed some grain in connection with hay and roughage. If timothy is fed as the roughage, the grain must be of nitrogenous character, as oats and bran. If good alfalfa or clover hay is accessible for the colt, this with oats will make a very desirable ration. Young colts make larger growth than older horses in proportion to the feed consumed and hence it is an economical proposition to put grain into the young animal.

"In addition to good feed, the young colts must have plenty of exercise. An open shed arrangement is excellent in most sections of the country for this purpose. This shed may be constructed by putting the feeding quarters inside and having them bedded so that the colts may have a dry place to eat and sleep; but with access to a lot or pasture where they may run at will. Colts handled in this way will have long hair, but will develop a ruggedness that cannot be obtained with colts that are raised with lack of exercise. Winter pasture should be used if available but it should not be depended on for the entire ration if maximum growth is desired.

"Castration is usually performed when the colt is one year old. If the animal is undeveloped in the neck and fore-quarters, the castration is sometimes deferred until the second year, but there is less danger of losing a colt by castration when one year old than later. Unless colts are castrated they usually have to be separated from other horses as early as the second winter, as they become a great nuisance, although they are not usually capable of getting colts until the second spring.

"The feed that the yearling should obtain will depend largely on his future use. If maximum gain is to be desired, as in the case of pure bred colts, they should receive some grain in connection with pasture. If the animal is merely growing for market purposes and the pasture is good, this should be sufficient. Under range conditions, nothing other than grass will be supplied. In sections in which the grass is limited and more grain is raised, the grain can be supplied to better advantage. If the maximum gains are desired, the colt should be kept up in the daytime when the flies become bad, and fed some grain, and then turned out at night.

"Plenty of bright legume hay, good water, shed for shelter, and as much oats as can be spared is a program that makes for ideal winter management of the yearling. If the animals come into the winter in good condition, very little grain is usually needed. A feed of grain once a day will help materially in keeping the flesh on the colt, and therefore make for larger gains. Under range conditions, the yearlings are usually left to run with the bunch, but if maximum size is desired, it would be more satisfactory to cut them from the bunch and winter on the better pasture, or with hay. With pure-bred stock, when large size is desired, it

is essential that some grain be fed in connection with the hay. Oats are very satisfactory for this, but if the hay is a legume, rolled barley will prove quite satisfactory. The shed arrangement spoken of for wintering the foal is even more essential for wintering older animals. It is not so necessary that the older colts have as good shelter as the younger ones. In the sections where the winters are warm and wet, protection should be provided so that they can keep out of the rainy weather. In sections where snows and storms are bad, protection is needed for like reason. Under moderate conditions of winter, the horses will do very well if left outside most of the time, with protection provided for extreme cases. Colts wintered in this manner will not have the same sleekness as the barn-fed colt but they will obtain a ruggedness of constitution that will last much longer than a glossy coat.

"The essentials in growing the twos and threes are to provide feeds that will continue the growth which was started in the foal and yearling. Fine pasture in summer, with good hay in winter, together with protection from storms makes for this growth. Colts that are twos and threes will not need as much grain as the foal or yearling but will consume rougher feeds. These feeds, however, should be of nutritious character, as legume or cereal hay . . . If the twos or threes are being developed for show purposes, they will need to be pushed along with some grain in order to give them their maximum size and the most satisfactory gains. For commercial purposes, however, very little grain is needed, until they reach the age when they will start to work."

Gay⁴ recommends that the weaning of the foal be undertaken at the age of from four and one-half to six months; early, when the pasture is poor or in case the mare or the foal are not in good condition, and late, should the mare continue to furnish ample supply of milk and is not worked. He says: "If the proper provision is made for the foal to take more and more grain as he grows older, he will gradually reduce the amount of milk taken from his dam, so that when the time for weaning arrives very little if any setback or disturbance is caused either foal or dam. If, however, the foal must learn to eat after being deprived of his ordinary source of sustenance, he will require some time to accommodate himself to the new regime, while the mare will demand especial care on account of the removal of the colt before her milk supply has been to any extent diminished. Furthermore, a little foal acquires a spirit of independence as he becomes self-sustaining, and for that reason the absence of the dam becomes a less disturbing factor to him, especially if he has the company of another foal, than to the young thing which has been entirely dependent upon its dam until she is suddenly taken away. When once the dam and foal are separated it is better for both if the separation is complete; if, after both have become reconciled to the parting, they are permitted to see, hear, or smell each other again, all that has been gained up to this time is lost, and it will be necessary to begin over. Especial care should be taken to see that the new quarters, where the weanlings are confined, are so constructed and arranged as to make it impossible for them to injure themselves, in case they make a demonstration of their resentment at being so treated."

Roudebush⁷⁶ says that weaning should be done at from four to six months of age. The procedure advocated consists of leaving the colt in the usual stall while the dam is placed in a nearby inclosure.

Under the subject of feeding the yearling, Roudebush⁷⁶ is quoted to say: "If the roughage has been cut, shredded or whole corn fodder or timothy hay, then equal parts by weight of crushed corn, oats and wheat bran twice per day, is an ideal ration. From one to two quarts may be given at a feeding . . . If fed on timothy hay and whole corn, feed a gill of oil meal once a day, and a little salt twice per week. If one has clover or alfalfa hay, whole corn can be fed exclusively as the grain ration. Oat straw and wheat bran make a good combination. Grass is

the natural food of the horse, and, if abundant, is sufficient without grain.

"The food the second and third winter should be the same as the first, except that a larger quantity should be fed."

Silage is considered excellent food if fed in small amounts and provided that there are no molds. Its value is enhanced when no roots are obtainable.

Rutherford⁹⁸ presents his system on the management of the weanlings: "As to age, no colt should, if at all possible, be permanently separated from his dam until he is at least four months old, while another month, or even two, by her side will make him a better horse and lessen considerably the risks of his first winter . . . the best diet is good sound oats with a moderate admixture of bran twice a day, and a well scalded, not too bulky, mash of the same materials, seasoned with a tablespoonful of salt, and perhaps a handful of crushed oil cake for evening meal.

"Weanlings are frequently troubled to a considerable extent with intestinal worms of various kinds, especially if grazed in low lying pastures in late summer or early fall. The old farmer's remedy of wood ashes and salt is not to be laughed at and if persevered with in small doses for some time will often have the desired effect but for a more speedy effect the following anthelmintic is recommended: Iron sulphate one drachm or powdered areca nut 203 drachms twice a day in a little soft food for a week to be followed by a drench composed of turpentine 1 oz., and raw linseed oil from 10 oz. to a pint, according to the size and condition of the patient.

"This mixture should be given on an empty stomach and all dry food withheld until the bowels have responded to its action. In all cases of intestinal worms, benefit is found from occasional injections of tepid water strongly impregnated with soap, and for this purpose Gamgee's enema funnel will be found suitable."

Wallace⁴⁸ is of the opinion that foals should be weaned when 5 or 6 months old, that is to say, if a spring-born foal, he should be weaned in October. He recommends that they be placed under shelter at night and during the second winter they should be turned out in fields provided with natural or artificial shelter, and should be well fed. He writes: "A sufficient allowance for a Shire or Clydesdale foal during the first winter is 2 to 3 lbs. of crushed oats, $\frac{1}{4}$ to $\frac{1}{2}$ lb. of bran, and $\frac{3}{4}$ lb. of finely ground linseed cake, given in two feeds in a day, with $\frac{1}{2}$ peck of roots and chopped sanfoin, lucerns, or clover hay in England, or rye grass hay in Scotland. As grass comes in spring, the dry food should be gradually reduced, and finally discontinued when good pasture is available.

"Colts born in November, when about 2 years old, should, if intended to do a full complement of work in spring, receive during the winter a mixture per week of (1) 3 stones of crushed oats and maize meal in equal parts (2) 1 stone of crushed linseed or finely ground linseed cake mixed with wheat or barley chaff (3) $\frac{1}{2}$ cwt. of chopped hay-clover, lucerne, or sanfoin—or an equivalent in strong boned rye grass hay, with (4) a foddering at night of oat or barley straw to pick over; also (5) about 1 stone of roots in season—swedes, mangels, and carrots—or an equivalent in steamed potatoes. Salt should be within reach of all young stock, which must also be allowed plenty of exercise to develop muscle."

Sanders⁴⁶ directs that to wean the colt, he "should be tied in an adjoining stall, with the partition so open that they are in plain view of each other, and the food of the mare should be reduced to a very small ration of dry oats and hay. When the udder becomes so full as to cause her uneasiness a part of the milk should be drawn off, but she should not be milked dry. This first milking may be done by the colt itself, but afterwards it should be done by hand . . . the drying off will be more speedily accomplished than when the colt is occasionally permitted

to suck. After the milk has entirely dried up the mare and her foal may be separated and she may safely be turned out to grass.

"Skimmed milk may still be given to the colt, especially if it is not in good condition to enter the winter; but clean, sound oats, ground or unground, constitutes the best of all grain foods for the colt. I prefer to have them ground; and as cold weather approaches about one-fourth in weight of corn-meal may profitably be added, as it helps to lay on fat and keeps up the animal heat. A little oil-meal—say a pint a day—may also profitably be given with oats for some time after weaning. Don't be afraid of feeding too liberally . . . As soon as the mare and foal can be separated the foal should have the run of a good pasture, as there is no food better than grass, no medicine so good as exercise and no exercise so profitable to young animals as that which may be taken just when they feel like it."

Reynolds⁴⁶ places the weaning age at five or six months. He says that "the separation of the foals from free-nourishing mares must be accomplished by degrees. For some days prior to final removal of the foal the intervals of allowing it to suck must be increased in length, and the food allowance of the mare reduced in quantity and quality for a corresponding time . . . the mare should be more severely worked. After ultimate severance of the foal the glands must be periodically hand-drawn, and a brisk purgative administered. Restricted diet, particularly in regard to fluid and succulent provenders, should be enjoined until the secretion of milk is completely suspended."

According to Dimon,⁴⁰ weaning should be done by tying the mare in an adjoining stall separated also by an open division which would make it possible for the foal and dam to see each other. The feeding of the mare should be light and on dry feed, and when the bag is full, causing discomfort, the milk may partially be drawn off by the colt, at first, and later on by hand, because then the milk is hot and unfit for the colt. Skim milk may be given to the colt after weaning, especially to colts that are out of condition. It is claimed that good oats are the best feed for colts, while a little oil-meal, carrots, clean hay, and good clover are also recommended. During the fall when grass is disappearing, the colt should be provided with laxative feeds, such as carrots or almost all of other root crops. Sweet apples are held in high esteem if cheap and in big quantities. While variety in the feed is desirable it should consist principally of crushed or ground oats, and some wheat is beneficial. Concerning the feeding of corn products Dimon writes: "I like a little corn meal mixed with ground oats and other feed for colts wintered in northern climates. Some think that corn meal is too heating for young colts; so it is, fed liberally and alone as a grain ration, but mixed as above, and fed in winter in our northern states, it makes a pretty good overcoat to help keep the youngster warm, and will keep them free from worms better than any other food except linseed oil meal, which, by the way, is a most excellent food for any and all stock, and especially so for young animals; but it should be fed sparingly and mixed with other grains." Regarding other details of feeding the colts, Dimon further says: "In the case of colts scant feeding is to be deplored, and worse yet, the exposure to severe cold and storms; while overfeeding the colt makes him clumsy by having the nerves overloaded with fat. Digestion has often been impaired by an over-loaded stomach; if this is done in the colt there is little hope of having a healthy and long-lived horse."

"In caring for weanlings the first winter, give them plenty to eat of clean, good, bright hay, and sweet rowen, if accessible, with grain rations suitable to its size and needs. Do not overfeed with grain, and give an occasional feed of roots, etc., and give plenty to drink. Skim milk is best, but water will do, and give plenty of open air exercise and sunshine but carefully avoid exposure to bleak winds and cold storms."

Murray⁷⁷ states that on weaning the foal, it "should be confined to a loose box and open yard for the first week, until it has forgotten its dam. It may then be allowed to roam over a pasture during the day, and should, where practicable, be accompanied by others of its own age. A piece of mixed seeds or old pasture, where the stronger growing grasses are allowed to run to seed, should be especially prepared for the foals. The young animals delight in nibbling off the ripe heads of the grasses. Bare pastures are objectionable owing to the liability of the young animals to pick up the embryonic germs of objectionable insect life. . . . A mixture of oats, wheat, peas, and a little linseed should be used . . . All the corn should be ground and mixed with a limited quantity of hay or straw chaff, mixed together and well saturated with boiling water. This should be allowed to remain for not less than twelve hours before being fed."

Biddell, Douglas, Dykes, Fleming, MacNeilage, Murray, and Trotter⁸² are authorities concerning the method of weaning and management of the weanlings, as follows: "The foal is usually weaned at the age of five or six months . . . Weaning foals should never be turned out on a bare pasture, as they are liable to become affected by worms, which are difficult to eradicate.

"As soon as the foal is weaned the mare may be gradually placed on dry food and should have one or two doses of mild aperient medicine with plenty of exercise . . . For the first day or two the milk should be drawn twice daily; she should not be milked clean out, but a sufficient quantity taken to relieve her from any suffering or uneasiness. In the course of a week or less the milk will dry up.

"When the foal is weaned it should be placed with others of its own age . . . For the first day or two after weaning the foal may be confined to the yard; as soon as it gains the confidence of its companions they may be allowed to run out in the pasture during the day.

"During the early years of the young animal's life, and more particularly during the first winter, the food should be prepared. The fodder, whether hay or straw, or a mixture of the two, must be cut into fine chaff, and the corn of whatever kind, ground into meal, the meal and chaff mixed together and well soaked with boiling water; the mass is then covered with a pliable non-conducting material and allowed to remain in this state for a period of at least twelve hours, when it will be in a suitable condition to be fed. The albuminoid ration should not exceed 1:4. Sweet well-matured oats, wheat, white peas, lentils or Indian corn, and linseed should form the mixture in somewhat the following proportions: to one of oats, add one-half of wheat, one-fourth of peas, one-eighth of Indian corn, and one-sixteenth of linseed. These should be mixed together in the grain and reduced to meal by being passed through an ordinary grist mill . . . from 4 to 5 lbs. per day of mixed meals will be sufficient."

Regarding the management of the yearlings the same authors further assert: "Altho it may be more costly we prefer a second class pasture rather than a rich feeding one, provided in the former case a fair allowance of artificial food is given. Rich grazing pastures tend to the development of fat rather than to the growth of bone and muscle.

"The yearling geldings and fillies are usually grazed together. The stallions are in a separate enclosure."

And, as to the two-year-olds, "The same treatment as that recommended for the yearlings must be continued with these, until such a time as a sufficient bit of grass is obtainable, and where the land is hard-stocked or inferior in quality an allowance of artificial food should still be continued. The great danger to guard against is superfluous fat At the age of 2 years both fillies and geldings should be bitted and broken to the halter."

Henry and Morrison⁵³ assert that "at from 4 to 6 months of age, depending on conditions, the foal should be weaned. When the mare is bred soon after foaling, or if for any other reason the dam and foal are not doing well, it is best to wean comparatively early. On the other hand, if the mother has a good milk flow, and her services are not needed, the foal may well be allowed to suckle 6 months. If the foal has been fed increasing quantities of grain as it developed, the weaning process will not be difficult, for the quantity of milk consumed will have been gradually decreased. Complete separation will then cause little, if any, setback to either dam or foal. In parting the dam and foal, keep them well separated, else all must be done over again . . . At such time the grain ration of the mare should be reduced till she is dried off. When the udder becomes so full as to cause uneasiness, part, but not all, of the milk should be drawn."

As to feeding the foals after weaning, Henry and Morrison⁵³ say that "Nothing is superior to blue grass or other good pasture and oats. Among the concentrates, wheat bran, cotton seed meal, linseed meal, buckwheat middlings, wheat middlings, soybeans, cowpeas, and Canada field peas are rich in nitrogenous matter . . . and in phosphorus . . . All the legume hays—alfalfa, clover, cowpeas, etc.—are rich in lime . . . When properly balanced by nitrogenous feeds, corn, barley, kafir, milo, or emmer may be used as part of the ration. When fed large amounts of alfalfa hay colts will relish a little timothy or prairie hay, straw, or corn fodder occasionally. If maximum growth is desired it will be necessary to feed some grain even on good pasture. The young horse which is not developing the proper skeleton may be fed substances especially rich in phosphorus and lime, such as 2 or 3 ounces daily of tankage containing ground bone, or 1 ounce daily of ground bone, ground rock phosphate (floats), or precipitated calcium phosphate."

Alexander⁸⁹ is hereby quoted on the feeding of colts: "We should advise feeding a mixture of 60% ground oats, 15% corn meal, 10% bran, and 15% cut alfalfa hay. Allow the colts to clean up all they want of this mixture. At Wisconsin experiment station 11 draft colts were thus fed and they consumed each 16.5 lb. of the mixture per day.

"Some feeders are feeding skim-milk to growing colts. Instead of allowing the colts to drink the milk a good plan is to use the milk to wet the feed at meal time. A quart twice a day is helpful, although some feed a larger quantity. Care must be taken not to cause scouring, or 'pot belly.' In addition to oats, bran and hay, allow the colts carrots, or even a little nicely made corn silage; but do not give silage and milk together. Oat straw and bright corn stover also are useful as part of the roughage for growing colts."

Jordan⁹² gives two grain mixtures which are considered less expensive than oats alone yet of such a quality as to promote growth of young colts. The first mixture is made up of oats 4 parts, peas 2 parts, while the other combination consists of corn 2 parts, oats 4 parts, bran 3 parts, oil meal 1 part.

According to McCampbell, the following rations have proved to lead to good results:

"1. Corn or oats, 6 parts; bran, 2 parts; linseed meal, 1 part; free access to alfalfa hay, together with some prairie hay, straw, or corn fodder.

"2. Corn or oats, 6 parts; bran, 3 parts; free access to alfalfa hay, together with some prairie hay, straw, or corn fodder.

"3. Corn or oats; alfalfa hay."

Reese³⁹ says that foals whose dams are being worked should be weaned earlier than those whose mothers are idle. He brings out that while it is the general practice to wean foals at the age of 5 or 6 months yet one should bear in mind that it is more economical to feed them through

their dams. But if the mares are to be in foal immediately afterwards, delay in allowing the foal to nurse over 6 months of age may prove injurious to the vitality of the mother. During the process of weaning, Reese says: "The foal should not nurse more than once after it has been taken away. The excess milk from the mare's udder should be taken from 3 to 5 times a day, but enough should be left so that her system will start to absorb the milk, otherwise the drying-up process will be delayed unnecessarily. Not withdrawing sufficient milk will cause the udder to cake and spoil. Vaseline or lard rubbed on the udder will aid in keeping it soft."

As to the feeding and management of weanlings during the first winter, Reese³⁹ is quoted, as follows: "Colts can be housed satisfactorily either in the stable or in an open shed . . . The main requirements (of the shed) are that the quarters be dry, sanitary, and provide fairly warm protection from winds. Several foals may run together if the weaker ones are not driven away from their feed by the stronger. The quarters should be kept clean and well bedded and occasionally should be disinfected. Lice are to be suspected when the animals get to rubbing and lose patches of hair. Thorough washing with the proper solutions of coal-tar disinfectants will kill lice . . . The foals should be out in the open every day that is not stormy; it is harmful, however, for them to remain out in the cold rain. The foal should be taught to lead and to stand tied during the first winter.

"Feeds that will promote growth should be supplied. Good, clean clover hay is palatable and slightly laxative. Timothy hay commonly is fed. Well-cured alfalfa hay free from dust is one of the best roughages for growing, but because of its relatively high protein content it generally is economical to supplement it with other roughage such as timothy, mixed hay, or corn fodder. Besides lending variety to the ration such a method of feeding alfalfa would offset any likelihood of kidney or bowel irregularities. Sheaf oats can be used to advantage to supplement other roughage. The animals should not be allowed to gorge themselves on dry feed. They should be given only what they will clean up readily, but at the same time enough feed should be supplied. Oats, corn, and peas, preferably fed ground, are suitable grains. Bran, oil meal, or gluten feed will add protein and lend variety. Cottonseed meal should not be fed to foals. Appropriate grain rations for the first winter are: 2 parts corn, 5 parts oats, 3 parts bran, and 1 part oil meal; or 4 parts oats, 1 part corn, and 1 part bran.

"Silage should not be fed to foals to any considerable extent. Sliced roots, such as carrots and sugar beets, are very palatable and have a cooling effect on the digestive system. The quantity of feed generally should be regulated by the appetite, although occasionally the appetite may be too ravenous to be a good indication. The general condition of the colt and the droppings should be observed daily. Usually not over 1 pound of grain per 100 pounds of live weight should be fed until the animal is 2 years old. A liberal supply of salt and good water and plenty of fresh air and exercise are essential for the proper development of young horses. Idleness succeeding exercise will cause constipation. It is often said that a horse is made during his first winter. Certainly this is a critical time in the animal's life, and at no other age will proper feed and attention do as much to make of him a good horse. If stunted during the first winter he will never gain proper size and shape."

As the second summer is reached, according to Reese,³⁹ "Foals should be changed from dry feed to pasture gradually, and should not be turned on pasture until the grass is old enough not to become washy. Grass is an indispensable factor in the economical and proper physiological development of young horses . . . The feet of the young animals should be noticed . . . and if the hoofs are too long or high

on one side they should be trimmed properly . . . Barbed wire should not be used for fencing the pasture; smooth woven wire is best . . . The animals should have plenty of fresh water and salt, and in hot weather they require shade."

Thomas and Shields⁸⁰ desire that weaning be done when fall comes. According to them, in the Savage farm and McKennan farm the colts are removed from the dams and the latter milked dry daily, while others let the colt suck twice daily for several days, and afterwards for some time once a day until the mare becomes dry. McGraw is cited, whose practice follows: "We wean a colt by taking it away from dam and milk mare for four days, twice a day, then once a day till dried up. I use equal parts spirits of camphor, tincture of belladonna, and lard (no salt) on mare's bag."

In feeding the colt after weaning, Thomas and Shields⁸⁰ state that "Oats is the usual food, together with timothy or prairie hay. Bran may be mixed equally with the oats; although this will not be necessary if clover or alfalfa is available. Some consider oats too hard for young colts to masticate and give ground feed and clover hay." Several horse-men are quoted whose recommendations along this subject are certainly worthy of consideration. Thus Miller suggests "two quarts of rolled oats, one quart bran, one pint cracked screened corn, and a handful of rolled barley, to a feed, three times a day, with all the straight clover hay that a colt will eat twice daily." He makes the remark that if any of the feeds be eliminated, clover should be excepted. Dodge says: "Feed the colts all the good oats and timothy they will eat up clean, and see that they get enough exercise to warrant such feeding." According to White a few carrots fed three times a week to the colts will drive the worms and keep the bowels in normal condition. One horseman is quoted to say: "As to feeding them, I give them clover hay, with a small allowance of corn, and all the good oats they will clean up. I also like sowed cane, which I think makes an excellent feed for young colts in winter."

Carter⁸⁷ places the weaning age at from 6 to 8 months. As to the feeding and management of the colts after weaning, he writes: "After weaning feed a liberal ration of ground oats, bran, a small amount of oil meal, and roots, carrots preferred. 'It is wise never to let the meat get off a colt that its mother has put on.' If allowed to be so the colt will be pot-bellied, stunted and will appear as a yearling at two years of age. The second summer as a year old, no matter how good the pasture may be the colts should have little ground oats until coming two. At two they will get along on good pasture."

Axe³⁸ writes: "Foals are usually weaned about September or October, when they are 5 or 6 months old. In all cases the foal should be well 'done' with corn, bran and chaff for 3 or 4 weeks before being weaned . . . We think that gradual intermittent process of weaning is most rational. To avoid painful distension of udder of mares weaning their foals the quantity and milk-forming quality of the food should be reduced and only a moderate measure of water allowed."

Weld and Du Hays⁴⁷ give the practice of weaning and feeding the colts afterwards as followed by French breeders: "At 6 months the colt is weaned. If it be a filly it remains in the canton where it was foaled, to be put to breeding when it reaches the proper age. If it be a horse colt, it is sold to the farmers of the raising districts."

"There is but little trouble taken in weaning the colts. This passage from one period of life to another . . . takes place quite simply . . . They wean themselves in the trip from their birthplace to their new destination. The farmers in the neighborhood of Regmalard, who ordinarily buy them very young, give a little cow's milk on their arrival, to strengthen them, and to serve as a transition, but even this method is far from universal."

"The colts when they come upon the farms, are put five or six together, pell-mell, into an indifferently ventilated stable, which receives its light through a lattice door. Their nourishment consists of a very thin mush, made of barley flour and bran, frequently renewed. The solid portion of their food is composed of dry clover hay, with which their cribs are regularly filled.

"Some farmers feed aftermath, which is sweeter; but as this is apt to load the stomach, in order to render it more easily digested, it is mixed with oat-straw.

"It is very rare that these colts, changed from one district to another, often making long stages, and exposed to the inclemencies of the weather, are not attacked with strangles. Many raisers at this period have the pernicious habit of giving them some kind of grain, in order to warm them up, and cause them to throw off the disease. But this food has the fault of thickening the blood too much, and exposes them to numerous ailments.

"The diet is continued until the spring, at which time the colts are given green fodder in the stable. Later they are turned into the clover fields after the first cut, or into the meadows after they are mowed.

"At 18 months they commence their apprenticeship; passing their necks through the collar, they are harnessed to plows or wagons with horses already broken, although of an age at which, in many countries, their equals are as yet ignorant of all labor."

2. COMMON AND INFECTIOUS DISEASES, AND OTHER AILMENTS

Strangles—Adenitis equorum

"Strangles is an acute, contagious, infectious disease of horses, in the course of which catarrhal symptoms of the upper air passages develop in association with suppurative inflammations in the adjoining lymph glands, and sometimes in a metastatic form in more distant lymph glands. The streptococcus equi is considered at the present time as the cause of the disease.

". . . Strangles occurs almost annually in studs and sale depots, when it usually affects practically all the young foals in a varying degree. In later stages it is rarely observed, and almost exclusively in horses which have not passed through the disease while young. It occurs almost everywhere (Ireland and Argentine are supposed to be free from the infection), and although its course is usually favorable, yet it may cause considerable loss to the horse owner through frequent disturbances in the development of the colts, and also by occasional deaths.

"Under natural conditions the infection occurs usually through the nasal secretion or pus from affected animals entering, directly by transmission with contaminated substances (food, drinking water), the upper air passages of a healthy horse . . . where it adheres to the mucous membrane. It is also very possible that infection takes place through the uninjured mucous membrane, where the bacteria very likely penetrate the excretory ducts of the mucous glands. The disease which usually attacks all the colts in a stable, could hardly be explained otherwise; on the other hand the infection is favored by conditions of the mucous membranes in which there is a desquamation of the epithelium, or by deep penetrating injuries.

"The disease occurs usually when affected or not entirely recovered animals are introduced into the stable . . . scabs from an exanthema of the skin of colts affected . . . may also disseminate the infection.

"The air evidently plays an important part in the transmission of the infection, inasmuch as in the warm and moist stable air the virus expelled during coughing and blowing may float for a considerable time

attached to the droplets, and later enter the upper air passages of healthy animals. This form of transmission through the air is less dominant out of doors, first on account of the smaller quantity of moisture, and second on account of its more rapid movement, which results in the rapid dilution of the expelled virus.

"Through contamination with nasal discharge and pus from the glands the most varied objects may become carriers of the infection, such as cribs, drinking utensils, the food, the drinking water, straw, walls, floor of the stables, the grass in the pasture, further the hands and clothes of the attendants. The fresher the secretion the greater its virulence; drying, however, does not wholly destroy its infectiousness. The disease usually occurs annually almost at the same time of the year in stables of colts, if they have not in the meantime been cleansed and disinfected. It usually appears in the spring, and it is not possible in all instances to prove a fresh introduction from the outside. In such cases it must be assumed that the virus remained in the stable after the disappearance of the disease, and was there dormant for months until it again attacked the susceptible individuals of the new generation of colts, and thereby caused a new outbreak of the disease.

"The infection probably enters from the digestive tract and especially through the intestinal mucous membranes in those cases in which it affects primarily or exclusively, the lymph glands of the mesentery. However, up to the present time it has not been possible to produce this form of the disease by feeding infected food.

"In copulation an infected stallion may transmit the disease to mares, and in such cases there appear symptoms of a vaginal catarrh, while the lymph glands in the vicinity of the external genital organs and of the rectum, as well as in exceptional cases also the udder, become affected Affected colts may infect their mothers during sucking and cause an inflammation of the udder and the neighboring lymph vessels

"There is another possibility that the streptococci of strangles may live outside of the animal bodies as saprophytes, and under favorable conditions may attack colts, especially when the animals are weakened by outside influences. In this manner those cases can be explained in which the disease appears in localities after years of absence, without any demonstrable introduction.

"Solipeds are exclusively susceptible to the disease, and they become infected at the age of one-half to 5 years, mostly, however, while they are colts. In rare cases the disease may occur at the age of 1 to 2 months and also in animals over 5 years of age. The greater susceptibility of young animals is associated with the lesser resistance of their mucous membranes. The greater resistance of older animals is, however, probably the result of their having already passed through an attack of the disease it usually attacks animals only once during their lives some horses may become affected repeatedly, but in such cases the attacks are usually separated by intervals of several years, while cases in which an animal becomes repeatedly infected in one year are exceptionally rare.

"Outside influences which reduce the natural resistance of the animals, especially colds, favor the infection, by causing a catarrh of the mucous membrane of the air passages, as a result of which the epithelia become loosened, and thereby the bacteria colonize more readily in the profusely accumulated secretion, from which they may penetrate the tissue of the mucous membrane.

"Usually weakened and poorly nourished colts are particularly susceptible to the disease. In this regard, stabling in poorly ventilated, excessively warm stables, insufficient feeding, sudden changes of weather, fatigue during transportation, also pre-existing illness have a modifying effect on the individual susceptibility. The cases in older horses usually

have a direct connection with such factors. On the other hand the resistance is increased by work, acclimation to the changeable outside influences and hardening. Other accessory conditions, such as temperament, teething, etc., have no influence on the susceptibility.

“Prevention. This consists in keeping healthy horses, and especially colts, from affected animals, as well as from stables and stands occupied by the latter. In this way it is frequently possible to protect animals from infection through their early years and if they should later contract the disease it will run a milder course. The colts born upon certain premises should be kept as much as possible separate from strange colts. If the disease appears in spite of it, it may be checked by transporting the healthy animals as early as possible to localities free of the disease; in such instances the animals should be guarded especially against cold; which would reduce their resistance. After the extinction of the disease thorough disinfection of the stables and the stable utensils is very desirable as otherwise it reappears annually in the infected establishments. Repeated disinfections will prevent the reappearance of the disease still more efficiently.” Hutyra and Marek.⁷²

Parasites

Dr. H. D. Bergman* mentions “various bots infesting both the stomach and intestines, common round worms and tape worms in the small intestine, and the pin worms and the so-called palisade or red worms infesting the large intestines.” Ringworms are also met with.

Among the skin parasites gnats, various flies, lice, mange, mites, ticks, etc., are given.

Cryptorchidy

“Cryptorchidy also constitutes a uniform cause of sterility when both testicles are retained within the abdominal cavity. We speak of abdominal and inguinal cryptorchidy but, ordinarily, only the former may exist as a permanent condition, while the latter is a transitory state, in which the gland is descending from the abdomen into the scrotum, which it will eventually reach. It is only very rarely that inflammatory adhesions or other conditions may permanently arrest a testicle in the inguinal region during its descent.

“Typically, cryptorchidy, is an arrest in the development of the testicle, the organ being small, flaccid and soft. Histologically it partakes of the character of the fetal testicle and spermatozoa are formed by it. If such a testicle descends and passes from the abdomen through the internal inguinal ring, it tends to at once develop normally and become fertile. However, it is essential that the gland itself shall descend. In some cases, the epididymis descends into the scrotum, while the gland remains in the abdomen, the testicle retaining its typical cryptorchid character and remaining sterile. While the typical abdominal cryptorchid testicle is regularly sterile, it nevertheless induces a sexual reflex, causing the development of the ordinary male attributes, such as the characteristic head, neck . . . and voice and usually a sexual desire of an intense and more or less perverted character, in which vice assumes a prominent role. If only one testicle is retained in the abdomen, the other being normally located and developed or even having undergone compensatorial hypertrophy, the animal may be fertile, that is, the normally developed gland is capable of performing its function regardless of the presence of the sterile gland within the abdomen. The perverted sexual desire, akin to nymphomania of the female, persists so long as one testicle is in the abdomen, even though one has descended into the scrotum, and functions. The defect is of further interest to the breeder because of its pernicious hereditary transmission from parent to offspring. The condition is beyond practical remedy. While it is surgically possible to procure the

descent of the testicle into the scrotum and thereby cause the gland to so develop that it will perform its normal function, this would not prevent the transmission of the defect to the offspring." Williams.⁴⁸

Cracks

"Interruptions of continuity of the wall extending in the direction of the horn-tubes are known as cracks or seams. They have according to their location, degree, and extent, not only various names, but also a varying significance.

Occurrence. On the inner side of front hoofs, especially of horses that stand base-wide; on hind hoofs, usually at the toe.

Classification. According to location we distinguish toe cracks, side-cracks, quarter-cracks, and bar cracks. Those cracks which affect only the upper border of the hoof are called coronary cracks; those which are limited to the lower border of the hoof are sometimes designated low cracks (plantar cracks); while those which are continuous from one border to the other are called complete cracks. If the crack passes through the entire thickness of the wall to the sensitive tissues underneath, it is called a deep or penetrating crack, in contradistinction to the superficial crack . . .

Causes. There are many. Besides wounds of the coronet, everything that impairs the elasticity of the horn, weakens the hoof, and causes an overloading of one-half of the hoof. Furthermore, great dryness and excessive work on hard streets.

Prognosis. This will depend upon the age, kind, and location of the crack. A low crack is without significance unless it is the remnant of an old coronary crack which has grown down. Coronary cracks, on the contrary, are more serious because of the lameness which often accompanies them, and especially on account of the long duration of the healing process.

"The borders of the crack never grow together, and healing can only take place through healthy, unbroken horn growing down from the coronary band." Lungwitz and Adams.⁷³

XI

EXPERIMENTAL WORK ON COLT FEEDING

At the Iowa Station, Wilson and Curtiss¹⁰² conducted an experiment on feeding weanling fillies in which a comparison of whole grain with ground grain was the objective. Six imported fillies were used—two Percherons, two English Shires, and two French Coachers. The feeding period was 79 days. Two lots were provided for each consisting of one of each of the breeds. The two lots received the same grain feed composed of oats, shelled corn, barley, bran and linseed meal, but lot 1 got the ground feed mixed with a small amount of moistened cut hay, while lot 2 received the unground grain preparation, dry and without hay. For roughage both lots were fed the same quantity of hay and stover. Salt was given at will. At the end of the experiment lot 1 gained 472 pounds and lot 2 gained 431 pounds, or 41 pounds in favor of the ground-feed lot. It is also claimed that the use of separator milk, which was used in the preliminary feeding, is a highly satisfactory feed for colt raising.

Another experiment similar to the above, or a continuation of the same test, was undertaken by the same experimenters at the Iowa Station. The same animals were used and they were again divided into two lots. But the experimental period was changed—two periods of 40 days each with an intermediate period of 16 days were provided. Lot 1 received oats, corn, bran, linseed meal, and cut hay, the grain being ground during the first period. To lot 2 the same feeds were fed but the grain was unground and the hay uncut. The lots were reversed during the second period. The gains during the first period were—lot 1, 149 pounds, and lot 2, 127 pounds, while during the second period lot 1 gained 108 pounds and lot 2, 57 pounds. The results therefore corroborate the findings obtained from the original.

It is pointed out that "An interesting feature brought out in these two experiments is shown in the amount of feed required for a pound of increase in weight at different stages in the colts' development. From April 1 to May 18, 1892, growth was made by these colts at the rate of 1 pound for each 7½ pounds of grain, while in February, 1893, the same colts, stabled in the same stalls, and under substantially the same conditions, except as to temperature, required 11 pounds of grain for each pound of increased weight. The amount of hay eaten was practically the same this year as last. It is generally estimated that it costs more to winter a weanling colt than a yearling, and under average Western farm conditions this assumption is correct, but when this is the case it is probably the result of the fact that the yearling colt is capable of making better use of the rougher and cheaper feeds of the farm, and not to superior digestive and assimilative power in utilizing feed of the best quality. The weanling colt requires palatable and nutritious feed of a high quality, and is capable of rendering a good account for such a ration."

At the Pennsylvania Station, Cochel and Severson¹⁰³ conducted an experiment on the developing of draft colts. Ten grade Belgian and Percheron colts and one pure-bred Percheron were used. The main object of the experiment was to determine the cost of raising the colt from weaning to two years of age, while other data such as feeds consumed and changes of form were also considered. No regular treatment was pursued whether in the feeding operations or in their handling. However, it is worthy of note to bear in mind the different feeds used, namely: The first winter the grain consisted of five parts shelled corn, 3 parts shelled oats, 2 parts wheat bran and 1 part linseed meal. One group received silage and hay, while another got only hay for roughage. The next summer the grain

feeds were for a time the same grain mixture referred to and at another oats alone. For a short time the fillies got no grain while the stallions got corn during the same period. Then corn and oats formed the grain portion of the ration at the latter part of the summer feeding. Pasture, silage, and hay made up the coarse feeds given. The third feeding period in the coming winter finds the colt getting mostly oats in the earlier part of the period and then a grain mixture embracing 6 parts of shelled corn, 2 parts of shelled oats, 1 part of wheat bran and 1 part of linseed meal was employed for the remainder of the test period. Hay was the only roughage provided for. According to the experimenters, "No effort was made to secure extreme weight, but the colts were kept in good growing condition." The feeding periods were 168 days the first winter, 196 days during the next summer, and 196 days the second winter.

The results of the test follow:

"During the progress of the test each colt consumed 28.5 bushels of corn, 52.2 bushels of oats, 1.6 tons bran, 1.2 tons of linseed meal and 3 tons hay and its equivalent in corn silage, together with less than an acre of good pasture.

". . . their increase in value during their development was sufficient to pay for all feed and labor, leaving a net profit of \$45.66 on each individual in addition to the value of the manure which is variously estimated from \$25.00 to \$50.00. The full value of these have not yet been reached, hence there should be a further profit as they develop, while doing the work on the farms. This test demonstrates the possibility of producing draft horses profitably under conditions which were not ideal and during a period when grain and forage crops were higher in value than in any like period in fifty periods.

". . . When the rate of gain as measured by the amount of fat deposited on the body was at its maximum, the growth width of chest was greater than the growth at depth. During the third period, however, the change in the form of heart girth was very noticeable in depth, though there was an actual decrease in the width as compared with the preceding period. This decrease in width was due entirely to the fact that the colts were losing in condition, although they were growing as far as the length of bones was concerned. During the last period when the colts were approaching maturity, it will be noticed that the change in depth of heart was very slight while there was a material increase in width, especially in that portion above the median line.

". . . it would seem that the rate of growth as measured by the increase in the length of bones is continuous from birth to maturity, but that the increase in width of body may remain stationary while that in depth increases. This is to a very large extent due to the amount of food that the animal consumes over and above that required for maintenance and growth which is represented by a deposit of fat over the outside of the chest. There was apparently a greater increase in the depth of chest than in the depth at the middle of the paunch, doubtless due to the colts being 'paunchy' at the beginning of the feeding period.

". . . that the height of withers was materially greater at weaning time than that of the croup, while in their two-year-old form the difference was very much less. Another interesting feature in regard to the measurements is that the depth of the chest increased 32% during the entire period, while the distance from the chest to the ground only increased 9.78%, showing that the foal is much more 'leggy' than the mature horse. There was very little change, amounting to only 1.8% in length of the cannon of the hind leg as indicated by the measurement from the point of the hock to ground. There was a very material increase in the length of shoulder and also in the length of back as measured from the scapula to the hip. In all of the measurements, however, the increase in width is proportionately greater than the increase in height, so that the body may be said to change in both depth and width to a greater ex-

tent than in the length of the long bones of the skeleton. There is apparently a much greater increase in the circumference of the girth at the heart than in either the circumference at the hind flank or in the middle of the paunch.

"During the last period when the grain rations were increased very materially in order to induce fattening, the most noticeable change was in the width of the body throughout. There was practically no additional growth in the depth of the chest or in the length of the cannon during this period. The greatest change was in the rounding out and improvement, in the symmetry, form and general appearance of the animals rather than any actual change in the form as indicated by the change in skeleton."

Snyder¹⁰⁴ of the Nebraska Station (North Platte) conducted an experiment on the value of some forages for growing colts, with the main idea of testing the utility of alfalfa pasture and alfalfa hay for the same purpose. Thirty colts were used and these were subjected to test from the time they were just weaned up till maturity. They were divided into three lots. Lot 1 received alfalfa hay in winter and alfalfa pasture in summer, Lot 2 were given access to alfalfa hay in winter and prairie pasture in summer, and Lot 3 got prairie hay and cane hay in winter and prairie pasture in summer. For the first winter these colts received grain ($\frac{2}{3}$ corn and $\frac{1}{3}$ oats), each receiving 4 pounds daily, but during spring this amount was altered. The feeding of grain after the first winter was rather irregular except Lot 3 which got 3 pounds of emmer per head during the next winter. When being broken as two-year-olds the colts received a little grain and at the age of three they were started to work at which time grain was given to them. This grain, however, was not included in the computation for their development on account of the work which pays for their keep.

Snyder gives conclusions of the experiment and writes:

"(1) It was not profitable to pasture the alfalfa during the summer, or at least after the first summer.

"(2) It was profitable to feed alfalfa hay during the winter.

"(3) It might have been profitable to pasture the alfalfa during the summer if the colts had been sold as yearlings or two-year-olds.

"(4) It may be profitable to pasture alfalfa with colts where there is some special incentive for getting rapid gains or where the cost of alfalfa pasture and of native grass pasture are about equal.

"(5) Alfalfa pasture put the colts in an excellent condition of flesh and finish and produced no injurious effects.

"(6) The flesh put on these colts is in no sense 'flabby' or temporary; it seems to be solid flesh that endures work.

"(7) Alfalfa hay produces more increase in weight on colts than prairie hay and cane hay during the winter.

"(8) Colts make a greater gain during the first winter and during the first summer after weaning than during any winter or summer following and also make greater gains during the second winter and second summer than during the third winter and third summer, when conditions are similar to those in this experiment.

"(9) Colts put on pasture when thin in flesh make faster gains than similar colts put on pasture when in good flesh.

"(10) The increase in weight on colts in this experiment cost less during the first winter than during the second winter, and less during the second winter than during the third."

Feeding trials conducted by Fuller¹⁰⁵ of Wisconsin Station on the feeding of 11 pure-bred draft foals resulted in development of as much as 1000 to 1200 pounds at the end of one year. The feeds consist of a mixture of 60 per cent ground oats, 15 per cent corn meal, 10 per cent bran, and 15 per cent cut alfalfa, supplied in amounts as the foals would clean

up at a time. These foals ate an average of 16.5 pounds per day. The feeding period varied from 140 to 223 days and the average gain was 2.1 pounds daily at an average cost of 18 cents for feed. \$51.66 was the estimated cost of feed for the first year. The method of feeding pursued, while not applicable to raising inferior stock, still finds place in forcing pure-bred colts or grades of superior make-up.

At the Kansas Station, McCampbell¹⁰⁶ performed a feeding test on ten pure-bred and ten grade colts and the objects in view were:

"1. Can good draft colts be grown without the use of oats?

"2. What does it cost to develop a draft horse under average Kansas conditions?

"3. What type of colt usually develops into the largest horse?"

The colts were approximately eight months old and the total length of time through which the experiment was carried was 720 days. One lot was fed a grain ration of oats with alfalfa hay, straw, corn stover, and pasture, while the other got a grain mixture composed of 75% of corn, 25 per cent of bran, and 5 per cent of oil meal, together with alfalfa hay, straw, corn stover and pasture. The same amount of grain and the same kind and amount of roughage were provided for. It was intended to induce maximum growth and the colts were in good condition but not over-fat.

The results of the investigation as summarized by McCampbell follow:

"1. The colts receiving a grain ration of 70 per cent of corn, 25 per cent of bran, and 5 per cent of oil meal made a daily growth of 1.023 pounds during the entire period of 720 days, while the colts receiving oats made a daily growth of only 0.926 pounds.

"2. Each pound of growth during the entire period made by the colts receiving corn, bran and oil meal cost \$0.1504, while each pound made by the colts receiving oats cost \$0.186.

"3. The colt made more rapid growth during the first year after weaning than during the second year. The first year's daily growth averaged 1.285 pounds and the second year's daily growth 0.7 pounds.

"4. Although the total cost of feeds consumed during the first year was greater than that during the second year, the growth was cheaper. The average cost of each pound of growth during the first year was \$0.142, and during the second year \$0.230.

"5. The average total cost of developing the grade colts from the time they were approximately eight months old until they were ready to work (two and one-half years) was \$123.37. The cost of raising a draft colt to the age of eight months is about \$50, making the total cost (including the labor) until the colt is ready to work approximately \$175, under conditions and prices similar to those of 1913-1914.

"6. The colts showing considerable bone and stretch at weaning time developed into the largest horses. The plump, mature looking weanlings are still plump little horses."

At the Illinois Station, Edmonds¹⁰⁷ put under trial the raising of ten pure-bred draft weanling fillies up to two years of age on alfalfa hay, corn and oats. Oats and corn, in half and half proportions by weight, form the grain mixture. Alfalfa was the only roughage fed, and during the pasture season the fillies had access to blue grass mixed with a little of timothy, orchard grass, medium red and white clover. The feeding periods embraced two winters and one summer.

According to Edmonds, "The trial seemed to indicate that a liberal portion of well-cured legume hay should be the foundation for feeding young, growing horses. Along with this roughage, enough grain should be fed to produce the desired growth. In this experiment it seemed necessary, unless the fillies received a setback in growth, to feed some grain throughout the pasture season.

"Alfalfa hay fed with corn and oats gave results of a character which

indicates that there is little or no need of feeding purchased mill feeds to growing horses when alfalfa can be grown on the farm. When alfalfa hay is the roughage used, a considerable proportion of the grain ration may safely be corn. In this experiment the proportion was one-half by weight.

"The average total feed consumed per head during the experiment was 45.35 bushels of corn, 79.36 bushels of oats, 2.58 tons of alfalfa hay, and four-fifths of an acre of good grass. The average total grain in weight per individual was 690.5 pounds, and in height, 7.96 inches. The average daily gain was $1\frac{1}{3}$ pounds.

"During the first winter an average of 5.674 pounds of grain and 4.266 pounds of hay was required per pound of gain. The second winter feeding period required an average of 9.228 pounds of grain and 12.99 pounds of hay per pound of gain.

"The average weight of the lot at twelve months was 1,112 pounds; at twenty-four months, 1,548 pounds. The average weight of eight head, the two youngest fillies being excluded, at corresponding ages, was 1,128 pounds and 1,578 pounds respectively. The growthiest filly weighed 1,260 pounds at twelve months and 1,775 pounds at twenty-four months.

". . . The three sets of prices used in figuring the feed cost show \$86.88, \$105.50, and \$108.49, respectively, as the value of the feed consumed by the ten head."

Harper,⁹⁴ in his investigations on the raising of colts at Cornell University, arrived at: That "it requires 4,746 pounds of grain and 6,804 pounds of hay to grow a colt up to spring when he is three years of age and of an average weight of 1270 pounds. This is approximately 2 2-5 tons of grain and 3 2-5 tons of hay." That "on general farms, where there is much work for the horses during the rush seasons and scant work at other times . . . that the work may be performed by brood mares; that the mares may raise a colt in addition to the work performed; and that the colts produced under such conditions not only provide a means for the disposal of extra farm produce, but in addition yield a profit of approximately \$50 a head, or 30 per cent on the investment." Harper goes on to say that "further, in this calculation, the colts are at a disadvantage inasmuch as they are under age, the most profitable market age being approximately five years."

X

CARE OF THE COLT'S FEET

According to Kennedy,⁶¹ the fact that crooked leg or deformed foot may result from neglect in trimming the hoof of the foot implies the necessity of giving occasional attention in leveling the feet of the colt. To do this, "take up the foot, and trim off the surplus horn with a pair of hoof nippers, a heavy knife, or rasp. Round off the edges so that there is less tendency for the hoof to break. Handle the colt gently at first, and if he struggles to get his foot down, talk gently to him and pet him, but do not release the foot. If he gets his foot away a few times he will acquire the habit and will always make trouble in handling the feet, either for shoeing or for trimming. A common method is to stand the colt on the board floor and trim off the surplus horn with his foot on the floor. One front foot is tied up to make him keep his other foot on the floor. In working with the left hind foot tie up the left fore foot; and with the right hind foot, the right fore foot. With this method the horn is cut with a mallet and chisel. This is a quick and easy device adapted to vicious horses, but the operator cannot do as good a piece of work, and often has difficulty in telling exactly where to cut, since he has to guess at the position of the sole."

Carter's⁶⁷ advice in training the colt's feet follows: "The care of and training of the hoof should begin when the animal is still young. The hoofs should be rasped frequently, keeping the foot level . . . I keep the heels down lower than the frog which will have a tendency to spread the heel. I also keep the toes rasped back. By letting the toes grow long they take all the substance away from the quarters, causing a long mule foot. By so doing I get the desired round foot. The important point to remember is to keep the foot level."

Thomas and Shields⁶⁹ say that, "If there is the slightest sign of curby hocks, we cannot cut the toes too snort, nor keep the heels too high, and when there is a strong predisposition to this unsoundness, early shoeing is strongly recommended, the shoe to be square toed and set back from the toe, the heels of the shoe to be of a good length and a heel calk turned up on them."

Broadhead¹⁰⁸ states that colts should not be let loose in the pasture unless their feet have been pared and leveled, which he says, should be done regularly every six months beginning at the time when the colt is a year old.

XI

EDUCATING AND TRAINING THE COLT

Johnstone⁵ dwells at length on the education and breaking of the colt, thus:

"Breaking a colt should begin when the youngster is a few days old. Fit a little headstall to its head and leave a strap 6 or 8 inches long hanging from it. Catch the foal by this strap often and get him thoroughly accustomed to being handled, to close association with mankind, to have his legs rubbed and his feet picked up. A foal is a friendly little fellow as a rule and likes to play and be petted . . . It is always bad to 'baby' a horse, but with a foal it is different. Familiarity with mankind and the consequent fearlessness accruing are safe insurance against trouble when it comes to breaking to harness. Early teach the foal to lead. Have a fairly long lead-strap, get behind him and make him go ahead. That is the right way. The wrong way is to get in front of him and try to drag him along. Gentle persuasion with the whip may be necessary, but if the foal has been gently handled he will not be afraid and will quickly learn to go on about his business. Make him do whatever you set out to teach him to do. Breaking colts or horses is much like raising orphan colts—it is largely in the man. A horse, young or old, is a stupid sort of a beast at the best and unless he is intelligently raised is possessed by fear. Then under strange circumstances he will do anything which he ought not to do; he gets rattled and then he does not know what he is doing. On the other hand if he has confidence in the man who has hold of him, his master's voice will reassure him.

"There is a whole lot too much fuss, as a rule, made about breaking young horses. If the breaking is made a gradual process it will come to a head much as a matter of course. If they are allowed to run practically wild until three or four years old and then suddenly caught up and the effort made to force them to do something they know nothing about there will be trouble and there always is.

"I figure that it is best to break colts and accustom them to the harness at two years of age. First of all, on the farm, take a thick straight bit and buckle it in the mouth with two short straps to the square irons in the ends of the cheek pieces of the halter. Let them stand tied in the stall and they will mouth and champ on the bit and so toughen the cheeks, or parts of the lips which the bit contracts, in that process.

"Now get ready a leather surcingle with a loop strap on top and buckles stitched half-way down each side. Buckle the surcingle around the colt's body and adjust a check rein moderately tight or if desired a regular biting harness may be used. This consists of a bridle and check-rein, a surcingle and crupper and two side lines, running from the bit to the buckles on each side of the surcingle. The bit in a biting harness usually is a thick snaffle with a line of little metal pendants called 'keys' hanging to the joint in the middle of it. The object of these keys is by annoying the tongue to make the colt champ the bit and so toughen his cheeks. After the colt has been allowed to go a while with his head checked up, attach the side lines and buckle them moderately tight. Turn him out thus rigged into the yard and let him go a few hours a day for a week. Then substitute real reins for the sidelines and drive around until he knows how to guide this way and that, to stop at the word 'whoa,' and to step up when directed. Break the colt to stand absolutely still when being harnessed. That is a first essential. A horse that is perpetually stepping around while being harnessed is but half broken. . . . A gentleman's horse is broken so that he stands until his owner

adjusts his apron or robe, takes up his reins and gives the word to go on. The time to teach the horse these pleasant ways is when he is first broken. Likewise teach him to back pleasantly and always with a pull of the reins. Do not try to teach the colt too much, but insist that he stop as instantly as possible at the word 'whoa,' back when told to do so and the pull on the reins shows what is wanted, and to get up promptly when the word is given.

"After the colt has been driven around by the reins and has learned to guide to the right and left, to turn around, 'get up' and 'whoa,' hitch him into a long-shafted breaking cart single, or double, with some steady-going horse, not necessarily an old one, but always reliable. It is a mistake to hook a colt up the first time with some old plug that cannot get out of his own way. He will never step fast enough for the young one and the latter will fret and worry. There are easier and shorter ways to break horses than this, but it pays to take him as described for the reason that the process outlined if followed will develop a mouth not too hard and not too soft . . . When he is young his brain is more plastic and sensitive to impressions than when he grows older. Habits he contracts at two years old will be retained through life.

"When colts have been well broken as two-year-olds they may be turned out for the rest of the year. They will never forget their lesson."

Gay recommends:⁴ "Little foals should be taught subordination at the very start, and not allowed to become wilful or headstrong. An early effort in this direction will not only simplify that culmination of their education, too often most properly termed 'breaking,' but it will insure that end being more completely accomplished. On the other hand the idea of fear must be kept as remote as possible, as the timid horse is usually the one which has some terrifying experiences to remember. Even before the time for haltering arrives, the youngsters may be taught to stand over, have their feet raised, and in a general way to respond to the master mind.

". . . When halters are to be placed on the colts in order that they may become accustomed to them, one of the light web variety is preferable to the heavier strap halter commonly used, and care should be taken not to pull heavily on the nose band at any time. Many deformed face lines have been caused by this means. It is not necessary to drag a colt by the halter in order to suggest to him that his business is to follow. As a matter of fact, the reverse effect is usual, and the harder a colt is pulled, the harder he pulls back. If on the contrary, he is coaxed along some accustomed route, as to the water trough and back, he will soon catch on and follow promptly whenever the halter is taken in hand.

"The first time the colt is tied up by the head, see to it that the halter will hold him in case he pulls. If it does and he fails in the first few attempts, a string will probably serve as well as a chain to keep him in his place thereafter, while if he succeeds in freeing himself at the first few attempts he will never cease trying to repeat what he has once accomplished.

". . . The first step toward getting a colt going successfully in harness is to properly bit and mouth him. In the old countries a common practice is to back the colt into a slip stall and hold him there by cross-ties snapped in the bit rings. He thus works against the iron, first bearing, then yielding, until he becomes accustomed to its presence and the pressure exerted by it. The dumb jockey or more simple biting ring, commonly used here, serves much the same purpose, but no mechanical device is as effective as the pressure of the hand on the rein; better mouths are made in this way. One of the most effective ways of developing a good mouth in a colt and of teaching him to flex his neck is by riding him as soon as he is old enough to be 'backed.'

"While teaching the horse subordination by leading him to underestimate certain of his powers, it is also essential that he be made to

believe that there is no limit to certain others. In the breaking process the kick-strap should not be left off until the habit has been acquired, nor should any pains be spared to prevent an initial performance at either rearing, backing, wheeling, or running. On the other hand, it is just as important not to overload a pair of draft colts, with a view of creating in them the notion that they can pull anything with two ends loose . . . Thus by exaggerating our equine servant's notion of those of his powers which are most useful to us, and at the same time deceiving him as to those attributes which, if realized, might impair his usefulness, we promote his serviceability."

Thomas and Shields⁸⁹ advise that the colt be placed in a boxstall and haltered. The use of a strong five-ring leather halter is advocated. To break the colt to stand tied, one horseman is quoted, as follows: "Take a five-eighths inch rope around the colt's girth, slip the plain end through the nose, and draw the rope tight around the girth, pass the loose end of the rope between the colt's legs and up through the halter ring. Tie end of rope to a ring in the stall and leave colt stand for an hour or so each day. This will break the colt to stand hitched, which is an important part of its education." Other horsemen, the authors say, object to the practice of tying the colts in the stall except only after they are thoroughly halter broken.

With regard to manning the colt, Whiteley⁸⁹ writes: "We commence manning the colts almost as soon as they are foaled, and soon accustom them to being handled. Our colts are haltered when they are two or three weeks old. We use an ordinary halter, and get a piece of half-inch hemp rope, about two and a half feet long, thoroughly wrapped at one end, or near the end, and with a snap hook attached to the other end, and snap the rope into the halter, letting the colt carry or drag it so as to become accustomed to carrying something, and in a way, to be guided by it."

Heather⁸⁹ is also of the opinion to put a halter on the colt, which is allowed to drag. He objects, however, to the use of ropes around the girth and hindquarter on account of injuries that might result. For further means of gentling the colt, he recommends putting a quiet man who is fond of colts who may play with the latter.

According to McCarr⁸⁹ the colt is halter-broken "by putting a piece of three-eighths inch bell cord around it, the same as a breeching, and then a short piece or run over the back, directly over the flanks, connecting both sides, to keep it from falling down over the heels; then the two long pieces are run through the halter ring. The colt breaker takes the halter shank in one hand, and the two ends of the cord in the other, then gently pulls on the halter shank and gives the cord a sharp jerk. The colt will generally make a jump forward and in some cases attempt to kick, but it takes, as a rule, only one lesson for the colt to grasp the idea that with a pull of the halter shank it will also receive a jerk on the cord, so that after a few lessons it will obey and lead on the first pull of the shank." Alley⁸⁹ is claimed to practice the same method modified in such a way, however, that the pull exerted on the halter rope and to the rope going around the colt is made equal. He points out the desirable affect of a steady pull, which would result in always making the colt step forward on account of the pressure behind.

McDonald's⁸⁹ method is described in the following way: "He uses the ordinary biting rig, consisting of a surcingle, back band (with a ring on either side), crupper attachment, plain, open bridle without check, and a soft leather bit with a leather guard at either side of the mouth. The colt is led out into the yard or paddock and a short strap attached to the bit on one side and tied through one ring on the back band, tight enough to draw the colt's head around to one side. The colt is then turned loose and allowed to wander where it will. As the head is turned

to one side, the colt will continue to go in a circle and cannot run. After a few minutes the strap is changed to the other side, and in a very few lessons the colt is perfectly bridle-wise. An important advantage of this method is that you can go up to the colt at any time, for it is impossible for the colt to get away from you and the colt will learn the purpose of the bit without inflicting any damage whatever."

Biddell, Douglas, Dykes, Fleming, Macneilage, Murray, and Trotter⁸² advise that at the age of a week or ten days a slender leather head-stall should be placed on the head of the foal, together with a short piece of leather strap connected with it. Soon after training the colt to lead by a plain halter, a leather head-stall is fitted on the head to which a bit is attached. "Then the colt is turned loose in the yard for several hours; this should be repeated for several days before any further steps are taken. At this period we prefer a round piece of hard wood of considerable circumference to the iron bit. When the colt has become sufficiently accustomed to the bit it is well to back him into a stall and have him secured on each side by a strong pillar rein. By repeating the lesson several times he becomes accustomed to and learns to be controlled by the bit. Having been thoroughly mouthed he is next driven in reins and thoroughly accustomed to answer the bit and should be further trained to answer to his name."

The handling of the foal, according to Dimon⁴⁰ should commence from birth. Dimon emphasizes the necessity of educating and training the colt and not to "break" him. According to him, "The first lesson to teach a young colt is that you do not wish to hurt him. The next that you are a stronger party and can master him. He will soon learn these two lessons and then you can go up to him anywhere, and when once you have your hand on him you can easily hold him and he will not struggle to get away from you.

"The next two lessons are to halter and lead him and teach him to stand tied by the halter. You may then, by kindness, teach him to follow you around and come at your call, by always awarding him for so doing with a sweet apple, a handful of oats, or anything else as such youngsters are known to like. Then teach him at an early age to be handled all over, including the taking up of his feet, and to be curried and brushed. When he finds that you do not hurt him he will like these lessons and will always remember them.

"Next, accustom him to stand with a bag or blanket thrown over him. When you have taught him all of these, he is ready, as soon as old enough, to be bridled and bitted. In biting, put a biting rig or single harness on him with an open bridle; check him up rather loosely at first and turn into a small paddock or yard. Do not compel your colt to wear the biting gear too long at one time, as by so doing it has a tendency to sour his disposition. Keep him in the gear long enough each time to give him to understand that he cannot get clear of it and that he must give up to it; and do not take it off while he is struggling to free himself from it, but let him fight it out and get quiet first. Always take it off when quiet, otherwise he may think the removal has been caused by his exertions to get rid of it.

"When he has become somewhat accustomed to the bit and has given up fighting it, start him up a little; always use the same expression, as 'go on,' 'get up,' or whatever term you choose to use for starting him. Practice in this way for a little while until he learns to start and stop at the proper command. Then take a buggy whip, crack it or touch him lightly on the rump, when starting him up. Teach him the word 'whoa' and 'back'; when he thoroughly understands all of this and the use of the whip, put the lines on him, running them back through the shaft tugs instead of the terret rings, to prevent his turning around, and thus teach him all about driving, starting, stopping, and turning.

"Make all these lessons short, and by frequent repetitions impress each point upon his mind. Be kind and considerate at all times, remembering that he is always willing to do what is required of him if he understands you. Do not scold or swear at him. After each short lesson, give an apple or lump of sugar, or some delicacy of which he may be fond, as a reward for good behaviour; it is surprising how soon he will learn to appreciate such awards or favors. Be sure you bit him thoroughly and practice this for some time before attempting to drive in harness on the road. If the colt has always been petted and treated kindly, as he should be, and has no fear of man, there will be but little trouble."

Roberts⁵⁹ gives some general pointers as to the manner in which a trainer should act in the handling of the foal: "The foal should be petted, but kindness and firmness should be used in handling it . . . It is a mistake to attempt to educate . . . foals above their capacity . . . While the foal is yet with its dam, it should be taught to lead and to allow its feet to be handled. The paramount object . . . is to teach it prompt obedience and to inspire it with courage and confidence . . . It should not be allowed to get its legs entangled in stable floors, bridges or fences, and it should never be purposely frightened. The colt and the filly, as well as mature animals, discern quickly a timid, hesitating, or incompetent attendant or driver . . . Teach the foal but little; but what little education it does receive should be so thorough that it will be retained through life. Young colts are nervous; endeavor to strengthen their nerves by implanting confidence, which tends to allay nervousness."

Hopkins¹⁰⁹ describes, in a lengthy and comprehensive manner, a method of training the colt: To educate the foal to lead "A light, well-fitted halter should be placed on the foal just before weaning time to accustom him to it before he is taught to lead from it. Attach a small rope, about five feet long, to the halter, then take a rope about twelve feet long and make a large loop in one end that will fit over the buttocks at the base of the hams. With a rope in each hand, give the halter rope a gentle pull and command 'come.' If he pulls back give the buttock rope a gentle pull; when the pressure is felt he will naturally step forward. After a few steps, place the hand on the nose band of the halter and command 'whoa' . . . To teach him to back place the hand on the nose band of the halter and the other hand against the breast and command 'back.' If he refuses, apply pressure on both nose and breast, and he will quickly learn to obey.

"The training of the foal to stand tied should come next. Place a rope, with a ring in one end, around the loins, forming a slip noose, with a ring on the under side of the body. Pass the rope between his forelegs and tie so that the pressure on the loins will be felt if he pulls on the halter. Care should be taken not to have too much pressure on the halter as colts often injure their heads or necks by pulling.

"When tied the colt should be handled from both sides; gentle by patting and rubbing the hands about the head, neck, back, and legs. If he shows a tendency to kick, use a stick four or five feet long. He should be allowed to examine and smell this stick before his body and legs are rubbed. Continue with the stick until he will stand quietly while being rubbed. The second day tie an old coat or rag on the end of the stick and repeat the first day's lesson. Accustom him to strange noises, unusual sights and fur coats and robes until he stands without fear.

"At this time the feet should be handled, trimmed and kept level . . .

"The foal should be driven with lines at an early age. To do this place a surcingle with line rings well down on the colt. Hitch the lines on either side of the halter and pass them through line rings on the surcingle, keeping them well down on the quarters. Standing on the near side well up to the shoulder, with the right line drawn around the quarters and the left line shortened, command him, 'get up.' If he does

not start, tighten the right line to bring pressure on his buttocks. This will have the same effect as the rope did when teaching to lead, and he will start readily. Circle right and left as well as straight away. Use the command, 'whoa,' and stop him with a hint from the lines and not a hard pull or jerk. Stop and start him often to give him confidence.

"After he is handy to drive teach him to back from the lines. Drive him ahead a few steps, with the command 'whoa,' give a steady pull and command 'back.' Keep straight behind him and have him step backward a few steps, then drive ahead a short distance. Change direction oftén and he will soon back without the pull from reins.

"The colt should be bitted at about two years of age. A good mouth is very important to any horse . . . A biting harness or dumb jockey is used at first to allow the colt to do much of this work himself while running in the paddock.

". . . The bit should be well up in the mouth, but not tight. The check and side reins should be very loose for the first few lessons. Then his head should be gradually drawn up and the side lines shortened until he has his head well up and straight.

"As soon as he is well bitted and accustomed to the harness, remove the side lines and substitute the driving reins. Attach them to the bit and pass through rings well down on either side of the surcingle. This will keep the reins down on the quarters and prevent the colt from turning the trainer, avoiding mishaps. Some trainers leave the 'near' or left rein out of the ring, making it easier to control the colt in case he attempts to run or lunge. He should be guided from left to right, should start at command 'get up,' stop at 'whoa,' and back straight without being pulled back by the reins. Drive him about, and up to strange objects and in strange places. Pass other horses with him and have him stand while others drive by.

"A complete set of harness should be used several times before he is hitched. Attach a piece of rope to each trace, and, with the reins in one hand and the rope in the other, have him pull you by his collar. If he objects to the pull, start it gradually while he is moving. Pole and gentle the colt well before hitching, as many kicking and runaway horses are made the first time they are hitched to the cart or wagon."

A long presentation of handling and training the foal is subsequently set forth, as Harper¹¹⁰ directs and advises: As to the age at which to begin to train the foal, Harper says that "If he is thrifty and strong, the very first day of his life is none too soon to begin training," because "he has fewer ideas of his own and fewer fixed habits." He goes on to say that "The earlier in life the training begins the easier the task, and the longer it is postponed the greater are the chances of a hard struggle. We can show, rather than force, him to do that which he does not understand. While it is true, no doubt, that at this early age the animal's power of memorizing is undeveloped, it must be remembered that the horse learns by association of ideas only and beginning at so early an age has many advantages aside from training the memory.

"Perhaps the most important advantage gained by early training is that the youngster becomes acquainted with his master at a time when man is the animals physical superior. This is significant. As has been stated, the horse obeys commands because he feels obliged to do so, and not because he likes to accomplish a task. It is, therefore, of advantage to fix the idea in the foal's mind that he is our mental and physical inferior and must obey. The earlier he comes into possession of this idea the better horse he will make. On the other hand, horses which have roughed it from birth to maturity having come to know their strength and having their instinct of independence strongly developed, are proportionately more difficult to teach to obey."

To catch the foal, Harper points out that "It is of much importance the

first time the foal is caught that he be held in such a manner as not to cause him fright," and the proper way is to "gently place one arm under the neck and the other under the hams. If he attempts to go forward, apply pressure at the neck, or if he attempts to go backward, apply pressure at the hams. If it is desired to have him step forward, relieve the pressure at the neck and apply it at the hams, or if it is desired to have him step backward, relieve the pressure at the hams and apply it at the neck. If caught in this manner, he will soon become quiet, then he should be handled all over the body and legs. Extra care should be taken when handling the ears, the back of the forelegs, the flanks, and the front of the hind legs, as these parts are extremely sensitive to the touch. This requires only a few minutes and the foal, in all probability, will come to meet you the next time you enter the stall instead of fleeing from you, as he will if you attempt to catch him by the neck or even if you pay no attention to him the first time you enter the stall. If the animals are to reach their greatest usefulness this natural timidity must be overcome and confidence in man established. This can be accomplished by kind, firm treatment. The occasional use of some relished morsel, such as a lump of sugar, will be of material benefit in overcoming timidity and in establishing confidence.

"No sudden movements should be made in approaching the foal, as these will make him start and jump away. In this way, he will soon learn that he can escape being caught. To avoid this we should always go about the young animal in a very quiet manner. Never make a quick movement in catching him, as this will serve to frighten him and make him more difficult to catch the next time. Never attempt to catch him unless sure of success, for if he succeeds in getting away, it is not at all likely that he will forget it soon.

"Children and thoughtless persons often try to make the youngster show off by doing something to frighten him, as throwing sticks, 'shooing,' running at him and the like. This should never be done. Such actions serve to make the animal more difficult to catch and handle, and in fact may so frighten a highly nervous one as to cause him to injure himself in an attempt to get away. If it is desired to see the foal in action, lead the mare away and the youngster will follow, when his action may be noted.

". . . After catching the foal and handling him as suggested, it is important that we secure his complete confidence before he is set free. If for some reason the youngster should make his escape after being caught and held fast, but before his confidence is secured, he will be very difficult to catch the next time. In view of this fact much care must be taken to dispel all fear. Loving kindness is an important factor in securing his confidence. Feeding sweets from the palm of the hand, such as a little granulated sugar pressed between his lips, will aid materially in securing the youngster's confidence. Sugar, being sweeter than the dam's milk, seems to give him the idea that we are his friend, and instead of fleeing as we enter the stall he will come to meet us, placing as much confidence in us as in his mother. The importance of securing the colt's confidence at this early age is very significant, as he is likely to retain the pleasant recollection throughout life.

". . . In handling the foal we should go about the work coolly and with confidence. We should be careful to avoid confusing or exciting him. It must be remembered that there is little connection between the two sides of the animal's brain, and he may be perfectly familiar with us from one side and yet become greatly excited if caught from the other side. To avoid this confusion, handle the foal from both sides. He should become familiar with strange objects from every quarter.

"In training the youngster it is important that the first lesson be of such a nature that they can be understood very easily, and even more easily

accomplished. The foal, of course, must understand what is wanted before he can be expected to accomplish the task. When he fully understands what is expected of him, he will do it with surprising rapidity. Confusion resulting from not understanding what is wanted often so excites or frightens the animal that he is likely to do anything, even to fatally injuring himself by running to telephone poles, gate posts, buildings and the like. Since it is not possible to teach an excited or frightened animal, we must first of all make it clear to him what he is expected to do.

“ . . . In handling the foal, the first few lessons should not exceed fifteen minutes in length, as this is sufficient time to impress an idea on his mind. These early lessons should be exceedingly simple, so as to avoid confusion. Take up one thing at a time, and be sure the colt fully understands what is wanted and how to do it before passing to another. As advancement is made, teach the lessons in the most useful order and always repeat each in the order taught. Soon the foal can be relied upon to go through the list in order given without a break. On the other hand, if the work is given in a haphazard manner, then all is uncertain as to just what the animal can be depended upon to accomplish. If the work is continued too long and the colt fatigued whether mentally or physically, his power of memorizing is weakened, and if the work is complicated, he may become confused. To avoid this make the work short and simple, particularly in the beginning.

“Teach the young animal only such lessons as will be useful to him later in life. As stated, he should be taught to be handled from both sides at every angle; teach him the use of the halter so that he will follow wherever you wish him to go; the meaning of . . . ‘whoa’ . . . ‘get up’ . . . and . . . ‘back’ . . . In addition, familiarize the youngster with objects that are likely to cause him fright, show him that such objects will not hurt him, and that he can trust himself to your care with perfect assurance that he will be protected from all harm.

“The best time to teach the foal the use of the halter is when he is about ten days or two weeks old. This is a very important matter, as it is the first time the youngster has been in any part of the harness, and he should be given to understand from the very beginning that such will not hurt him and that he must obey the signals given by means of the halter. Many animals which have been very teachable up to this time are often spoiled by improper methods of training to lead . . . In this way the foundation is laid for a confirmed halter-puller . . . This comes about because we are not mindful of the natural tendency of the horse to move backward when pressure is applied at the front and to move forward when the rear end is touched. Without thinking, the halter is placed on his head and we begin to pull on the strap, and true to his instincts the foal goes backward . . . It is not necessary to drag the foal by the halter in order to suggest to him that his business is to follow . . .

“ . . . For the foal a web halter is preferable to a leather one, as it is much lighter and softer and not so likely to injure or frighten him. Never use a rope halter on the young foal. An old halter that has been in constant use is better, all things considered, than one that has been hanging up or even a new one that smells of a lot of things that are strange to the animal. It is very important to have the halter fit the head perfectly. Because the foal's head grows so rapidly, colt halters are, as a rule, made too large for the very young animal in order that they may fit later on. The head-stall, brow-band, throat-latch and nose-band should be taken up until they fit, otherwise the pressure will not be applied properly, the check-straps may be pulled around against the animal's eyes, the chin-band slip over the nose and the like, all of which must be avoided. It often happens that in taking up the halter, long

straps are left hanging about the head to annoy the foal. These should be fastened up in some way. It is often rather difficult to adjust the halter to a nervous foal's head, but to be successful one must have patience. Do not be in a hurry, but let the youngster get acquainted with everything as you proceed. With the halter properly adjusted, coax the youngster along behind his mother or some accustomed route, as to the water trough and back. If one has sweets available, such as sugar, and permits the youngster to taste of them occasionally, he will soon follow promptly. If he resents, however, other means must be tried. Do not stand in front and try to pull his head off, for he will only roll his eyes, shake his head and move back; and, above all, do not give up. We must now take advantage of the animal's natural instinct and apply pressure at the rear end as we wish him to move forward.

“ . . . Secure a small rope or sash-cord, about ten feet long, tie a loop or fasten a ring in one end, gently place the rope over the foal's back just in front of the hips, with the loop or ring on the under side of the body, so that when the free end of the rope is run through the loop the rope can be closely drawn around the loins and flanks; pass the rope along under the body between the fore-legs, and then up through the ring on the halter or under the jaw strap . . .

“Take the halter strap in one hand, the loin-hitch rope in the other, and stand in front and a little to one side of the foal. Pull gently on the halter-strap, and as he begins to shake his head give the loin-rope a sharp pull and he will immediately move forward. In fact, he is likely to move forward so rapidly that he will run into you if you stand squarely in front of him. Do not be in a hurry, but give the animal time to get used to the lesson. If he is excited, give him sweets or caress him until he quiets before attempting to give the loin-rope a second pull. When his confidence has been restored, try again, using the loin-rope again if need be. Soon he will follow wherever you lead. All of this requires only five to fifteen minutes, whereas by the old method—pulling on the halter alone—we have little or no assurance when the foal will follow.

“As soon as the foal fully understands the use of the halter and will follow wherever we lead, he should be taught to back. Do not attempt to teach him to back the same day he is taught to lead, but put it over until the next day . . . All that is required is pressure in front. Take the halter strap in one hand so as to guide the foal in a straight line or in any desired direction, extend the fingers of the other hand between the points of the shoulder and press gently against the animal, and he will step back . . . Reward him for his action, and repeat until he will move backward by applying the pressure at the halter alone. Never force the animal by jerking on the halter strap; simply apply pressure in the sensitive chest cavity with the ends of the fingers. In fifteen minutes' time, in addition to leading wherever desired, the foal should be willing to back any distance or in any direction.

“By the third day after haltering, if all has gone well and the colt will lead and back, he should be driven in lines. To do this most successfully, a surcingle, properly adjusted, is required. The surcingle must be provided with a loop on each side, placed well below the center of the body, the lines passed through the loops and fastened to the ring on either side of the halter. Never use a bit in the mouth of a very young animal. Now the lines will pass the hind quarters low and thus prevent the foal from turning with his head towards us, which he will do occasionally if the surcingle is not used. It is very important to keep the reins low in turning to make the guiding process easy. At first walk close to the animal so as to encourage him to go forward by occasionally touching the rump with one hand, while the guiding is done with the other. As soon as he becomes accustomed to being driven, he may be touched up with the lines,

guided to the right and left, but should be stopped often to assure him that he is doing well.

". . . For best results, these terms, 'whoa,' 'get up,' and 'back,' should be taught one each day, beginning the next day after the foal has been driven with the lines. After driving for a short time, or until the excitement has worn off, give the command 'whoa,' following immediately with a sudden and positive pull on the lines . . . Do not speak loud, but rely more on the pressure applied with the lines. The foal should be rewarded. After waiting a short time, start by applying pressure on the rump, and after going until all is right, repeat the command and the pull as before. As soon as he shows indication of stopping at the command, do not pull on the lines. When he stops at the command alone, reward him.

"The next day, after driving for a short time and stopping at the command 'whoa,' the foal should be taught the meaning of the term 'get up,' To do this, start the animal by the command 'get up,' followed immediately by a rather sharp tap upon the rump. Tap the animal according to what he will stand and not so as to frighten him. As soon as he is going normally, stop by the command 'whoa' and caress him. Repeat the process until he will start at the command alone.

"The following day teach the foal the meaning of the term 'back.' This should first be done in the way suggested; that is, by holding the halter in one hand and applying the pressure between the shoulder points with the other, at the same time giving the command 'back.' Repeat until the youngster will move back at the command alone. Now you are ready to snap on the lines and teach him to back from behind. At first it may be necessary to pull on the lines following the command. Repeat and reward him until he will back at the command. By the third day the foal should respond to all three commands.

"The time required to carry out the above suggestion is but fifteen minutes for six consecutive days, or ninety minutes in all, during which time the youngster has been taught to lead, to drive, to stop at the command 'whoa,' to start at the command 'get up,' and to back on command. While he is not yet three weeks of age yet he will obey commands better than the average horse will ever obey them. The value of training begun thus early cannot be overestimated. It fixes the idea of subordination in the horse's mind at a time in life when no subsequent treatment can shake it, and even though the time consumed in such training is quite insignificant, it adds as nothing else can to the future usefulness of the animal."

Youatt³⁷, in his method of breaking-in the colt, writes: "The process of breaking-in should commence from the very period of weaning. The foal should be daily handled, accustomed to the halter, led about, and even tied up. The tractability, good temper, and value of the horse depends a great deal more upon this than breeders are aware; this should be done as much as possible by the man by whom they are fed, and whose management of them should be always kind and gentle. There is no fault for which a breeder should so invariably discharge his servant as cruelty, or even harshness, towards the raising of stock; for the principle on which their after usefulness is founded is attachment to and confidence in man, and obedience, implicit obedience, resulting principally from these. With the horse used for agricultural purposes, after the second winter, the work of breaking-in may commence in good earnest. He may first be bitted, and a bit carefully selected that will not hurt his mouth, and much smaller than those in common use; with this he may be suffered to amuse himself, and to play, and to champ for an hour, on a few successive days. Having become a little tractable, portions of the harness may be put upon him, and, last of all, the blind winkers; and a few days after he may go into the team. It would be better if there could be one before and one behind him, besides the shaft horse. Let there be first the mere empty wagon.

Let nothing be done to him except that he may have an occasional pat or kind word. The other horses will keep him moving and in his place, and no great time will pass, sometimes not even the first day, before he will begin to pull with the rest; then the load may be gradually increased.

"The agricultural horse is wanted to ride as well as to draw. Let this first lesson be given when he is in the team. Let his feeder, if possible, be first put upon him: he will be too much hampered by his harness, and by the other horses, to make much resistance; and, in the majority of cases, will quietly and at once submit. We need not repeat that no whip or spur should be used in giving the first lessons in riding. When he begins a little to understand his business, backing, the most difficult part of his work, may be taught him: first, to back well without anything behind him; then with a light cart, and afterwards with some serious load, and taking the greatest care not to hurt his mouth. If the first lesson causes much soreness of the gums, the colt will not readily submit to a second. If he has been rendered tractable before by kind usage, time and patience will do all that can be wished here . . . The colt having been thus partially broken-in, the necessity of implicit obedience may be taught him, and that not by severity, but, by firmness and steadiness, the voice will go a great way, but the whip or the spur is sometimes indispensable—not so cruelly applied as to excite the animal to resistance, but to convince him that we have the power to enforce submission . . . Correction may or must be used to enforce implicit obedience after the education has proceeded to a certain extent, but the early lessons should be inculcated with kindness alone."

Youatt³⁷ describes a system of gentling the colt as set forth by Rarey, as follows: "Mr. Rarey commences his acquaintance with the colt when at pasture; and by the gentlest means, and almost without gesticulation, he will entice or urge the colt to enter into the precincts of a barn, stable or outhouse in the immediate neighborhood. The colt is very quietly surrounded, or an old horse is first led in. When the colt has entered he is left alone with the operator, every one and everything having life being excluded, so that the attention of the colt may be entirely absorbed in the person of the man who has to train and subdue him. After a short pause, the man advances very slowly, holding out either hand and speaking to the colt with the gentlest tone of voice. Eventually the colt will also approach, smell the hand, when occasion must be taken to stroke the nose, then the front of the face, cheeks, and neck. So soon as the colt remains perfectly passive and content with this treatment, then a leathern halter is very gently passed up and onto his head. Rope halters, from their coarseness, are highly objectionable . . . When the halter is secured, a plain, smooth snaffle bridle, with a moderate-sized snaffle bit, is passed into the mouth and fitted to the head. Should the colt resist the introduction of the snaffle, then the left hand, having the iron bit in it, is placed immediately behind the lower lip, and the finger and thumb feeling the bars of the mouth within the lips, instantly induces the colt to move the tongue and open the mouth. At that moment the snaffle is inserted within the front teeth, and is drawn well into the mouth by the headstall in the right hand. This must be effected without hurry or in any manner to disturb the feelings of the animal. When the bridle is secured with the reins in the left hand, the person proceeds with his training by handling, with the utmost gentleness, the neck, shoulder, and near fore-leg. This operation may require some time to effect by continued and oft-repeated pattings and coaxings, since the nervousness and the perverseness of some leads them to strike with the near hind-foot, and follow with rapidity the hand of the operator. When the colt permits the handling of the leg and fetlock, the front of the shank is taken in the palm of the hand, and the foot raised from the ground. Sometimes a pressure of the back sinews with the finger and thumb will conduce to lift the leg; at others, turning

the colt's head and neck well to the left will assist the movement. When the foot has been once stirred, the operation must be repeated until the colt will allow the foot to be bent near to the elbow joint, and to be retained for a time in that position. The gentle feeling of the hand then proceeds along the body near the hind quarter and leg. The hind-leg should be lifted in the quietest manner and raised as high as possible. The tail is then well handled, and the off-side of the colt finishes the process of handling or gentling."

*See Appendix II.

RESULTS OF INVESTIGATION

In the survey made of the breeding, feeding, and management of purebred draft horses two systems of investigation were followed, viz: Firstly, by personal inquiry while visiting several leading studs, and secondly, through correspondence in which an expansive questionnaire* was sent to each of a number of breeding establishments. The amount of time available and the big traveling expenses necessary were limiting factors which made it possible for the writer to visit but twelve breeding establishments in Wisconsin, Illinois, and Iowa in the summer of 1920. In addition to this, as has already been mentioned, personal interviews were also held with a few breeders while visiting the county fairs at Janesville, Wisconsin, the interstate fairs at Kankakee, Illinois, and at Sioux City, Iowa, the State Fairs at Springfield, Ill., and at Des Moines, Iowa, and the Belgian Horse Show at Waterloo, Iowa, during the same period.

A good deal of material in Chapter XIV of Sander and Dinsmore's "A History of the Percheron Horse" was incorporated in the results of the investigation. This was done so in view of the fact that several breeders treated in this chapter were also dealt with in the survey.

The subsequent discussion is the result of investigation based on data furnished by breeders of Percheron, Belgian, Clydesdale, Shire, Suffolk, and mixed-draft breeds of horses.

*See Appendix II.

I

1. STUD FARMS SURVEYED

Altogether, the number of breeding establishments contributing to this survey, excluding those which have oft and again been cited from "A History of the Percheron Horse," totals forty-two. The owner of the farm, the manager or breeder, as well as the location and the breeds raised, are indicated under each of the studs investigated, as given herein below:

CHAS. BROWN AND SONS

Owner—Chas. Brown and Sons.
Manager or Breeder—Chas. Brown and Sons.
Location—Marcus, Iowa.
Breed Raised—Percheron.

CORNELL UNIVERSITY

Owner—Cornell University.
Manager or Breeder—M. W. Harper (questionnaire answered by George Haines).
Location—Ithaca, New York.
Breed Raised—Percheron.

CHESTNUT FARM

Owner—G. M. Oyster, Jr.
Manager or Breeder—J. F. Pallister.
Location—Walkersville, Maryland.
Breed raised—Percheron.

GREGORY FARM

Owner—W. S. Corsa.
Manager or Breeder—W. S. Corsa.
Location—Whitehall, Illinois.
Breed Raised—Percheron.

GOSSARD BREEDING ESTATES

Owner—H. W. Gossard.
Manager or Breeder—O. E. Reed.
Location—Martinsville, Indiana, Preston, Kansas, Axial, Colorado.
Breed Raised—Percheron.

J. H. SERVEN AND SON

Owner—J. H. Serven and Son.
Manager or Breeder—See Serven.
Location—Prairie City, Illinois.
Breed Raised—Percheron.

LAKWOOD FARM

Owner—J. B. McMillan.
Manager or Breeder—J. B. McMillan.
Location—Rock Rapids, Iowa.
Breed Raised—Percheron.

LESLIE FARMS

Owner—A. L. Robinson and Son.
Manager or Breeder—A. L. Robinson and Son.

Location—Pekin, Illinois.
Breed Raised—Percheron.

MAPLEGROVE FARM

Owner—J. O. Singmaster and Son.
Manager or Breeder—J. O. Singmaster and Son.
Location—Keota, Iowa.
Breed Raised—Percheron.

MAPLE LAWN FARM

Owner—Clarence E. Peterson and Banks Peterson.
Manager or Breeder—Clarence E. Peterson.
Location—Peterson, Iowa.
Breed Raised—Percheron.

OAKLAWN FARM

Owner—Dunhams.
Manager or Breeder—Rob't Henderson.
Location—Wayne, Du Page County, Illinois.
Breed Raised—Percheron.

PLEASANTVIEW FARM

Owner—Casey Bros.
Manager or Breeder—
Location—Iowa City, Iowa.
Breed Raised—Percheron.

PENTOILA STOCK FARM

Owner—G. A. Dix.
Manager or Breeder—G. A. Dix.
Location—Delaware, Ohio.
Breed Raised—Percheron.

ROOKWOOD FARM

Owner—C. F. Curtiss.
Manager or Breeder—C. F. Curtiss.
Location—Ames, Iowa.
Breed Raised—Percheron.

RABOIN PIONEER HOMESTEAD FARM

Owner—C. J. Raboin.
Manager or Breeder—C. J. Raboin.
Location—Ashkum, Illinois.
Breed Raised—Percheron.

SELMA FARM

Owner—E. B. White.
Manager or Breeder—E. B. White.
Location—Leesburg, Virginia.
Breed Raised—Percheron.

SANTA ANITA RANCHO

Owner—Anita M. Baldwin.
Manager or Breeder—
Location—Los Angeles Co., California.
Breed Raised—Percheron.

UNIVERSITY OF WISCONSIN

Owner—State of Wisconsin.
 Manager or Breeder—J. G. Fuller.
 Location—Madison, Wisconsin.
 Breed Raised—Percheron.

UNIVERSITY OF MISSOURI

Owner—State of Missouri.
 Manager or Breeder—E. A. Trowbridge.
 Location—Columbia, Missouri.
 Breed Raised—Percheron.

WOODSIDE FARM

Owner—W. H. Butler.
 Manager or Breeder—D. P. Haxton.
 Location—South Sandusky, Ohio.
 Breed Raised—Percheron.

WHITE OAK STOCK FARM

Owner—D. Augstin.
 Manager or Breeder—D. Augstin.
 Location—McLean County, Illinois.
 Breed Raised—Percheron.

UNIVERSITY OF ILLINOIS

Owner—State of Illinois.
 Manager or Breeder—J. L. Edmonds.
 Location—Urbana, Illinois.
 Breed Raised—Percheron.

IRVINEDALE FARM

Owner—Chas. Irvine.
 Manager or Breed—Chas. Irvine.
 Location—Ankeny, Iowa.
 Breed Raised—Belgian.

LEFEBURE SONS' Co.

Owner—Lefebure Sons' Co.
 Manager or Breeder—Lefebure Sons' Co.
 Location—Fairfax, Iowa.
 Breed Raised—Belgian.

LONGVIEW STOCK FARM

Owner—John M. Moon.
 Manager or Breeder—John M. Moon.
 Location—Correctionville, Iowa.
 Breed Raised—Belgian.

OAKDALE FARM

Owner—C. G. Good and Son.
 Manager or Breeder—C. G. Good and Son.
 Location—Ogden, Iowa.
 Breed Raised—Belgian.

RITCHIE STOCK FARM

Owner—Robert Ritchie.
 Manager or Breeder—Robert Ritchie.

Location—Stratford, Iowa.
Breed Raised—Belgian.

TOP NOTCH STOCK FARM

Owner—Dr. W. A. Hamilton.
Manager or Breeder—Dr. W. A. Hamilton.
Location—Paullina, Iowa.
Breed Raised—Belgian.

ARNGIBBON FARM

Owner—Mrs. James McLay.
Manager or Breeder—John McLay.
Location—Rock County, Wisconsin.
Breed Raised—Clydesdale.

HAYFIELD FARM

Owner—J. N. Conyngham.
Manager or Breeder—Jack Haxton.
Location—Wilkes-Barre, Pennsylvania.
Breed Raised—Clydesdale.

G. ANDREWS AND SON

Owner—G. Andrews and Son.
Manager or Breeder—G. Andrews and Son.
Location—Furnas County, Nebraska.
Breed Raised—Clydesdale.

LONGWOOD FARM

Owner—Ernest B. Dane.
Manager or Breeder—L. L. Sanborn.
Location—Center Harbor, New Hampshire.
Breed Raised—Clydesdale.

HAWTHORN FARM

Owner—Samuel Insull.
Manager, Joseph Rouse; Breeder, John Wood.
Location—Libertyville, Illinois.
Breed Raised—Suffolk.

THOMPSONDALE FARM

Owner—Fred E. Thompson.
Manager or Breeder—Fred E. Thompson.
Location—Thedford, Nebraska.
Breed Raised—Suffolk.

WADDINGTON FARM

Owner—F. W. Ogleby.
Manager or Breeder—M. C. Hine.
Location—Wheeling, West Virginia.
Breed Raised—Suffolk.

THOMAS KIDDOO FARM

Owner—Thomas Kiddoo.
Manager or Breeder—R. C. Kiddoo.
Location—West of Central Illinois.
Breed Raised—Shire.

HOLBERT FARMS

Owner—Thos. R. and Fred B. Holbert.
 Manager or Breeder—Dr. J. S. Hunt (questionnaire answered by Thos. R. Holbert).
 Location—Greeley, Iowa.
 Breed Raised—Belgians, Percherons (few).

IOWA STATE COLLEGE

Owner—State of Iowa.
 Manager or Breeder—J. G. Hanmer.
 Location—Ames, Iowa.
 Breed Raised—Percheron, Clydesdale, Belgian.

MICHIGAN AGRICULTURAL COLLEGE

Owner—State of Michigan.
 Manager or Breeder—R. S. Shaw (Dean), R. S. Hudson (Superintendent).
 Location—East Lansing, Michigan.
 Breed Raised—Percheron, Clydesdale, Belgian.

PURDUE UNIVERSITY

Owner—State of Indiana.
 Manager or Breeder—R. B. Cooley.
 Location—Lafayette, Indiana.
 Breed Raised—

TRUMAN'S STUD FARM

Owner—J. H. Truman and Sons.
 Manager—J. G. Truman.
 Location—Bushnell, Illinois.
 Breed Raised—Shire, Percheron.

UNIVERSITY OF MINNESOTA

Owner—State of Minnesota.
 Manager or Breeder—W. H. Peters.
 Location—St. Paul, Minnesota.
 Breed Raised—Percheron, Clydesdale, Belgian.

Besides the above-mentioned studs, Secretary Stericker of the Suffolk Breed Association and J. J. Hooper of the University of Kentucky, who speaks for the breeding establishments of Central Kentucky, have also furnished data.

II

MANAGEMENT OF THE STALLION

1. SELECTION

To quote Cooley, the chief points looked for in the selection of a breeding stallion are "Pure-breeding of the right blood lines, size, character, quality, strong, clean bone, good feet, good action." Truman desires a "good masculine head, plenty of size, good bone, good feet and well-sprung pasterns, plenty of height and as close to the ground as possible." The "mare-looking head and neck, poor feet, straight pasterns, little, chunky-built fellows," and individuals that are too fine are objected to. Peters places four principal points to be looked for in the stallion, viz: "Soundness, type, pedigree, sureness as a breeder," while unsoundness, lack of masculine appearance, lack of size or type" are matters that should be discriminated against. Shaw and Hudson call for an individual "with prominent breeding, size, quality," as well as "masculine, sound, and of good draft conformation," and it is also brought out that if the stallion is old enough his record should show that he is a proven sire. "Bad habits, unsoundness, inferior breeding and conformation" are considered undesirable points with the stud header. Haxton mentions "type, soundness and prepotency" as favorable qualifications, while "unsoundness, faulty conformation and disposition" are disliked. According to Reed, "soundness, size with quality, type, and masculinity" are the important points to be looked for in the stallion, whereas unsoundness, lack of size, bad feet, side bones and deformed hocks are disfavored. McMillan emphasizes on "size, character, quality, and soundness," and, in a general way, Fuller speaks of "draft conformation and breeding" as qualifications of a stud horse. Fuller objects to poor feet and crooked hocks as well as unsoundnesses. White gives most weight to the feet and legs in the selection of the stallion, and "any unsoundness and unevenness in gait" are objected to. Edmonds points out "soundness, type, good action" as the principal points to consider in the selection, while Henderson states that "very good conformation, clean-cut head and neck, good feet and legs," and size, which is governed by the size of mares with which he is to be mated, should form the chief guiding points in the process of choosing the stud header. "Scale, quality, soundness, breed type, vigor, good conformation" are the principal points to be considered, according to Trowbridge, while Pallister speaks of "conformation, breed type, and soundness" under the same category. Hanmer takes in "breed type, constitution, prepotency, soundness of legs and feet" as important qualifications of the stud horse, and Servens says that he should be "sound," and his size and general make-up and breeding" must be approved. Kiddoo makes the statement in regard to the selection of the stallion to "always look to good, sound, clean-legged" horse of a "rugged constitution." Peterson describes the stud horse as one that is characterized by "good bone and feet, sound in eyes, wind and limbs"; one that has "lots of weight, and some quality, short back, but thick and deep." The individual that is narrow in the breast, of poor feet, bad eyes, long back, bad hocks, and lacking in quality, is discriminated against. Dix states that he must be masculine, sound, and must be set right on his legs, while Ritchie looks for a sire "that has plenty of size and quality and lots of 'pep,' clean flat bone, good feet, sound and good straight mover." A stallion that shows with a "dead head," undersized, and of poor underpinning is rejected. Good gives credit on masculinity, right conformation, and further states that as

much size and quality as could be procured should be emphasized in the selection of the stallion. The Lefebures give close attention to soundness of feet, legs and wind, and, too, to be sure that the individual is a breeder, the use of a microscope in examining the semen is advocated. The Andrews advise that both sire and dam for four generations back be examined as to the relative merits of each in order that proper conclusion be arrived at in the selection of the stud horse. According to Haxton, color as well, besides breeding and conformation, should form primary considerations in selection, and Augustin mentions "soundness and conformation" in this regard. The characteristics of a breeding stallion, as set forth by Sanborn, are indicated by good bone, which should be flat and well-muscled, well-set pasterns, full of hoof-heads, broad breast, full eyes and well-sprung ribs (of good feather in the Clydesdale). Hine says that he should be of good disposition, possessing well-developed feet, good quality, large flat bone, and of good conformation. Kindness of disposition, soundness of eyes, good head, good bone, and good action, according to Thompson, should be given especial consideration in the choosing of a stud horse; whereas Holbert speaks of "individuality and breeding reputation," besides the "final test" as indicated by the offspring begotten. On this subject Stericker writes: "If for draft purposes, good size and weight are primary considerations, also soundness and good appearance, and good breeding."

In the following paragraphs are quoted the different statements made by various leading breeders of the Percheron horse in the United States regarding the selection of the stud horse as given in Sanders and Dinsmore's "A History of the Percheron Horse."

Fletcher writes: "In my opinion, a typical Percheron stallion should weigh between 1900 and 2100 pounds in good condition. His height will range from 16½ to 17¼ hands. In selecting a stallion I look for an intelligent head, broad between the two eyes, and carrying well-set ears, a well-cut neck, set on sloping shoulders, and a short back, with the tail set neither too high nor too low. He should have a broad breast, with a muscular forearm, broad quarters, a deep body with well-sprung ribs, legs squarely set with clean bone, sloping pasterns not too long, and a wide, deep foot. Avoid a stallion narrow between the eyes, ugly-headed, with ears set too wide, narrow in front or behind, short-ribbed, or with a crooked or puffy hind leg, a straight pastern, or a flat foot."

Prichard gives his view as follows: "Forty-seven years of experience and observation have convinced me that the most serviceable Percheron stallion should stand from 16.2 to 17.1 hands high and weigh from 1800 to 2000 pounds in thrifty breeding condition. Some 200 or more fat could be added to this weight, but it is to the injury of the stallion; it is usually not real horse, it is worthless blubber."

"In looking over a stallion have him stand in the shade of a stable door. Take him by the bit with the left hand, look in his mouth, look in his eyes, look over his face; then drop your eyes down to his breast and shoulders, then down to his knees, pasterns and feet. See that he stands squarely on his feet. Then step to his left shoulder; chin him. Then step back about ten feet and take in the topline and depth of body, especially the flank. Step behind and observe the width of quarters, the fullness and depth of the stifles. Step around to the right side and look him over just as on the left. Examine his coronets; observe how he stands on his pasterns, which should be fair in length and sloping. See that he has plenty of bone of good quality below the knee and hock, and is sound. Then let him walk out and return on the walk. Have him move at the trot, out and back, and see that his action is straight."

"The stallion should be rugged and masculine, and not feminine, in appearance. He should have a strong head, well poised on a good neck. His breast should be full, wide, and deep. The body should measure well at the heart, and be full and deep at the flank. The back should be strong

and short, well coupled with long hips of good width. He should stand on good, big feet, and be of kind disposition.

"Before settling for the stallion see his certificate of registration and try his wind. Buy of a responsible breeder or dealer, one who can and will treat you right if anything goes wrong."

According to White, "The main things to seek in the Percheron stallion are bone of good quality and quantity, good feet and correctly set legs, especially the pasterns, a good back, plenty of depth in hoof, a good middle, and straight and free action at both walk and trot. Of course, the horse should be sound and clean. He should show quality, but not be coachy. The size of a draft horse's head should be in proportion to his body and show quality. The eyes should be prominent, and the horse should appear always alert. I believe that alertness strongly indicates prepotency. I have never seen a preponent sire that nearly always appeared dull and sleepy. He should be of medium size, and I would suggest that he weigh not more than 2100 pounds in show condition. I believe that the very large ones are seldom, if ever, satisfactory in the stud. The things to be avoided are unsoundness, especially the kind that is generally considered hereditary, any faulty conformation that is frequently found in the breed, such as a droopy rump, crooked hocks, and the like. I prefer not to have an off-colored horse, not that the color makes the horse, but it indicates the possibility of the presence of some other blood than that of the breed, and to that extent makes uncertain the type of colts which the stallion will sire."

De Lancey's presentation follows: "In choosing a stallion one must remember that the sire is half the stud, and that his selection is most important. There are many experienced breeders who can tell at the first glance a stallion that will be more than an average breeder. The same stallion, on close inspection, may have faults, either in breeding or conformation, which would make him undesirable as a stud header. But if one can get the strong 'personality' in a stallion which so attracts the man of experience, and without the other faults, one is almost sure to be piloting in safe waters for a sire.

"The general points to seek in the selection of a sire are much the same as for mares. In addition, he should be stronger and more masculine in appearance, especially in head and neck, as well as more upstanding. The day of the blocky Percheron is past. A stallion to head a stud of registered mares should stand not less than 17 hands high, and weigh no less than 2100 pounds in sale condition.

"In the selection of both stallion and mares the breeding is very important and should be carefully considered. The families of Percheron which have made the greatest successes as sires and dams are well known, and one should get as much of the blood of these strains as possible in the foundation stock."

Singmaster writes on the subject and says: "In my opinion, the characteristics of a Percheron stallion are these: a head of good length and breadth, broad between the eyes, wide-open nostrils, eyes full and rather outstanding, rather than deep set, or in any ways out of normal; a gracefully curved and massive neck; broad and heavy shoulders; a deep-ribbed body; a back well developed from the point of the shoulder and of graceful symmetry; medium closely ribbed at the point of the hip; the hind quarters slightly narrower than the shoulders; a gently sloping and rather long hip; the legs to match this body—a good, straight limb, a flat bone of rather heavy type; long, springy pastern joints; good, dark-colored hoofs of above medium size, and clean legs, both front and rear. He should have a heavy tail, docked at nine inches for beauty of carriage, and still long enough to brush away the flies. There are other points, but these should assist the inexperienced purchaser in guarding his own interests. The stallion's weight in selling condition should be 2,100 pounds

and in breeding condition 1,950 pounds. I prefer the dark or steel gray or black colors, without markings other than a star in the face. Plenty of bone to support the body is essential, but abnormal bone is rather a weakness that foretells an early breakdown or roughness of limb."

Dunham's methods and points of view of selection are explained in the following words: "When a horse is brought out for my inspection I first note his general conformation and size. A stallion to be successful in the stud should have good feet and legs and stand well on them. Nothing is so sure to be transmitted to the offspring as faults of conformation in the bony structure, such as curby formation of the hind leg, lack of bone, or crooked or badly placed hind legs. In order to suit me a stallion must have some quality and must be a true mover. If he has a powerful forearm and shoulder, he is almost sure to transmit these qualities to his offspring and to beget colts of large size. For a sire do not buy too small a horse, and do not buy one that is lacking in substance or that does not stand well on his legs, feet and pasterns."

In the words of McLaughlin, the selection of a Percheron must be governed by the following desideratum: "Proper draft size is, of course, the prime requisite for the Percheron stallion. Correct conformation and alignment of the legs, big, broad joints, heavy bone with quality, pasterns sloping at an angle of about 45 degrees, a short back and a long hip with the tail set high, great depth through the chest, or heart as we usually call it, great width of chest, with the front legs not set too far out, plenty of middle, with great width to hips and stifles—these points, together with a big, broad foot with a high heel and plenty of straight, clean, vigorous action at both the walk and trot, are the most essential characteristics of a Percheron stallion. The things most to be avoided are improper conformation and alignment of the legs. A perpendicular line projected from the middle of the front toe should bisect equally the pastern joint and the knee-joint. A line passed through the point of the stifle, the point of the hocks and the point of the hind toe should bisect equally the hock joint and the pastern joint."

Lee presents points to be considered and is hereby quoted to say: "The selection of the stallion to use either on pure-bred or grade mares should be studied carefully. One should exercise his very best judgment not only as to the animal's individuality and breeding, but as to what he will do in the stud. One horse may be a good individual but be lacking in bone, another in size, and so on.

"In all our experience we have found it easy to right a wrong early, not waiting until we have one or two crops of colts, and then seeing where our stallion is lacking. Some localities want a heavy, low-down block; others want a tall, rangy, light-boned horse. My idea of a good Percheron stallion is one which at the age of three or four weighs about a ton, is black or gray in colors, neither the low-down or the tall, rangy kind, but one well-balanced all around. I want him wide between the eyes and with a good, clear eye. I prefer hazel eyes as they seldom lose their sight. See that his ears are well set, not pointed or drooping, but standing up well in about the same distance apart at top and bottom. He should show a clean-cut neck, nicely set on his shoulders, with his head up to attract attention. I want always to see a wide breast and clean, flat bone, not a meaty, large bone (it will always give trouble, both in the stallion and his offspring). Well-set limbs are essential; see that he is not buck- or calf-kneed, and that he is clean around his pastern joints. Look for side-bones; they are considered by 75% of the farmers as a buyer's trick to buy horses cheap, but they have worked more harm to the heavy horse for market than any other one thing in the past five years. See that the horse has a good hoof, not the pancake kind, or the narrow, contracted kind, but a well-shaped, solid hoof. If one follows this he will find a good front end. Next have the stallion deep through the heart,

close-coupled, good of withers, strong in topline, well-sprung of rib and with a place to carry some hay, not too sloping on the hips, with a well-set hind leg, clean at the hock, no curbs, thoroughpins, bog or bone spavins, and clean about his pasterns. See that his legs are well set; no one wants a cow-hocked or a crooked leg. Have the salesman move the horse from you, first at a walk, then at a trot; watch closely and see that he moves away, that he is not a paddler or a weaver.

"Often high-fed horses have had the shipping fever or distemper and are left weak in the back or a little thick in the wind. My advice would be not to buy either kind because he is cheap; in the long run he is high-priced. Our old stud sire, Scipion, now in his eighteenth year, is as clean as a ribbon all over and sound, except for being out a little in the wind, due to his age."

Augstin's thirty years' experience in the breeding of Percheron horses gives weight to his opinion regarding the selection of the stallion. Augstin writes: "I believe more in Percheron bloodlines than many breeders do. If Percheron breeders generally would pay more attention to selecting animals of the right kind of breeding, progress would be made more rapidly. Now that the war has cut off the importation of horses from Europe and we are trying to produce the good kind here at home, the cry has gone up from everywhere, 'I am in need of a good sire.' Breeders are just now coming to realize that constructive breeding of the highest degree cannot take place without the right kind of bloodlines to build upon. Why have purebreds and pedigrees, unless we give preference to those families that have been producing the desirable kind? When I first started in the business I bred my grade mares to the best sires available at a cost of \$25 or \$30 for the service fee. My neighbors thought I was crazy, but they soon saw the error of their ways.

"Frequently one hears it said 'I want a stallion or a mare, but I will not buy anything but a prize-winner.' No greater mistake was ever made. Of course, it is a fine advertisement to have a champion in the stud, but not all champions produce champions, by a long way. Many outstanding individuals come from the common ranks. Always select the very best breeding stock available, but that does not mean that one should purchase a prize-winner and turn down one that is not. Many show animals are ruined as producers and many equally good individuals never see the tanbark. I have made a great many mistakes since I first began, but believe that I have made fewer in selecting my breeding stock than in other ways, because I have given bloodlines and individuality first importance and price only second concern."

In a brief manner Burdick says that "The essential features of a draft stallion are good feet, strong, flat bone, and size well balanced with quality. I would not select a horse with light bone, nor with poor feet, nor with large size unless he had quality to go with it. Nor would I select a horse with quality if he did not have size. I am speaking about ranch conditions only." Briefly also, Gammon writes: "Thirty years ago I began the breeding of Percheron horses on the range in northern Wyoming. I realized at that time that in order to be successful in this far-western country the horses I raised must be of a good quality, excelling the pampered horses of the lower altitudes in breeding and size. My start in the business consisted of a number of high-grade and pure-bred mares, of good colors and size, picked to conform to my idea of what good dams should be. I chose for the head of the band an imported stallion that weighed 2,140 pounds, as good a horse as I could purchase at that time. With this start I have been able to build up by the purchase of new blood, always of the best, until I now have a band of Percherons that is the delight of all who see them."

2. UNSOUNDNESS, DISEASES, AND OTHER DEFECTS

At the Gossard Breeding Estates, such defects as "curby hocks, spavins, ringbone, bad low backs and short quarters" are brought out as sufficient to bar a stud sire for breeding services. Hine mentions under this subject, "stirility, unsoundness of limbs, and venereal diseases," while Stericker states that "windiness, side-bones, spavin, and ringbone" are condemned in the breeding sire. Pallister makes this statement: "The only unsoundness I ever have seen transmitted was bog or blood spavin." Hanmer takes in "bog or jack spavin, ophthalmia, small hoofheads and small feet" as enough to bar a stud horse from standing for breeding purposes. According to Edmonds, special attention should particularly be given to "sidebones, bone spavin, bog spavin, ringbone and bad eyes" in excluding the breeding sire for breeding work and Truman believes that "sidebones, ringbones, spavins and roaring" are enough to disqualify him. The Lefebure Sons' Co. points out "sidebones and defects of hock, wind, eyes" as disqualifying factors, while Good condemns the presence of ophthalmia, ringbone, sidebones, curby conformation of hocks, and small feet. McMillan says that "ring-bone, spavin, curby hocks and bog spavin, bad eyes, and, of course, bad defects in conformation" should bar the breeding sire from services, while Henderson takes in under the same subject "sidebones, ringbones, curb, bone spavin, bog spavin, thick wind, stringhalt." Fuller reports on "large sidebones, ringbones, bone spavin, heaves, blindness" as disqualifying defects of a breeding stallion, while Peterson includes "sidebones, periodic ophthalmia, spavins, boggy hocks" under the same head. Holbert bars the breeding stallion affected by any unsoundnesses or diseases unless these have been caused by some serious accident and, similarly, Kiddo speaks of "anything transmissible" as being sufficient to disqualify a sire for stud work. According to Moon, "poor wind, poor eyes, poor feet, poor action, and under size" should bar the stallion for breeding purposes. Thompson says in regard to this: "Better get them sound, healthy and without any glaring defects," and, similarly, Sanborn says "nothing but a perfectly sound, well-developed individual would be considered." At the Cornell University, the same rule holds true by barring any unsoundnesses for breeding purposes.

3. SYSTEMS OF BREEDING

Of the breeding establishments surveyed, line breeding is reported to be the exclusive system followed on the following farms: Gossard Breeding Estates, Lakewood Farm, Selma Farm, Longview Stock Farm, Oakdale Farm, Lefebure Sons' Co., Ritchie Stock Farm, Arngibbon Farm, Longwood Farm, Waddington Farm, Thompsondale Farm, Truman's Pioneer Stud Farm, White Oak Stock Farm, Raboin Pioneer Homestead Farm, Holbert Farms, and at the Universities of Missouri, Minnesota, Cornell, and Purdue. Among those that reported, the only farm where exclusive inbreeding is pursued is at the Maple Lawn Farm, and at the University of Wisconsin it is claimed that "only a few cases of inbreeding are practiced," and, likewise, at Hayfield Farm inbreeding is said to be followed whenever practicable. Both inbreeding and linebreeding are practiced at wherever practicable. Both inbreeding and linebreeding are practiced at the Woodside Farm, J. H. Serven & Son, Thos. Kiddoo Farm, and at the Michigan agricultural college and the University of Illinois. In the latter two, however, the animals are more line-bred. At the Pentolia Stock Farm line breeding is followed while outcrossing is resorted to with individuals, neither of which are closely bred. With the exception of one instance of inbreeding, the rule at the Iowa State College is to follow the line-breeding system.

4. STUD FEE. BREEDING CONTRACTS

Those which reported a stud fee of \$20.00 alone are the Arngibon Farm, G. Andrews and Son, Hayfield Farm, the Michigan Agricultural College, the University of Wisconsin, and Thomas Kiddoo's Farm. A higher rate of \$25.00 is charged by the Hawthorn Farm, Raboin Pioneer Stud Farm, Gossard Breeding Estates, Lakewood Farm, White Oak Stock Farm, Ritchie Stock Farm, Longwood Farm, and by the Universities of Minnesota, Cornell, and Illinois. At the Longview Stock Farm the rate is \$30, while at the Woodside Farm, Selma Farm, and at the Iowa State College it is \$50. The Lefebure Sons' Co. gives the rate at \$100, the Maplegrove Farm at \$150, while both the Oakdale Farm (for Farceur) and Irvinedale Farm, each collects for stud fee \$200. The stud fees at the Petoila Stock Farm are: one at \$50; two at \$25; four at \$20; at the Maple Lawn Farm: \$20-35; at the Oaklawn Farm: \$15-100; at the University of Missouri: \$15-25; at the J. H. Serven and Son: Jasmine, \$100; others, \$15 and \$20; and at the Holbert Farms: \$15 on barn; \$20 on road.

A review of the survey reveals a variety of contracts entered into by both owners of the stallion and outside mares, such as are indicated in the items shown opposite the farms listed below:

FARMS	CONTRACT STATEMENTS
Cornell University	"Guarantee with foal."
Gossard Breeding Estates	"\$5 at service and balance, \$20, when mare is proven pregnant."
J. H. Serven and Son	"We guarantee a colt to be all right."
Lakewood Farm	"\$5 when mares are bred; \$10 when she proves in foal and \$10 when colt is dropped."
Maplegrove Farm	\$50 down and \$100 when foal is dropped.
Maple Lawn Farm	"In some cases we guarantee the foal to stand and suck at so much; in other cases to get the mare in foal."
Oaklawn Farm	"Pay at time of service, but get a foal for money."
Pentoila Stock Farm	"Living colt for all horses except the \$50 horse, the same within county, out of county or state \$50, cash, but guarantee to settle mare or money returned."
Raboin Pioneer Homestead Farm	"For living colt" (verbal).
University of Wisconsin	"No risks."
University of Missouri	"\$15 to insure in foal—\$25 living foal."
Woodside Farm	"Cash at service, return privilege if mare proves not to be in foal."
White Oak Stock Farm	"To insure."
University of Illinois	"Cash when first bred."
Irvinedale Farm	"Cash."
Lefebure Sons' Co.	"None."
Oakdale Farm	"\$100 right away and then \$100 more at foaling time with live foal."
Ritchie Stock Farm	"I try to make everyone satisfied."

Arngibbon Farm	"Foal to stand and suck."
Mayfield Farm	"\$10 down at time of service and \$10 if mare proves in foal."
G. Andrews and Son	"In foal."
Hawthorn Farm	"With return privilege."
Thompsondale Farm	"\$10 at time of service—\$10 cash at time mare is first bred—one or two free return privileges."
Thomas Kiddoo's Farm	"Must be tried regularly and colt is good for fee."
Holbert Farms	"Insures living colt." ". . . at \$50 to insure the mare in foal. Service fee is due when mares are known to be in foal. If mare is disposed of fees at once become due."
Michigan Agricultural College	"Insure for a living foal."

5. BREEDING AGE. SERVICES

Among the different breeding establishments studied, the Irvinedale Farm, Gossard Breeding estates, Woodside Farm, Lakewood Farm, Longwood Farm, J. H. Serven and Son, the Thomas Kiddoo Farm, Hayfield Farm, G. Andrews and Son, Oakdale Farm, Arngibbon Farm, Oaklawn Farm, Selma Farm, the Universities of Wisconsin, Missouri, the Michigan Agricultural College, and Iowa State College concur in starting the prospective stud horse to serve mares as a two-year-old. At the Raboin Pioneer Homestead Farm the young stallion is not allowed to cover a mare until he is past two years of age, and so it is at the Truman's Pioneer Stud Farm and at the Maple Lawn Farm. Stericker advises similarly. The first cover to be allowed the stallion, between two and three years of age, is advocated by the Lefebure Sons' Co., White Oak Stock Farm, Pentoila Stock Farm, and the University of Minnesota. At Purdue University it is the practice to start breeding the stallion between two and a half and three years of age, and at the Hawthorn Farm the breeder states that it is unusual, although possible, to let the stallion cover for the first time as a two-year-old, so that the colts are not generally bred until they are three years years of age. At the Longview Stock Farm, Moon is of the opinion that the stallion should be started to breed at the age of two and a half years, and likewise at the Holbert Farms some are used at the same age, although the rule is to wait until the beginner is three years old. At the Santa Anita Rancho, and according to Hooper, the first breeding age should not be started until the colts are three years old.

One question was asked as to the age of maturity of the stallion, and again a variety of opinions are revealed. To begin with, at the Selma Farm, the three-year-old, if well grown out, is considered as mature. Next, at the Hayfield Farm, Maple Lawn Farm, and at the University of Wisconsin, at four years of age the stallions are considered to be mature. While in twelve establishments—the Longview Stock Farm, the Thomas Kiddoo Farm, Raboin Pioneer Homestead Farm, Pentoila Stock Farm, Santa Anita Rancho, Lakewood Farm, Waddington Farm, at Cornell University, at the Universities of Minnesota and Missouri, at the Michigan Agricultural College, and at the Iowa State College—all support the view that the stallion is not mature until he is five years old. Hooper makes the same statement. The Gossard Breeding Estates and Woodside Farm place the mature age of the stallion when five to six years old, and, lastly, in several farms the mature age is considered to be reached when six years

of age, viz: in Purdue University, G. Andrews and Son, Trueman's Pioneer Stud Farm, and in J. H. Serven and Son.

It is interesting to note, also, the range of variability as regards the "prime breeding age" of a stud horse according to breeders. Raboin, Trowbridge, Hooper, Kiddoo, and Hanmer uphold that the stallion's prime breeding age is from 5 to 10 years, while Haxton, the Andrews, Henderson, McMillan, and Shaw and Hudson maintain that it is at six years that the stallion is in his prime procreative power. The following farms reporting designate the stallion's prime breeding age as are indicated: The University of Minnesota, at 5 to 8 years; Truman's Pioneer Stud Farm, at 7 to 10 years; the University of Wisconsin, at 4 years and over; Selma Farm, at 5 to 6 years; White Oak Stock Farm, at 6 to 12 years; Pentoila Stock Farm, at 6 to 15 years; Irvinedale Farm, at 5 to 12 years; Longview Stock Farm, at 10 years; Maple Lawn Farm, at 4 to 17 years; Cornell University, at 5 years; Purdue University at 7 to 12 years; Lefebure Sons' Co., at 4 to 8 years; Holbert Farms, 6 and 7 years; J. H. Serven and Son, 6 to 8 years; Waddington Farm, at 7 or 8 years; and according to Stericker at from 5 to 9 or 10 years. Good of Oakdale Farm states that the stallion is at all times of his breeding age in his prime provided that he is well cared for and not overdone in his breeding services.

That the stud sire is never too old to breed is the assertion of several breeders, namely: Cooley, Serven, the Lefebure Sons' Co., Raboin, Dix, Henderson, White and Truman. Others who reported are of the belief that there are definite ages when the stallion is too old to breed, among whom are: McMillan gives the limiting age of fertility for the stallion at 25 years; Trowbridge gives it at from 15 to 25 years; Hanmer states that he is too old at 18 to 20 years of age; Hooper believes the limit to be at 15 years, although, he says, some individuals would still be breeding at 20 years; Peterson places the limiting age at 22 years; and according to G. Andrews and Son, at 30 years of age the stallion is too old to breed. Moon expresses the view that the stallion becomes too old to breed when he is "too old to take on flesh," and at the Irvinedale Farm it is the belief that fertility persists as long as the stallion is active and could cover the mare. According to Stericker some stallions are too old to breed at 20 years of age, some still proving fertile after that age, while a number are done as 18-year-olds.

The importance of gaining insight into the allowances or number of services deemed sufficient for the stallions to render at different ages, in keeping with their health, vigor and procreative ability is evident. On account of the variability and more or less complex nature of the subject as a whole, a scheme to present part of this in the form of a table is believed to be more satisfactory, thus:

At the Oaklawn Farm the three-year-old stallion is allowed one service daily, the four-year-old one the first day and two each succeeding day, and the five-year-old twice a day. Serven says two or three services a week for the two-year-old is sufficient, while the three-year-old may be allowed a service a day, to miss one or two days in a week, and the aged sire to be limited to one service daily. According to White, the two-year-old beginner is to be limited to cover twelve mares, serving not more than twice weekly, while at the age of three years or more the stallion may serve 75 mares. The Lefebure Sons' Co. rules that the two-year old may start on 15 services for the season, and then twice as much each year until the mature age. Ritchie allows the two-year old but six mares, while the aged stallion might cover two mares a day and none on Sundays. At the Chestnut Farms, Milord, the ten-year-old stallion, is allowed to cover 12 mares weekly, and Rectorat, fourteen years of age, six mares a week.

The limitation of only one service for the day by the mature sire is the practice enforced in such studs as the Lefebure Sons' Co., Oakdale Farm,

TABLE I

Showing service allowances at different ages of the stallion:

Farms	Services			
	2-Year-Old	3-Year-Old	4-Year-Old	5-Year-Old
Gossard Breeding Estates	12 (?)	35 (?)	60	.....
Lakewood Farm	20	60	100	150
Maple Lawn Farm.....	2 a week	4 or 5 a week	1 per day at 4½ years	.....
Pentoila Stock Farm....	10-20	30-60	45-90	100-200
Raboin Pioneer Home- stead Farm	Not over 25	Not over 50	Not over 75	Not over 150
University of Wisconsin.	10-15	40-60	80-100	.....
University of Missouri..	1 or 2 per week	3 to 5 per week	1 per day	9 per week
Woodside Farm	10	50	100-125	100-125
Irvinedale Farm	20	40	40 (Shedding teeth)	60-65
Longview Stock Farm...	12-15	20-30	40-50	60-80
Oakdale Farm	15 or 16 mares (never more than twice a week)	40 mares	40-60 mares	60-90 mares
Arngibbon Farm	8 mares or less	.....	.....	.....
Hayfield Farm	10 mares	20 mares	.....	.....
G. Andrews and Son....	20	60	80	100
Hawthorn Farm .....	.....	10 mares	.....	.....
Thos. Kiddoo Farm.....	10	50	75	.....
Holbert Farms .....	.....	40-60 mares	60-80 mares	100 mares
Iowa State College.....	12 mares	35-40 mares	75 mares	100 mares
Michigan Agricultural College	10 (maximum)	30 (maximum)	70 (maximum)	120 (maximum)
Truman's Pioneer Stud Farm	10-15	25-50	50-70	50-100
University of Minnesota	15	30	60	100
According to Hooper....	10 (if at all used)	15-20	40-60	.....
According to Stericker..	10-12 mares	35-60 mares	60 to 100 mares	

Waddington Farm, Longview Stock Farm, Maple Lawn Farm, Hawthorn Farm, Raboin Pioneer Homestead Farm, at the Kentucky farms, and at Purdue University. The establishments that limit the services to two a day for their mature stallion are the Selma Farm, Irvinedale Farm, Lakewood Farm, Truman's Pioneer Stud Farm, Gossard Breeding Estates, Pentola Stock Farm, White Oak Stock Farm, J. H. Serven and Son, Ritchie Stock Farm, G. Andrews and Son, Maple Lawn Stock Farm, and the Universities of Missouri, Minnesota, and Illinois. Followers of three-services-a-day limitation are the Arngibbon Farm, Holbert Farms (if far apart), Woodside Farm, Cornell University, the Michigan Agricultural College, Iowa State College, and Stericker. In Hayfield Farm and at the University of Wisconsin the mature stud horse is allowed to cover as many as four times in a day, while Kiddoo says that as many as five services have been indulged in in his stud, and all mares served produced. White prefers that the two services stipulated in one day be not closer than four hours apart.

Some farms find that, as a general rule, one service is enough to settle the mare, among which are: the Oakdale Farm, Lefebure Sons' Co., the Thos. Kiddoo Farm, and the Raboin Pioneer Homestead Farm. "Two services to settle" is the experience of the Arngibbon Farm, the Michigan Agricultural College, Hawthorn Farm, Pentola Stock Farm, Iowa State College, and at the Hayfield Farm it is claimed that it is seldom that more than two services are required to impregnate the mare. In some stud farms the breeders find that the number of services necessary to effect impregnation is from one to three. This is so at the Universities of Missouri and Minnesota, Longview Stock Farm, and Truman's Pioneer Stud Farm. At the Irvinedale Farm, it takes from two to three services to settle the mare, and at the Woodside Farm and the University of Wisconsin from one to two services. J. H. Serven and Son reports on three services to settle the mare.

Compiling the data on the percentage of successful impregnation with mares that once accept the stallion, as well as those bred twice, thrice, and four or more times, we find that the figures from different breeding establishments are at variance. These are more clearly demonstrated in the following table:

6. "TEASERS"

The majority of farms reporting do not advise the use of teasers, but several hold an important place for them. Those that are opposed to the use of "teasers" are the Selma Farm, Oaklawn Farm, Pentola Stock Farm, Woodside Farm, Lefebure Sons' Co., Longview Stock Farm, Ritchie Stock Farm, Raboin Pioneer Homestead Farm, Arngibbon Farm, Truman's Pioneer Stud Farm, Lakewood Farm, and the University of Wisconsin. But Good says that it is absolutely necessary to employ a teaser, inasmuch as teasing is just as much a task on the stallion as breeding. At the Hawthorn Farm it is the practice to employ teasers only when the mares to be bred are plenty, and at the Gossard Breeding Estates, while teasers are not generally needed, they may be employed to help out nervous stallions. So, too, Hanmer is of the opinion that teasers are needed in the case of a nervous stud horse. Edmonds advocates also the employment of a teaser when services on the part of the stud horse are heavy, and the same procedure is followed at the Michigan Agricultural College. At the Maple Lawn Farm it is only with the best stallions that teasers are used, in this instance the point being to safeguard these valuable individuals from accidents. J. H. Serven and Son favor the employment of teasers. It will not be amiss to mention breeding establishments that employ the teaser,

namely: the Hayfield Farm, the University of Kentucky, Purdue University, the White Oak Stock Farm, and the University of Minnesota.

TABLE II

Showing percentages of successful impregnation from different number of services:

Farms	After 1 service	After 2 services	After 3 services	After 4 or more services
	Per cent	Per cent	Per cent	Per cent
Cornell University	60	16	14	.....
Chestnut Farms	50	About 75	.....	.....
Maple Lawn Farm.....	25	25	15	10
Pentoila Stock Farm...	80*	.....	.....	.....
Raboin Pioneer Homestead Farm	25	20	10	5
Selma Farm	33¼	45	60	65-70
University of Wisconsin.	Less than 50	25	25	Very few
University of Missouri..	30	20	10	Very few
Woodside Farm	65	70	5	.....
White Oak Stock Farm..	50	33½	25	Doubtful
Lefebure Sons' Co.....	33	50	60	65
Longview Stock Farm...	50	66½	10	Scarcely any
G. Andrews and Son....	40	60	75	80
Thos. Kiddoo Farm.....	75	Practically all	.....	.....
Holbert Farms	40-50	60-75	.....	.....
Iowa State College.....	75	15	Very few	1 or 2%
Michigan Agricultural College	50	85	10	2
Purdue University	30-50	.....	.....	.....
University of Minnesota.	60	80	85	.....
According to Hooper....	60	65	70	.....

*With mares bred nine days after parturition.

7. INDIFFERENT BREEDERS. STIMULANTS

Going over the subject of indifferent breeders, that is to say, stallions which fuss or exhibit inaptitude to cover mares readily during breeding operations, we find that in a long list of farms—the Longview Stock Farm, Lefebure Sons' Co., Oakdale Farm, Hayfield Farms, the Thos. Kiddoo Farm, Woodside Farm, the Raboin Pioneer Homestead Farm, Pentoil Stock Farm, White Oak Stock Farm, Santa Anita Rancho, Oaklawn Farm, Cornell University, and the University of Illinois—the indifferent breeder is not to be found. Ritchie states that some stallions may turn indifferent breeders when overbred, and at the Gossard Breeding Estates it is believed that such disposition is rather the cause of bad handling. Holbert mentions masturbation as one of the causes of the indifferent sire. According to Peterson, "some mares have bad smell that some stallions do not like; also, some mares are kickers, and some stallions are a little shy"; all of which are considered the reasons that some breeders find difficulty in making certain stallions cover the mare. Hooper is of the opinion that the indifferent breeder is simply fanciful in traits, and Fuller recommends that stallions so addicted should be disposed of, because, in such cases, they are likely to be uncertain breeders.

With sixteen breeders responding to the question on the use of stimulants to induce copulation, all have answered negatively. But Hanmer mentions yohimbine as an effective agent for this purpose.

8. FEEDING. WATERING. SALTING

Answering the question, "In what condition of flesh is the stallion maintained? During the breeding season . . . During the non-breeding season . . ." the replies may be subdivided into two principal headings. There are those that may go in one class characterizing the condition during both the breeding and non-breeding seasons as "good," "good flesh," "fair flesh," "just a healthy condition," "not too fat," "fairly good flesh," "working," "thrifty," "fairly good, not fat," "medium flesh," "moderate," "medium thrift," represented by twenty-two farms, and then there is the other set that stipulates varying conditions of the stallion differing from the former class. Thus, at the Waddington Farm, the condition of the stallion is kept "vigorous" during the breeding season and "fair" during the non-breeding time; at the Thompsondale Farm, the condition is kept "gaining" during the breeding season and "not too fat" when out of season; at the Pentoil Stock Farm, during the breeding season, the condition is maintained "good," and "thinner" in the non-breeding season; and at Holbert Farms the stud horse is kept in "good flesh, not over-fat" during the breeding season, while, during the non-breeding season, the condition is kept in "good flesh," allowing him lots of exercise. Truman wants a "good, thriving condition" when the stallion is breeding and a "show and sale condition" when he is over the service period; at the Selma Farm the stallion is kept "good" while breeding and about 100 pounds lighter in out-of-season; at the Gossard Breeding Estates it is the practice to keep the stallion in good working condition, to gain only as the breeding period advances; and McMillan says: "I try to get horse thinned down during winter and have him gaining during the breeding season." At the Iowa State College the condition is kept "200 pounds less than show condition" during both seasons.

As to the number of times the stallion should be fed daily, the survey shows that the majority of farms, represented by twenty-six reporting establishments—the Longview Stock Farm, White Oak Stock Farm, Pentoil Stock Farm, Oaklawn Farm, Maple Lawn Farm, Arngibbon Farm, Lakewood Farm, Truman's Pioneer Stud Farm, Iowa State College, J. H. Serven and Son, Rookwood Farm, Holbert Farms, Selma Farm, Hayfield

Farm, Irvinedale Farm, Lefebure Sons' Co., Ritchie Stock Farm, Oakdale Farm, Raboin Pioneer Homestead Farm, Thos. Kiddoo Farm, Woodside Farm, Purdue University, Cornell University, University of Missouri, University of Illinois, and Michigan Agricultural College—follow the feeding of three times daily—in the morning, noon, and evening or night. At the Wisconsin University the stallion is fed three times daily, but when the breeding services are heavy, an additional feeding is given for the day. At both the Thompsondale and Hawthorn Farms the feeding is made three times daily during the breeding season and only twice when out of season. It is the practice at the Gossard Breeding Estates to feed the stallion three times daily during the breeding season and the same number when out of season if the stallion is being worked. The University of Minnesota reports that two feedings a day are all that the stallion receives, in the morning and in the afternoon, while at the Chestnut Farms the feeding is made at 8:00 a. m. and 4:30 p. m., and during the show season the same amount of feeds are distributed in five feedings daily.

It is again the majority practice to water the horse before feeding, as evidenced by the reports of twenty-one farms, viz: the Longview Stock Farm, Chestnut Farms, the Thos. Kiddoo Farm, Rookwood Farm, Iowa State College, Pentoila Stock Farm, Maple Lawn Farm, Arngibbon Farm, Lakewood Farm, Truman's Pioneer Stud Farm, Raboin Pioneer Homestead Farm, Lefebure Sons' Co., Oakdale Farm, Hawthorn Farm, Waddington Farm, Thompsondale Farm, Gossard Breeding Estates, Woodside Farm, the Universities of Wisconsin, Minnesota, and Missouri. Seven farms—the Oaklawn Farm, Holbert Farms, White Oak Stock Farm, Ritchie Stock Farm, Purdue University, the University of Illinois, and the Michigan Agricultural College—follow the system of watering both before and after feeding. There is no one rule followed at the Hayfield Farm; it is usually before, but sometimes after, feeding; and likewise at the J. H. Serven and Son farm, there is no certain time of watering the horse. In Cornell University the stallion is watered at 9 o'clock in the morning and at 4 in the afternoon only. According to White, at the Selma Farm the stallion is watered before feeding and also between feeding while he is in the stable. In the paddock water is kept before him. Hooper, writing on the practices to be found in Central Kentucky, says that horses there are watered several times daily. Watering six times a day, at six, eight, and eleven-thirty in the morning, at one and five-thirty in the afternoon, and at eight in the evening, both before and after feeding—these constitute the system of watering the stallion enforced at Irvinedale Farm.

Save one, the Top Notch Farm, of the thirty-five farms reporting, the common table salt, either in loose or brick forms, is used in salting the stallions. In the Top Notch Farm, instead of using the table salt, a handful of Glauber's salt is administered, but only whenever the stallion is constipated. The manner of giving the salt falls under two heads: One class of breeders advocates the system of giving the salt at will, while the other gives it in limited quantities. Adherents of the "free supply" system are the Ritchie Stock Farm, Pentoila Stock Farm, Lakewood Farm, Gregory Farm, Oakdale Farm, Hawthorn Farm, Longview Stock Farm, Truman's Pioneer Stud Farm, Thompsondale Farm, Waddington Farm, Raboin Pioneer Homestead Farm, Gossard Breeding Estates, Purdue University, Cornell University, and also, according to Hooper, in the farms at Central Kentucky the brick salt is kept in the stall or in the pasture to which the stallion has access at all times. In Cornell University the caked form of salt is used, which is supplied by means of a special device. Others, supplying the salt in limited amounts, almost all give the salt by mixing with the feed. This is true of the Arngibbon Farm, where a handful of the salt is placed in the feed once a week; of the Maplegrove Farm, in which a handful of salt is mixed with the feed every feeding; of the University of Illinois, whose practice is to supply daily a level tablespoon-

ful of salt by mixing with the grain; and also in the case of Irvinedale Farm, which follows a system of salting twice a week, giving a handful each time in the feed. At Selma Farm, Woodside Farm, and Oaklawn Farm, the salt is given also mixed with the feed. The salt is mixed with the feed only in the case of salting older animals at the Lefebure Sons' Co. At the University of Minnesota the stallion is supplied with salt in the feed box once a week. To salt the stallion, from the report of Michigan Agricultural College, the salt is sprinkled in the chop feed, and the balance of the supply is kept in a salt box on the side of the stall. At the Iowa State College the stallion gets one tablespoonful of powdered salt twice a week. Assuming that those feeding the salt mixed in the feed furnish the salt in loose form; therefore, the farms using the "loose," "coarse," "powdered," or "barreled" salt would include the Selma Farm, Irvinedale Farm, Oaklawn Farm, Maplegrove Farm, in which the nature of the salt used is not specifically indicated, besides ten others—the Arngibbon Farm, Iowa State College, Chestnut Farms, Oaklawn Farm, Maplegrove Farm—which do not state specifically the character of the salt given, besides eight others—Arngibbon Farm, University of Illinois, Michigan Agricultural College, Maple Lawn Farm, University of Minnesota, Gregory Farm, Ritchie Stock Farm, and Hawthorn Farm—in which the "loose," "coarse," or "barreled stock" salt is used. At the Lefebure Sons' Co. the loose salt (presumed so because it is mixed with the feed, although not specifically stated) is given only to the older horses, as above mentioned, while for the younger horses the rock salt is given. Those in which the "rock," "block," "brick," or "caked" form of salt is used exclusively are: the Truman's Pioneer Stud Farm, Longview Stock Farm, Rookwood Farm, Thos. Kiddoo Farm, Thompsondale Farm, Waddington Farm, Gossard Breeding Estates, Raboin Pioneer Homestead Farm, Purdue University, Cornell University, and, according to Hooper, at the Central Kentucky Farms. Stericker also advises the use of rock salt.

Twenty-eight farms replying to the question, "Are any commercial 'stock tonics' fed to the stallions? If so, which ones?" answered no. Among others who responded, Hooper says that in Central Kentucky "some use, but not often"; Truman writes: "Unless the stallion is run down in flesh give no tonic"; according to Thompson, feed oil meal and bran instead of the so-called stock tonic; and at the Top Notch Stock Farm the stallion is given three or four eggs daily, or one or two eggs every feeding, which, presumably, is intended to give the same effect as is generally expected from stock tonic.

The systems of feeding the stallion in the different establishments studied differ in practically each individual case. The foodstuff used, however, bears similarity in a number of instances. It would be most logical, it is believed, to present this phase of the subject by citing in full the feeds and methods of feeding followed in each establishment.

Cornell University: When the stallion is in "service-free" months the ration consists of timothy hay, fed morning and afternoon at the rate of six pounds each feeding, and whole oats, fed at the rate of two pounds each time, morning, noon, and afternoon. Four pounds of bran mash are supplied once a week in place of two pounds of whole oats. During the breeding period the amount of whole oats given is doubled or trebled, while from eight to nine pounds of chopped timothy hay are furnished in the morning, and the same amount in the afternoon. The cut timothy hay given during the breeding season is mixed with the grain portion of the ration. Carrots are supplied occasionally.

Chestnut Farms: During the breeding months the stallion at this stud gets six quarts of rolled oats in the morning, and next, in the afternoon, the grain feed consists of rolled oats, bran, and chopped roughage. Mixed

hay in one-inch lengths is given in the morning and at night, at the rate of twenty pounds per twenty-four hours. The same feeds are given during the "rest" season. The grains are fed in a damp form. The use of molasses is resorted to only with show horses, but never to breeding stud horses, while the feeding of corn is considered a "bad policy unless they (stallions) have green feed enough to offset the heat." Small amounts of any oil meal, it is claimed, are satisfactory for the stallion; and in regard to feeding clover or alfalfa hay as part of the ration, this is "very good if the ration is balanced."

Gregory Farm: The feeds of Carnot, the Percheron stud-header, during the breeding season and out of season are the same, but during the breeding period he is getting grass in the pasture, or cut grass when in the stall, in place of carrots which are supplied to him in winter. Carnot is given ten to twelve pounds of cut grass along the middle afternoon. For his grain feed he gets one and one-half gallons of rolled oats, dry, at about 5:30 a. m. Then at noon the same amount of rolled oats, together with one gallon of very finely chopped alfalfa hay, mixed together and dampened, is given. In the evening, at 5:45 o'clock, the same feed as the noon meal is supplied. When alfalfa hay is used no timothy is fed. If timothy is to be given, it is fed after the stallion has come from the pasture, and in the afternoon before grain feeding. Carnot is turned to pasture for from one to one and one-half hours after eating the grain, to be brought in when the flies begin to come. The timothy hay fed to him is about ten to twelve pounds each time; that is, all he will clean at one feeding.

Gossard Breeding Estates: Timothy and prairie hay constitute the kinds of roughage used for the stallion during the breeding season, fed at the rate of twenty-six pounds a day. No mention is made of the grains used. While during the non-breeding season the hay fed is not restricted in amount, provided that only enough is given as the stallion is able to eat clean. This is so as the amount of grain is cut down. The grains consist of oats or barley, bran and oil meal, supplied in amounts of twelve pounds, ten pounds, and one-half pound per day, respectively. Oats and barley are fed in rolled form, while some cut oat straw, Sudan hay or fine cane, cut in half-inch lengths, are employed in mixing with the grain feed. Enough of these cut roughages are added to the grain ration so as to make one-half bushel of feeds. Before feeding, the grain roughage mixture is dampened with molasses, one quart of this diluted with eight quarts of water being applied to the mixture at each feeding. Corn is discriminated against because it "burns him (stallion) up." When other hays are available preference is given to them over alfalfa, which is deemed "hard on the kidneys," and over clover, also objected to on account of its ill effect on the wind. Silage is said to be of great value in winter.

J. H. Serven and Son: Ear corn and whole oats are the grain feeds given to the stallion during the breeding and non-breeding seasons in this farm. The kinds of hay are not indicated. Although corn is fed, not too much of this, however, is fed. The inclusion of alfalfa or clover hay as part of the ration is considered good. The grains are fed dry and hay is given uncut.

Lakewood Farm: The breeding season ration at this stud comprises oats and bran, in ratio of half and half, fed three times daily, and timothy and clover hay or prairie hay supplied twice daily. The out-of-season feeds, on the other hand, include a little corn and oats, and prairie hay, the latter supplied as amounts as the stallion wants. The grains are given in a dry form or may be dampened a little. Alfalfa hay and cottonseed meal are objected to. Corn is deemed acceptable in winter months, but not during the breeding season.

Maple Grove Farm: It is the practice at this farm to feed the stallion a

pail of feed mixture prepared at the farm each time, four times a day, at six and eleven o'clock in the morning, and five-thirty and eight o'clock in the evening. The preparation and contents of the mixture follow: One-third of oats and two-thirds of cut hay are mixed together. To the amount of this mixture to be fed to eighteen horses a gallon of molasses, diluted in a pail of water, is added. The hay is cut in one-quarter-inch lengths by means of a Smalley Force Feed No. 12 hay-cutter. One pail of the mixture as has just been referred to, together with a handful of salt, is given each horse each feeding.

Maple Lawn Farm: Oats and bran, mixed together, and bright wild hay and timothy hay are mentioned as feeds given to the stallion during the breeding season. These are fed three times a day. When out of season mixed hay is fed three times a day, but oats and bran, in half-and-half proportion, are fed only in the morning and night, at the rate of one gallon and a half each feeding. The grain feed is wetted with diluted molasses, one gallon of molasses to five gallons of water. Alfalfa or clover hay is fed only very sparingly. As to feeding cotton-seed meal, Peterson says: "I would consider it very poor practice in case of a breeding horse." He writes, too, in regard to corn feeding: "I would not feed corn in the breeding season," but ear corn is fed once in a while. The show horses, in the fall, are given green corn at the rate of about ten pounds per head (supposedly per day). To show horses special attention is given to feeding oats, which should be recleaned of all foul seed and dust.

Oaklawn Farm: The breeding season ration consists of six quarts of oats fed three times a day and hay (kind not mentioned) in limited amounts. Two times a week the stallion gets bran mash, with about half an ounce of saltpeter. When the stallion is out of breeding work the grain feed includes four quarts of oats supplied twice daily. Clover or alfalfa hay is considered a very good adjunct to the stallion's feeds.

Pentoila Stock Farm: At this farm the feeding practice is to give the stallion, during the breeding season, all the mixed hay he will clean up, and whole oats and bran for concentrate. The same feeds are given in the non-breeding time, but the amount of grain should be less. Some green corn is given in the fall, and clover or alfalfa hay is held in satisfactory esteem.

Raboin Pioneer Homestead Farm: When the stallion is active in service he is fed one and a half gallons of whole oats each feeding, and for roughage good timothy hay, three times a day. These are supplemented with liberal access to pasture. Oat straw, fed three times a day, is given in the non-breeding season. No mention is made of the grain feeds during this season. No objection is offered to feeding alfalfa and clover hay mixture, and corn to form part of the ration is considered satisfactory.

Selma Farm: The feed of the stallion during the breeding season consists of one and a half gallons of crushed oats each time, in the morning, noon, and at night, with mixed hay for roughage. During and about a month before the beginning of the breeding season timothy hay is substituted for mixed hay. In winter bran in equal amounts as crushed oats is given instead. The feed during the non-breeding season is reduced to two-thirds in the case of grains and of hay; enough is supplied as the stallion will eat up clean.

University of Wisconsin: At this institution the grain mixture given to the stallion during the breeding season comprehends crushed oats and wheat bran, in proportion of eighty and twenty parts, respectively. Eight to ten pounds of the mixture are set aside to be divided equally in three equal feeds. No mention is made of the roughage fed during the same period. When the stallion is in out-of-service season only six to eight pounds of the grain mixture referred to are given daily in three equal feeds. The roughage feed at this time consists of fifteen to eighteen pounds of mixed hay given three times a day. If corn is to be fed it should not

form more than twenty per cent of the ration. Alfalfa or clover hay is considered a satisfactory roughage for the stallion. During the months of June and July cut grass is given, and in August and later cut green corn is continued to supply succulence.

University of Missouri: During the breeding season the stallion is given twenty pounds of grain in a day, divided in three feedings. This consists of two parts of corn, two parts of oats, and one part of bran. For roughage mixed clover and timothy hay are furnished with occasional supply of alfalfa. When out of season the amount of grain fed is less, but more clover is included in the ration than during the breeding period.

White Oak Stock Farm: The grain feeds consist of bran and oats and a small amount of corn each feeding during the breeding season. The same feeds are given during the non-breeding period excepting that the amount is less.

University of Illinois: From fifteen to eighteen pounds of crushed oats and twenty pounds of mixed hay—these make up the stallion's ration during the breeding season at this stud. Together with these bran mash is supplied twice per week. The same feeds apply for feeding the stallion when out of season, but less grain is fed. Carrots are fed whenever obtainable, and alfalfa or clover hay is given, but should not exceed one-half of the roughage mixture.

Irvinedale Farm: The feeds of the stallion during the breeding season consist of rolled oats, oil meal, and clover hay. The grain portion of the ration consists of ten pounds of oats mixed with one pint of oil meal, the mixture to be dampened with one gallon of water before being fed. Ten pounds of hay are supplied each time after feeding the grain. During the non-breeding period the same feeds are given, but the amount of the concentrate is reduced to one-half, the amount of roughage, however, remaining the same.

Lefebure Sons' Co.: The grain mixture fed to the stallions in this farm consists of one part of chopped clover, one part bran, and two parts rolled oats. To this is added diluted molasses, about one-quarter pint of molasses made into thinner solution with one quart of water for every horse each feeding. About twelve quarts of this mash is given each feeding three times a day. Timothy hay is supplied at will twice daily after the grain feeding. Besides, about one tablespoonful common salt is given to each horse each feeding. This method of feeding holds true both during and out of breeding season, excepting that the grain mixture fed during the non-breeding season is less, from six to eight quarts each time. Also, during the summer time the stallion is turned to pasture, where he may have access to green grass early in the morning and sometimes throughout the night when the weather is good.

Longview Stock Farm: According to Moon, the stud horse at this farm gets eight quarts of oats and bran each feeding, morning, noon, and night, during the breeding season. For roughage timothy and clover hay are furnished, all the animals will clean up. When out of season only oats for concentrate are given, and the same roughages are provided for. Corn, if fed, is preferred on the ear. For oilage or succulence alfalfa is given.

Oakdale Farm: Good states that during the breeding season, Farceur, the Belgian head sire, gets a grain mixture composed of four quarts of oats and two quarts of bran each feeding, three times a day. Mixed hay is supplied in amounts as the horse will clean up in thirty minutes each time, three times a day also. The stallion has access to grass besides. When over with breeding work the same procedure should rule, excepting that the ration should be reduced to two-thirds. Corn is adjudged a good concentrate if fed in little amounts during the winter season, and alfalfa or clover hay is considered an acceptable feed if limited quantities are used on account of laxativeness.

Ritchie Stock Farm: Ritchie has for his stallion's ration oats, two parts, bran, one part, to which one pint of oil meal is added, and hay—timothy, clover, alfalfa, sweet clover—furnished ad libitum. The same feeds are supplied both in the breeding and out-of-breeding periods. Beside the grain mentioned above, a little corn is also added, and for roughage, straw and occasionally hay are employed. The grain feed may be given dry or in mash form, and corn could either be on the ear or ground. For dampening the grain feed half and half of water and molasses, mixed together, is added to produce the mash. It is desired that only a limited amount of alfalfa or clover hay be used. For soilage Ritchie uses cut alfalfa, sweet clover, and green corn.

Top Notch Stock Farm: Whole oats, bran, and oil meal constitute the concentrate components of the stallion's ration. These are mixed in equal parts during the breeding season. When out of season the amount of oats in the mixture is increased to two-thirds, and the rest, oatmeal and bran, in half-and-half portions. For roughage, timothy and clover hay are given. At each feeding, three times a day, whether during the breeding season or not, the stallion gets two-thirds of a pail of the grain mixture, and the hay is supplied on the ground twice a day, first in the morning, and next at night, after the grain feeding in both cases. Only enough of the roughage is given as the stallion will clean up.

Arngibbon Farm: Two parts of oats, two parts of bran, and one part of chopped hay—these form the grain mixture given to the stallion in this breeding establishment. At noon this mixture is fed in a dampened form, for which one cup of molasses, made thinner by the addition of an equal amount of water, is used each feeding. Timothy hay is given, all the horse will clean up in the morning and at night. During the breeding period one pail of the concentrate is provided for each feeding, but on "rest" days, when the stallion is over with the breeding work, the grain feed is reduced to one-half. Soilage crop in the form of cut timothy clover and sometimes corn, may occasionally be fed to the stallion in the spring.

Hawthorn Farm: The system of feeding in this farm comprises: For concentrates eighteen quarts of rolled oats are divided into three feedings in a day, and on Tuesday and Saturday nights one pail of bran mash takes the place of the rolled oats. Five pounds of mixed hay (timothy and clover) are supplied in the morning and next, at night, the amount is increased to fifteen pounds. This procedure applies to breeding season feeding practice. In the idle months, when the stud horse is out of breeding service, only rolled oats are given, at the rate of five pounds each feeding, morning and night, while the feeding of one pail of bran mash is continued, but only on Saturday nights. The same amount of mixed hay (five pounds) is given in the morning feeding, and for the second feeding fifteen to twenty pounds of the same material are used. A handful of Epsom salt is placed once a month in the manger the year around. The hay is fed on the ground. Once in a while soilage crop is furnished.

Thompsondale Farm: For roughage the stallion is fed small amounts of wild hay (prairie) in the morning and also at night during the breeding period. The feeds include mostly oats and some bran. When the breeding season is over prairie hay, together with a small amount of a mixed prairie-timothy-clover hay forms the roughage portion of the ration. For concentrates corn, bran and oats, and, at times, a little oil meal, are fed. The oats are fed whole or ground, and the corn may also be fed on the ear or ground. Occasionally the grain feed is turned into mash, but no molasses is given during the breeding season. A little green feed is advised at any time, but silage is discriminated against. In feeding clover only the clean material should be used, this to be mixed in small amounts with other hays.

Waddington Farm: Hine states that the stallion in this stud farm "is 'roughed,' and has all the hay he will clean up with about two quarts

crushed oats twice daily," during the breeding season. When through with the stud service the hay is fed at will, twice during the day, timothy in the morning and alfalfa in the afternoon. No grains are given in the summer time, but as fall comes a little crushed oats is fed, mixed with a handful of chopped hay. The hay is chopped in half-inch lengths. When corn is fed it is supplied on the ear.

Iowa State College: The stud horse at this breeding establishment receives during the breeding season a ration: Of grains, six quarts of oats and two quarts of bran, each feeding, morning, noon, and night; and of mixed hay, five pounds in the morning and fifteen pounds at night. When out of season the same amount and kind of roughage are provided for, but oats and bran are fed at five-quart and two-quart amounts, respectively, each feeding, three times a day. Rolled oats are used, but the hay is fed uncut. Diluted molasses is used to dampen the grains before feeding. If well cured, clover or alfalfa hay is considered a satisfactory feed, but cottonseed meal and corn are not wanted.

Michigan Agricultural College: The feeding practice at this institution follows: The first feeding during the breeding season consists of ten pounds of mixed hay, chopped and fed with four quarts of crushed oats; secondly, five pounds of chopped mixed hay is fed with four quarts of crushed oats; and for the third feeding ten pounds of alfalfa hay are chopped, mixed with four quarts of crushed oats and dampened with molasses water before being fed. When out of season only two quarts of crushed oats are supplied in the morning, and in the night six pounds of ear corn are provided for. Ten to fifteen pounds of sorghum, in bundles, form the roughage feed, and ten pounds of alfalfa are given in the night feeding. The roughage is furnished in half-inch lengths and mixed with grain in ratio of half and half. Corn is considered a good portion of the ration if fed in small amounts early in winter, but cottonseed meal is objected to. Alfalfa or clover hay is held as splendid feed. During the winter a daily allowance of ten to fifteen pounds of silage is supplied to the stallion, young and old. To dampen the chop mixture only enough of the molasses solution is added as will moisten the feed. To dilute the molasses two-thirds of water is used with one-third of molasses. About one pint of molasses is necessary for each horse each feeding.

Truman's Pioneer Stud Farm: The feeds of the stallion at this establishment consist of crushed oats and chopped alfalfa mixed with diluted molasses. This mixture is fed three times a day. The same roughages are fed in the non-breeding season, but more are provided for at this time. No mention is made of the grains fed in the non-breeding period. The alfalfa hay fed is cut in one-inch lengths. Only two feedings a day are dampened with diluted molasses. During the summer time a little green alfalfa is fed, but the amount is restricted to the breeding stallion.

University of Minnesota: During the breeding season the grain feeds of the stallion consist of 85% of oats and 15% of bran, fed at the rate of eight pounds each feeding twice a day, in the morning and afternoon. Six pounds of clover and timothy hay are fed in the morning and ten pounds in the afternoon. The same roughages are fed in the non-breeding season, and for grain sometimes 20 to 50% of corn is used, together with 60% oats and 10 to 20% bran. No cut roughages are supplied and the oats are given whole. Shelled corn is preferred. Clover or alfalfa hay is considered a good feed if fed clean.

Central Kentucky Farms: Hooper, in speaking for the horse men of Central Kentucky, states that breeders in this part of the country feed the stallion during the breeding season oats and mixed hay, while in the non-breeding season mixed grain and mixed hay are given. Hay is fed in racks. Sometimes sheaf oats are cut and mixed with the grain. The oats are fed in the "clipped" form or whole. Corn is fed moderately to idle

horses in winter, but cottonseed meal is not used because it is unpalatable. Alfalfa or clover hay is considered a good feed except during the breeding season. Molasses is sometimes fed in winter, while silage is usually not used. The feeds are fed dry, but on Sundays it is the rule to give bran mash.

According to Stericker, the stallion, during the breeding season, may be fed a generous supply of oats and bran, together with cut hay, and grass once a day is recommended if available. When the breeding season is over the feed should be diminished in amount. Hay is fed in amounts as the stallion will eat clean. A little corn is believed to have its place in stallion feeding, and clover or alfalfa hay is considered a very desirable roughage.

In setting forth the views and recommendations disclosed by different breeders on the feeding and management of the stallion, such as are quoted in Sanders and Dinsmore's "A History of the Percheron Horse," again it is seen befitting to discuss the details, as follows:

Fletcher writes: "A stallion should be housed in a large, roomy, well-ventilated box stall, and given plenty of exercise, either in a well-enclosed yard or under saddle on the road every day. Plenty of fresh water, clean, fresh hay, and sweet, clean oats and bran in sufficient quantities during breeding season to keep the horse in good condition are essential in my plan of breeding stallions. I avoid corn in any form as a feed, as well as dirty or musty hay or oats. A moderate amount of green feed is beneficial. A good stallioner will not permit his charge to become too fat or too thin, and will be sure that he does not lack exercise. A clean, well-cared-for stable, with good ventilation, is necessary, and there should be sufficient grooming to keep his coat in a clean, healthy condition."

Prichard states that "If it is possible to give a stallion work, break him to harness and give him constant work about the farm out of season. When the breeding season comes he will be in condition, and it will be easy to give him daily exercise of from five to six miles. If you cannot work the stallion, make a paddock, enclosing an area of ground with good grass and plenty of water always at hand. Build a stall for shelter from sun and storm, so that he can go in and out at will. Feed oats and a little dry bran in every feed. If he does not eat oats readily, feed a little corn and good timothy hay. Handled in this manner, the stallion should live long and be useful as a sire."

White, who has been cited oft and again in previous paragraphs, is again referred to in the following discussion on the feeding and handling of the stallion: "I do not believe that one can afford to work a high-class stallion; the risk is too great. He should have a large box stall opening into a paddock containing about an acre, and the door should be kept open day and night, so that the stallion can go in and out at will. The fence must be secure, but at the same time constructed so that the horse can see through and ascertain what is going on. If possible, I like to have a knoll in the paddock, from which the horse can get a good look over a large part of the farm. He should be made happy and contented. The stallion should be kept in the stall a month before the breeding season begins, fed more heavily and given plenty of exercise, so that when the season begins he will weigh about 150 less than in show condition and be hard. I use only oats, bran and timothy hay for my stallions. Other feeds may be as good, and they may be better, but I know from experience that these are both good and safe."

While the feeding of the stallion at the Maplegrove Farm has already been discussed, nevertheless, some pointers may further be gained by including Singmaster's presentation on the subject, including the handling of the stallion, thus: "The breeding season in our latitude should not be earlier than April 1. The stallion should be put on the road for exercise a

month earlier, so as to harden him for producing fertile semen. We would not increase his feed of bright timothy hay and oats until he is put to breeding; then increase the amount fed, and add small quantities of clover hay or alfalfa and use bran mash as a bowel corrective. He should have four to six miles of exercise daily, except Sunday, when he should rest and not be used. If the stallion does not settle his mares by May 1, put him to work, either to a wagon or at farm work, from two to four hours a day. The stallioner should be a kind man, and yet have his stallion under complete control. Never strike your horse, but guide him, control him. It is sometimes necessary to reduce your stallion to subjection, but never when you are in a passion."

Dunham is quoted to state "That the matured stallion, when in use during the breeding season, should have plenty of exercise and good feed. He should, if possible, be kept gaining in weight during the season. I find that the best way to take care of such a horse is to give him a yard to run in, with plenty of oats, bran and good hay. I do not believe that he needs artificial feeds or stimulants. It keeps him more tractable and surer if he has plenty of exercise, or even work when not in stud service."

In the practices advocated by McLaughlin for the handling and management of the stud horse, he says: "A stallion should have at least five miles of exercise every day. Out of the breeding season the best thing is to work him moderately. He should have oats and corn enough to keep him always in good condition. He should be given enough bran or clover or alfalfa hay to keep his bowels in good shape."

In the words of Lee, "He (the stallion) should have a good box stall, if possible, twenty-five feet square, with a high ceiling and ample light. It should be in a place where he can see what is going on around him, see the other horses come and go and feel that he is not alone. A stallion likes company. Give him from three to six miles every day to a cart or at the side of another horse, and when the breeding season is over hitch him with a steady horse and put him to work. In the beginning start at light work, increasing it each time, from an empty wagon to a manure spreader and hay hauling, and from that to any kind of work at which he can have plenty of time, so as not to become over-heated or broken in constitution. During the breeding season turn the stallion into a bluegrass or clover pasture of two or more acres, or at least give him a paddock 200 feet square, where he can have plenty of exercise and see everything that is going on. Give him plenty of good alfalfa hay, or, perhaps, prairie hay, and feed him equal parts by measure of bran and oats, together with a small amount of corn chop. Wet this feed well. Some horses require a greater amount of feed than others. In starting a new stallion in our barn he is tried out in a very small amount of feed. This is increased little by little until we have him eating what we think he should have. Our foreman requires one thing of our feeders—the horse must be ready for every meal."

9 EXERCISE AND WORK

The nature of exercise given to the stallion in a number of farms differs. To give this in a presentable manner the various farms are listed below, opposite each of which the kind of exercise enforced is indicated:

FARMS	KIND OF EXERCISE
Cornell University	Run in the paddock or driven.
Chestnut Farms	"Led alongside of pony."
Gregory Farm	During the breeding season, beside the exercise given on the pasture,

FARMS	KIND OF EXERCISE
Gossard Breeding Estates	the stallion is also worked in the harness, or led by hand, or ridden. During the non-breeding season the stallion is simply exercised in half-acre pasture. If not worked, the stallion is walked four miles daily.
J. H. Serven and Son	"A paddock to run in all the time and driven to a cart in breeding season."
Lakewood Farm	Run of a paddock and led.
Leslie Farm	Run of a 32-foot square paddock, but during the breeding season is hand led.
Oaklawn Farm	Sometimes led two miles daily.
Selma Farm	The main exercise consists of allowing the stallion a free use of a one-and-a-half-acre paddock, but he is sometimes ridden.
University of Missouri	Ridden and running in the lot.
Woodside Farm	Run of a paddock and hand led.
University of Illinois	Ridden on the road four to seven miles per day.
Lefebure Sons' Co.	Run in a paddock, 100x30 feet, or a five-acre lot. If the stallion will not exercise in the paddock he is led or driven in the road.
Longview Stock Farm	Worked in the harness.
Hayfield Farm	Led.
Hawthorn Farm	Led and worked in harness.
Thompsondale Farm	During the breeding season every day the stallion is exercised at the end of a rope on a side hill.
Thos. Kiddoo Farm	About four miles' walk, and partly in harness.
Michigan Agricultural College	The stallion has constant access to the paddock when not working in harness.
According to Stericker	Run of half-acre lot, but exercising by hand is surer and better.

In thirteen farms—the Maple Lawn Farm, Arngibbon Farm, Raboin Pioneer Homestead Farm, Iowa State College, Ritchie Stock Farm, Pentola Stock Farm, Oakdale Farm, Holbert Farms, Waddington Farm, Top Notch Stock Farm, Wisconsin University, Purdue University, and the University of Minnesota—the stallion is allowed the run of a paddock or pasture

In fifteen farms, according to the reports, the stallions are not worked, among which are the Top Notch Stock Farm, Irvinedale Farm, Holbert Farms, Iowa State College, Hawthorn Farm, Woodside Farm, Raboin Pioneer Homestead Farm, Oakdale Farm, Thompsondale Farm, Oaklawn Farm, Selma Farm, Lefebure Sons' Co., Arngibbon Farm, University of Minnesota, and Purdue University. Also, according to Hooper, in Central Kentucky the practice is not to work the stallion. Good states that if the

stallion is to be worked he will be so heated that his efficiency to settle a mare would be lessened. In some other farms the stallion is given some work of one kind or another, thus: at the Maple Lawn Farm the stallion is worked on general farm jobs when not in breeding season; at the Penttoila Stock Farm some of the young individuals are worked; the stallion at Cornell University is worked hauling milk during the breeding season; at the Longview Stock Farm the work consists of field and hauling jobs; at the Gossard Breeding Estates the stallion is employed hauling feed, etc., to various depots; at the Michigan Agricultural College he is always on the wagon doing farm work; as has been referred to above, at the Gregory Farm the stallion is worked in harness or led by hand or ridden during the breeding season; and at the Ritchie Stock Farm some are given all kinds of work. At times at Hayfield Farm the stallion is also worked. Trowbridge also advises working the stud horse, and Truman thinks a steady light work would be a good job for him. Stericker is also of the opinion that the stallion is best worked like a gelding.

10. GROOMING. CLIPPING THE HAIR COAT. SHOEING

Of the twenty-nine farms answering, two farms—the Raboin Pioneer Homestead Farm and Waddington Farm—do not practice grooming the stallion. To a limited extent, or as one of the breeders states, “not much, only when he is ‘dolloed up a little’”; four farms—the White Oak Stock Farm, the Penttoila Stock Farm, Ritchie Stock Farm, and Wisconsin University—enforce cleaning their stallions. At the Arngibbon Farm the stud horse is cleaned but once a week, and at the Oaklawn Farm, Hayfield Farm, and at the University of Missouri, he is groomed so as to keep him fairly clean. The stallion is groomed daily at the Thompsondale Farm, Truman’s Pioneer Stud Farm, Lakewood Farm, and Cornell University, but the reports do not state the number of times grooming is done daily. At the Chestnut Farms he is groomed every day before and after exercising. Three farms report of grooming their stallions only during the breeding season, namely, the Selma Farm, Oakdale Farm, and Michigan Agricultural College. At the Selma Farm the stallion is also groomed one month before the breeding season, but not afterwards. The majority of those which reported is classed within those that groomed their stallions once every day. These include the Lefebure Sons’ Co., Iowa State College, Thos. Kiddoo Farm, Hawthorn Farm, Minnesota University, Illinois University, Irvinedale Farm, and Maple Lawn Farm, or eight farms in all. Stericker also opines in like manner. Only two establishments—the Gossard Breeding Estates and Purdue University—indicate grooming their stud horses twice a day.

Twenty-six breeding establishments respond opposedly to the question, “Is it advisable to clip the stallion? If so, how often?” Because, according to Cooley, it is not necessary, provided that the animal has been well kept during winter. Good also asserts that clipping the stallion’s hair is not required if he is properly fed. But in the University of Missouri, Trowbridge states that the hair of the stallion is occasionally clipped; and at the Maple Lawn Farm, Peterson writes: “In the case of a horse that grows a long coat of hair I surely would in the spring.”

“Is it advisable to keep the stallion shod? If so, how many times in a year is shoeing done?” To this query three farms—the Thompsondale Farm, J. H. Serven and Son, and Waddington Farm—answer “No,” while Peterson says “If the horse has the right kind of feet he should not be shod”; and Good explains that “If good feet are desired the stallion should not be shod”. The major body of breeders favor the use of shoes at all times or under some circumstances. Their remarks follow:

FARMS	REMARKS
Cornell University	"As often as necessary."
Chestnut Farms	"Bar shoes reset every 60 days."
Lakewood Farm	Do not shoe unless feet are breaking.
Oaklawn Farm	"Shoe during breeding season."
Raboin Pioneer Homestead Farm	The stallion is shod when to be shown.
Selma Farm	Shoeing the stallion depends on the foot and as to whether or not he is to be traveled. If he is to be shod the shoes should be changed every five to six weeks.
University of Wisconsin	Not to be shod if kept on the farm.
University of Missouri	Part of the time shoe in front.
Woodside Farm	The stallion is shod ten times in a year.
University of Illinois	"Plates in front, heel calks behind, reset every six weeks."
Irvinedale Farm	The stallion is shod six times a year or every two months.
Lefebure Sons' Co.	"No, unless on road for some time."
Ritchie Stock Farm	Not to be shod excepting only when to be shown.
Arngibbon Farm	"Always do—once every six weeks."
Hayfield Farm	"Depends on stallion."
Hawthorn Farm	"Always shod. Never left over a month. Just to keep feet looking good."
Thos. Kiddoo Farm	To be shod if doing road work.
Holbert Farms	"Should be kept barefoot unless traveling during season."
Iowa State College	If not on the road it is considered better without shoes; otherwise, to be shod every six weeks.
Michigan Agricultural College	"Depends entirely on condition of his feet and how much he works."
Purdue University	Shoe as often as necessary to keep the feet in good shape.
Truman's Pioneer Stud Farm	"Better without shoes if you do not intend to show him, and take him on the hard roads."
University of Minnesota	"Depending on condition and quality of feet."
Central Kentucky Farms	"Shod regularly."
According to Stericker	Shoeing depends on the work required, but usually should be shod every six weeks.

11. VICES

Eleven breeding establishments—the Santa Anita Rancho, Woodside Farm, Lefebure Sons' Co., Iowa State College, J. H. Serven and Son, Wad-

dington Farm, Maple Lawn Farm, Selma Farm, Cornell University, the University of Missouri, and the Gossard Breeding Estates—all answer negatively that their stud horses have developed any vices. On the other hand, a variety of vices are indicated by several stud farms. For instance, at the Pentola Stock Farm, stall kicking is mentioned, and at the Arngibbon Farm, cribbing and windsucking. At the Michigan Agricultural College, the stallion is claimed to rub the mane and tail, for which the remedy advised is to apply kerosene and to change the feed. From Lakewood Farm comes the word that masturbation is a vice developed by the stallion. To eliminate this, it is recommended to turn the stallion out with the mares all the winter. Hooper claims that in Central Kentucky Farms the breeders find biting people or blankets and kicking as vices developed by the stud horse. In the words of Ritchie concerning the stallion's vices, the following is reproduced: "My horse, when I first got him, had never been educated, and he wanted to breed a mare when he got ready whether you are ready for him or not. But just get a good whip and go after him and show him that you are boss." According to Truman, "on account of lack of exercise and being constantly confined, once in a while they develop cribbing," to overcome this he says, "take out mangers, and don't let them have anywhere to bite with their teeth; there are several devices to stop cribbing if taken in time." Good is here referred to, to say that vices are usually caused by the man handling the young animal, but in this connection he brings out that in twitching the mare to be put ready for breeding operation the groom must release the twitch during the act of copulation or else the mare will not do her part. Stericker mentions self-abuse as a stallion's vice for which he advocates the use of the "shield" as a remedy. He further says "do not play with a stallion or tease him; at first he will bite playfully, later he may do so viciously." On this Holbert writes: "None with our stallions—except one stallion nips his chain or leader's sleeve and is not a well-mannered server. Cannot be remedied now as he is seven years old and has a mind of his own. Could have been remedied when a colt."

12. ACCIDENTS. DISEASES OR AILMENTS

Four farms surveyed find hardly any or no common accidents at all to which the stallion may fall a victim, namely, the White Oak Stock Farm, Holbert Farms, Oakdale Farm, Lefebure Sons' Co., and Hawthorn Farm. In this connection it may be said that at the Oakdale Farm mean mares are hobbled, and the twitch is applied in all cases during the breeding operation. That the most common accident to which the stud horse is subject is to get kicked, is the unanimous reply of twelve breeding establishments, viz: the Maple Lawn Farm, Selma Farm, University of Illinois, Longview Stock Farm, Truman's Pioneer Stud Farm, Irvinedale Farm, Iowa State College, Lakewood Farm, Gossard Breeding Estates, Arngibbon Farm, Ritchie Stock Farm, and Wisconsin University. Stericker and Hooper also make the same statement. At the Michigan Agricultural College it is claimed that the stallion occasionally may slip in the paddock or may be kicked by cross mares during the breeding service. From the Santa Anita Rancho comes the statement that common accidents of the stallion are sprain of the shoulder, sprain of the stifle, and kicks by unhobbed mares, any of which may be met during the breeding operation. Likewise, at the Raboin Pioneer Homestead Farm experience teaches that the stallion may ordinarily be kicked by the mare or sprained while doing service.

The stallion is attacked by very few or no diseases or ailments as reported by the following farms: The Ritchie Stock Farm, Hawthorn Farm, Michigan Agricultural College, White Oak Stock Farm, and Santa Anita Rancho. While a number of establishments, eight of them, such as the

University of Missouri, Woodside Farm, Maple Lawn Farm, Truman's Pioneer Stud Farm, Irvinedale Farm, Lakewood Farm, and the Gossard Breeding Estates, give colic as the common ailment of the stud horse. According to Hooper, the same trouble, colic, is a common derangement of the alimentary system of stallions in the farms of Central Kentucky. At the Oaklawn Farm colic and lung fever are mentioned as common ailments; at the Pentoila Stock Farm, influenza; at the Longview Stock Farm, colic and clogging of bowels; at the Arngibbon Farm, distemper; at the Wisconsin University, founder, over-heatedness, lameness, colic; at the Oakdale Farm, distemper, so that, according to Good, the stallion, before the breeding season, is treated with serum (procured from Dr. Meyer, Wenona, Illinois) in order to prevent the occurrence of this malady; and according to the Lefebure Sons' Co., the stallion commonly gets the "shipping fever" when being sent out, to prevent which serum is also used before the animal is shipped. Stericker is authority in saying that colic and gastritis are common ailments of the stallion, which, however, are mostly caused by injudicious feeding.

Edmonds, Ritchie, and Stericker are all of the opinion that a veterinarian should always be summoned for any disturbance that might befall the stud horse, and as Ritchie says, "Better not experiment with a good stallion unless one has had some experience." But in four farms—the Oaklawn Farm, Longview Stock Farm, Pentoila Stock Farm, and Truman's Pioneer Stud Farm—colic is being remedied without the aid of a veterinarian. At the Wisconsin University the veterinary surgeon is called for all diseases except for the most common ones. Among other breeding establishments in which some diseases are remedied without the assistance of a qualified practitioner may be mentioned the Gossard Breeding Estates, in which only those calling for surgical operation are considered as requiring the work of the veterinarian; the Arngibbon Farm, where the practice is to take care of cuts, bruises, colic, and distemper without outside consultation; at the Iowa State College, where it is considered safe to treat influenza, grease, and cuts without the aid of the veterinarian; and the Lefebure Sons' Co., where the veterinarian service is considered a necessity only in treating cases of cholera, colic, or other of like severity. At the latter stud those that are cured in the absence of the veterinarian are cuts for which they use tincture of iodine; navel, for which also tincture of iodine is employed; and distemper, which is cured with the application of Spohn's medicine. Spohn's preparation is also used for worms at this farm. At the Maplegrove Farm all diseases and accidents, save castration, are handled without calling the certified practitioner, and at the Irvinedale Farm it is the absolute policy to remedy all diseases that may occur among their stallions by themselves. Peterson remarks that "some grooms are about as good as the average veterinarian and do a lot of home doctoring."

II

MANAGEMENT OF THE MARE

1. SELECTION

For breeding purposes Truman says that "plenty of length and width" should be the principal points to be looked for in the selection of the mare; while shortness and stubbiness of body form, straight joints and blemishes, should be guarded against. Shaw and Hudson describe desirable brood mares as "tidy, short-backed animals, with plenty of quality," and of "known breeding from prolific strains," discriminating against individuals that are characterized by "coarseness, puffy legs," and those "that have failed to reproduce successfully." Following the qualifications stipulated by Peters, the brood mare should possess "soundness, type, size, pedigree," while Cooley calls for "bloodlines, quality, femininity, size good feet and bone, action." Stericker's principal points include "good disposition (as colt often gets that from mares), good legs and feet, short back and intelligent head." According to Thompson, the mares to compose the breeding herd should be of "good disposition, easy feeders, wide-barreled, good feet and legs, good heads, broad-chested," and Hine wants "correct conformation, good bone, big and flat." On this subject, Ritchie writes: "I want a mare sound, good size, with clean, flat bone, good feet, lots of quality and a good mover and lots of pep," but, on the other hand, he points out that "crooked legs, no quality, unsoundness, poor movers and deadheads" should jeopardize the value of a mare for breeding purposes. Mares should be "good, big, sound, and, if old, they should have been good breeders"—these constitute the main points for which the Lefebure Sons' Co. look. Moon looks for "bone size, style, action, good head and eyes, good feet," in the brood mare, and to simplify the matter Good advises that the same points as are desired in the stallion should apply in the mare, the only difference to be considered being in the femininity which the mare should possess in lieu of the stallion's masculinity. Considering Augstin's stipulations in the selection of the brood mare, the individual must possess "soundness" and must be "roomy-built, of quiet disposition and motherly looking." At the Gossard Breeding Estates, the following points are emphasized: "soundness, size with quality, good, strong back and loins, and of feminine appearance." Hains places "size, quality, action and soundness" as the principal points to be looked for in the brood mare, while Henderson favors "good, nice, roomy, good-boned, good-footed mares." According to Peterson, "mares that are sound, of good type, with lots of size, wide and deep," should be selected for breeding purposes. Besides soundness, says White, the mare should also be long, roomy, feminine, must possess good feet and legs, especially in the case of the hocks and the pasterns, which should be sloping. "Good conformation, soundness and capacity," briefly speaking, should, in all, describe the ideal brood mare as promulgated at the Santa Anita Rancho. Again, soundness is pointed out as a point to be insisted upon in the selection of the brood mare, according to Edmonds, and, furthermore, she should also be of good type and have the feminine look. Dix characterizes the brood mare as one that is "large, roomy, sound, with good underpinning." Raboin states that similar qualifications should hold true for both the stallion and the brood mare, excepting that in the latter the body should be more roomy. According to Hooper, the matter of selecting the ideal brood mare should be focused to her "kinship to great horses"; that she should be a descendant of a noted dam, and, no less, she should be of right conformation and

have size. Three cardinal points, "size, soundness and femininity"—these are considered by McMillan as all-important matters to be borne in mind in the selection of the brood mare. Fuller gives more weight on the "breeding, size, soundness, temperament," while Haxton prefers "type, conformation, femininity, soundness, action" over other in choosing mares to be used in the breeding herd. Haxton mentions unsoundness and masculinity as undesirable characteristics of the ideal brood mare. According to Pallister, plenty of length, but closeness to the ground, should in general describe the kind of mare desirable in a breeding herd, while Serven looks for individuals that are "sound" and have "type, size, and breeding," such mares as are characterized by small and crooked feet, crooked legs, and poor heads being objected to. Kiddoo wants a mare that is sound and large, together with quality and ruggedness in her make-up. Hanmer, however, says that the "brood mare should be free from spavins, ringbone, and ophthalmia," and that the general conformation, as well as constitution, should be good, besides being of agreeable disposition. The selection of brood mares, according to Holbert, should be based on the best of breeding and good individuality; besides, they "must have size, good legs, good bone, good backs and rumps and heads and necks." The fact that certain individuals have always produced good colts is, of course, another consideration of no less importance that is brought out by Holbert.

From Sander and Dinsmore's "A History of the Percheron Horse," Fletcher's views, as well as others, are reiterated here, now on the selection of the brood mare. In Fletcher's own writing the following are quoted: "In selecting a brood mare, I should choose one from a producing family, weighing 1,700 to 2,100 pounds, and standing 16 to 17¼ hands high. She should be sound and of feminine type. The mare should have a fine head, with eyes well apart and well-set ears, not too heavy, a slim, graceful neck, well set on sloping shoulders, a large, roomy barrel, a well-sprung rib, a tail not too low, clean, sound, well-placed legs not inclined to be meaty or to carry too much hair, sloping pasterns and deep, tough hoof. The mare to be avoided is the one of masculine type or from a family of shy producers. They are rarely successful. A coarse, Roman head, heavy, poorly set ears, a masculine neck, a tail set too low, a short rib, a crooked, puffy hind leg, a straight pastern and a foot that is too narrow or too flat are also very undesirable features."

Prichard says: "Our experience has been that the full-made, wide, deep-bodied mare of medium height, standing on rather short legs, is the most successful in the hands of the average breeder. Her weight in ordinary working condition should be from 1,600 to 1,900 pounds. She should have plenty of bone both fore and aft, specially below the knee and hock. We like as much refinement about the head and neck as is consistent with the conformation. The mare should have a strong back, well coupled to broad hips. Of course, she should stand on sound feet and limbs. Be sure that she has a sweet disposition and is not nervous and fretful. The frothy-dispositioned mare is a nuisance and should be avoided. Look your mare over and find a stallion that can correct her faults. Keep her in harness, if you can, working her up nearly to foaling time."

White is here referred to once more in the selection of the mare, but in a more descriptive manner. He writes: "I believe that the size in the colt should be mainly derived from the mare. Therefore, I like a large, open, roomy mare, but she must be feminine. While I do not want a long back, at the same time I prefer it to a short, pony-built mare. She, like the stallion, must be sound and have good, true action. Mares, while pregnant, can and should be worked when it is possible for the owner or his sons to handle them or when a reliable man is to be secured. When this is not possible, it is best that the mare remain idle, but in this case she should be out every day unless the weather is very bad and should be allowed the

run of large pastures and not be confined to paddocks. A fair number of mares can be allowed to run together, but I regard it desirable not to have more than eight in one pasture."

Singmaster's recommendations in the selection of brood mares follow: "Select the type of mare that suits you best. We prefer the rather lengthy mare of good reaching neck, with a sweet feminine head, a good pair of shoulders, a deep body, closely ribbed to the point of the hip, a gently sloping hip, and flat-boned legs with springy pastern joints. At the throatlatch she should be much lighter and cleaner than the male. The prominent eye and the medium-sized hoof, dark colored and sloping, but not steep, should be sought. Get your mares of similar conformation, so that, when mated with a stallion of opposite good points, they will produce foals of distinctive conformation or type that will build your reputation as a studious breeder of all that is best in Percherons. Color in the mare is not so essential as in the male. The mare should weigh from 1,750 to 1,900 pounds, and be a square walker, with no wobbly joints. Percherons are of good disposition, and it stands us in hand to have it so remain, but it requires care in mating and care in handling the colt."

According to Dunham, "Brood mares should be selected with due reference to size and soundness. They should be of feminine type and of the largest size to be found, short in the back, but long below, and of good substance. Lightness of bone is apt to reappear in the colts."

First of all, Corsa emphasizes soundness in the mare to be included in the breeding herd, because, as he says, "Although the available stallion may be a breeder and an impressive sire, sound and of correct pattern and sufficient size, we cannot expect him to overcome a material unsoundness in the mare." Corsa goes on to say: "The size of a brood mare is also of importance. We would not expect to raise real drafters from 1,400-pound mares; the offspring at maturity are seldom more than chunks. On the other hand, there is quite a temptation to use, and a very general demand for, the one-ton mare. There are many such mares that are quick in their movements and handy at work on the farm; they make good mothers and regular breeders. They are the exception, however, among those of their size. In general, I believe the experience of breeders of purebred livestock will bear out the statement that the excessively large females are seldom the best breeders.

"A mare weighing from 1,700 to 1,800 pounds in ordinarily good condition is the draft mare that may be expected to give a good account of herself both at work and in the stud. Get size in the offspring through the selection of the sire and through the kind, quality and quantity of feed given the colts. Fortunately, it is among those under excessive weights that we find the greater number of mares of acceptable brood type—sweetly feminine sorts which usually have necks long enough so that one may put his arm around and love them.

"Avoid flat, shelly feet, straight pasterns, crooked hind legs, excessively sloping rumps, low backs and straight shoulders, both in the mares and in the stallion to which they are bred. The size of the bones may well be considered, though too much stress frequently has been placed upon mare size. It is the quality, however, which counts. We want a clean, flat, hard, flinty bone, and enough of it to hold up the mare and carry her on any work she may be called upon to do. It is desirable, also, that the front legs should not cut under too much just below and back of the knee.

"Having found a mare that is sound and acceptable in size, type and conformation, let us hope and pray that she has snap and courage to carry on the work that comes with the heat of the day and to pass them on as an heritage to her offspring. Such a mare not only moves more gaily, but is likely to move more correctly than the dull-headed, wabby legged mare."

2. DISEASES, UNSOUNDNESS, ETC., AS DISQUALIFYING FACTORS

Fuller states that blindness, heaves, or when the animal is windbroken, and most physical unsoundnesses, will be sufficient to bar the mare from breeding purposes. Hooper makes the assertion that "any serious unsoundness is considered detrimental." Edmonds believes that a knowledge of the history of the disease or unsoundness should first be had before certain defects or ailments could be adjudged as disqualifying factors of a brood mare; for instance, Dix and Stericker hold that all hereditary unsoundness should constitute a hindrance in entering the mare into the breeding stud. Generally speaking, such hereditary diseases as are affecting the bone, respiration, and eyesight should bar the mare from breeding purposes: these comprehend the rules followed at the Santa Anita Rancho. The following disqualifications of the mare are brought out by Holbert, thus: "Side bones on a young mare, puffed hocks or thoroughpin, and periodic ophthalmia." Touching on the same subject, White says that all unsoundness and diseases should be considered so, but emphasis is laid on side bone, curbs, and bad wind. According to Peterson, mares that are blind, or affected with any kind of spavins should not be included in the stud, and Haines says: "Any very serious unsoundness which injured the usefulness of the mare and which had occurred because of faulty conformation" should be sufficient to disqualify the brood mare. At the Gossard Breeding Estates, "all hereditary diseases and deformities" are looked upon as detrimental affections of the brood mare, while Haxton and Kiddoo consider all diseases, unsoundness, and other defects as disqualifying factors. "Poor feet and poor eyes," according to Moon, should disqualify the brood mare in the stud, but Shaw and Hudson bar only two main points—"any genetal disorder and baggy hocks." Peters makes the statement that diseases, unsoundness, and other defects that bar the mare from breeding work depend upon the age of the animal in which these have developed. Seven breeding establishments—the Truman's Pioneer Stud Farm, Iowa State College, Lefebure Sons' Co., Oakdale Farm, University of Missouri, Oaklawn Farm, and Lakewood Farm—rule that the same diseases, unsoundnesses, and other defects as would bar the stud horse from breeding purposes should hold true in the case of brood mares.

3. BREEDING SEASON

Six stud farms report on opening their breeding season during the months of April, May, and June. These include the Selma Farm, University of Illinois, Woodside Farm, Lakewood Farm, G. Andrews and Son, and Michigan Agricultural College. The rest of the establishments responding give their "open breeding season" at varying periods, thus: At the University of Missouri, from March 1 to July 15; at the J. H. Serven and Son, mostly in March, April, and May; at the Truman's Pioneer Stud Farm from April to the middle of July; at the University of Minnesota, from April to July; at Purdue University and Iowa State College, chiefly in April, May, and June; at the Gossard Breeding Estate, from February 1 to June 1; at Wisconsin University, from April to August; at the Pentola Stock Farm, from February to December, being heavy during the months of April, May, and June; at the Thompsondale Farm, during the months of April, May, June, July, and August; at the Waddington Farm, from March to May; at the Chestnut Farms, from March to August; at Longwood Farm, from May 1 and on; at the Ritchie Stock Farm, from April to October; at the Hayfield Farm, from February till July; at the Raboin Pioneer Homestead Farm, from April 1 to late fall; at the Thos. Kiddoo Farm, principally in May; at the Longview Stock Farm, only in the month of June; and in the Central Kentucky Farms, during the spring-time; at the White Oak Stock Farm and Maplegrove Farm the breeding

season lasts throughout the entire year. At the Maple Lawn Farm the mares are bred any time of the year, but in the case of outside mares the breeding season lasts from April to July, and so as at Holbert Farms in which their own mares are bred the year round, but only from May 1 to August 1 with outside mares. Likewise in Cornell University the mares are bred any time they come in heat, but Haines says, "Try to prevent as much foaling when there is most work as possible."

4. ARTIFICIAL INSEMINATION

Nineteen farms report that artificial insemination is not carried on or practiced. Those farms are: the Wisconsin University, Chestnut Farms, Thos. Kiddoo Farm, Selma Farm, Maple Lawn Farm, Oaklawn Farm, Cornell University, University of Missouri, White Oak Stock Farm, Pentoila Stock Farm, Raboin Pioneer Homestead Farm, Arngibbon Farm, Hayfield Farm, Longview Stock Farm, Maplegrove Farm, Waddington Farm, Thompsondale Farm, Truman's Pioneer Stud Farm, and the University of Minnesota. Hooper states that in many studs in Central Kentucky this method of breeding is practiced, both capsules and syringe being used. According to McMillan, some work on this line has been performed in his farm, but unfortunately no satisfactory results were attained. The impregnator was the means of insemination employed. Butler reports that the impregnator and capsule are used at the Woodside Farm in carrying out artificial insemination, but this is resorted to only in cases of infection, while at the Iowa State College the impregnator is used only to treat doubtful mares. At the Santa Anita Rancho, artificial insemination is practiced occasionally, using both the capsule and impregnator or syringe, and, likewise, at the University of Illinois now and then this method of reproduction is adopted, but in this stud only the capsules are employed. At the Gossard Breeding Estates very little of this work is done, as there is no necessity for it, and, too, at the Ritchie Stock Farm, very few mares, from three to five, have been artificially bred by means of the capsule so far. At the Hawthorn Farm once this method of breeding was undertaken for the sake of experiment, using the Kansas City apparatus. Cooley states that at Purdue University artificial insemination is employed, but not to any extent, and Holbert states that while it is practiced at the Holbert Farms, yet it is not often necessary. Four stud farms seem to practice artificial insemination as a regular procedure, as follows: The Lefebure Sons' Co., in which, it is claimed, from one to eight mares are served at each operation. The capsule method is considered better than the impregnator. In the Oakdale Farm, where the Kansas City impregnator is employed, as high as ten mares are subjected to insemination each time. At the Michigan Agricultural College, in which the Carbon semen extractor and capsules find us, no more than two mares are treated at each service. And at the J. H. Serven and Son the impregnator is employed, treating from two to six mares at a time.

5. BREEDING AGE

Evidently there are those which believe in starting the fillies for breeding purposes at the age of two years, those that would not breed them until they are three years of age, and the third class of breeders that takes option of breeding them either at the age of two or three years. Only one farm, the Oaklawn Farm, reports breeding their mares for the first time at fourteen months of age, the lowest figure shown among those reporting. Followers of breeding the two-year-olds may be mentioned the following: the Raboin Pioneer Homestead Farm, Iowa State College, Chestnut Farms (if mare is large enough), Lakewood Farm, G. Andrews and Son, Hayfield Farm, White Oak Stock Farm, Irvinedale Farm, and Cornell Uni-

versity—altogether, nine breeding establishments. Among those that reported, the majority of breeding establishments, numbering to a total of fifteen stud farms, state that the breeding of their mares begins at three years. These include Lefebure Sons' Co., Woodside Farm, Rockwood Farm, Holbert Farms, Wisconsin University, Santa Anita Rancho, Selma Farm, Longview Stock Farm, Arngibbon Farm, Hawthorn Farm, Waddington Farm, Thompsondale Farm, Michigan Agricultural College, Minnesota University, and Truman's Pioneer Stud Farm. In the Central Kentucky Farms the fillies are started to breed also as three-year-olds. Six farms—the Pentolla Stock Farm, University of Illinois, Maple Lawn Farm, J. H. Serven and Son, University of Missouri, and Ritchie Stock Farm—indicate that in their breeding practices the mares may be bred for the first time at either two or three years of age. At Purdue University the mares are seldom started to breeding service at two years of age, but, rather, at three, and the same holds true at the Gossard Breeding Estates. Stericker places the first breeding age at three years, but he says that some may be bred as two-year-olds.

Varying statements are evinced by different breeders regarding the "prime breeding age" of mares. To illustrate these the following men are cited: McMillan believes that the mare is in her best procreative power at the age of three years; Haines says at from five to eight years of age; G. Andrews and Son, at from five to fourteen years; Raboin at from three to fifteen years; Butler at eight years; Haxton, at six years; Fuller, at sixteen years; Hooper, at from five to ten years; Moon, at eight years; White, at from five to six years; Truman, at seven or eight years; Peterson and Kiddoo, at five years; Shaw and Hudson, at from five to nine years; Hanmer, at three to twelve years; Dix, at from eight to fourteen years; Holbert, at ten years; Serven, at six, seven or eight years; Stericker, at from five to ten or twelve years; and Cooley, at from five to fifteen years. At the University of Minnesota it is held that a mare is in her ideal state of breeding ability at from five to twelve years of age; at the Santa Anita Rancho, at from four to twelve years; at the Irvinedale Farm, at from three to twelve years; and at the Waddington Farm, at from four to twelve years, or even beyond the twelfth year if the mare is a good breeder. At the Lefebure Sons Co., the mares are considered in their best breeding condition up to the age of twenty years, or even up till death, but aged mares are generally condemned. Good believes that the mare is always in her prime for breeding purposes as long as she is properly cared for, and, similarly, Pallister makes the statement that her prime breeding period comes when she reaches "over three (years of age) and as old as (her) condition permits."

In fourteen breeding establishments—the Lefebure Sons' Co., Raboin Pioneer Homestead Farm, Woodside Farm, Irvinedale Farm, Pentolla Stock Farm, Gossard Breeding Estates, Ritchie Stock Farm, Hayfield Farm, Longview Stock Farm, Selma Farm, White Oak Stock Farm, Thompsondale Farm, Cornell University, and Purdue University—it is held that mares are never too old to breed so long as they will breed, settle, or produce a colt. Hooper gives the same view and Truman remarks that she is seldom too old to be used for this purpose. At the Michigan Agricultural College, however, the mare is considered too old for breeding work when she ceases to produce good, strong offspring. Stericker, Peterson, Hanmer and McMillan are of the opinion that the mare reaches her normal breeding term at twenty years. Trowbridge states that the mare gets too old to breed when from twelve to twenty-five years of age, and Fuller places the age at from fifteen to twenty years. At Santa Anita Rancho cases are cited in which prize winners are produced from twenty-year-old mares; Kiddoo mentions mares twenty-two years old that are producing regularly; at the G. Andrews and Son, one foal was born from

a twenty-four-year-old mare; at the Oaklawn Farm, instances of mares twenty-eight years old are known to have raised foals, and at the Oakdale Farm a mare at the age of twenty-five years is also indicated as having delivered a colt.

6. WORK

Excepting only in two farms, the Waddington Farm and Oaklawn Farm, where mares are not worked, in others, including thirty-three establishments altogether, such as the Truman's Pioneer Stud Farm, Thompsondale Farm, Rookwood Farm, Chestnut Farms, Hayfield Farm, Cornell University, Selma Farm, Santa Anita Rancho, Wisconsin University, Woodside Farm, Thos. Kiddoo Farm, University of Illinois, Raboin Pioneer Homestead Farm, Iowa State College, Holbert Farms, J. H. Serven and Son, Pentola Stock Farm, Maple Lawn Farm, Gossard Breeding Estates, Irvinedale Farm, White Oak Stock Farm, G. Andrews and Son, Longview Stock Farm, Ritchie Stock Farm, Arngibbon Farm, Hawthorn Farm, Purdue University, Michigan Agricultural College, University of Minnesota, Lefebure Sons' Co., Oakdale Farm, Lakewood Farm, and University of Missouri, mares are worked, generally farm work. At Central Kentucky Farms, says Hooper, mares are likewise worked. According to Stericker, also, mares should be worked, but not too heavily, nor should they be backed.

With regard to suckling mares, these are not worked at the Maple Lawn Farm, and Santa Anita Rancho. At the Selma Farm, Chestnut Farms, J. H. Serven and Son, Holbert Farms, and Hayfield Farm, the mares are, as a general rule, not worked. Several farms report the working of suckling mares, namely: the Truman's Pioneer Stud Farm, Thos. Kiddoo Farm, Woodside Farm, Rookwood Farm, Longview Stock Farm, Lakewood Farm, Pentola Stock Farm, Ritchie Stock Farm, University of Missouri, University of Minnesota, White Oak Stock Farm, G. Andrews and Son, and Gossard Breeding Estates. At other farms, while suckling mares are also worked, it is brought out that they should not be strained hard at all, but rather a light work should be given. These farms include the University of Illinois, Raboin Pioneer Homestead Farm, Purdue University, Michigan Agricultural College, Cornell University, Thompsondale Farm, and Wisconsin University.

7. PASTURAGE

Thirty-three farms reporting all unanimously indicate that mares are turned out in the pasture during the "grass season," provided that they are not worked as some breeders point out. But during "fly time," which, according to White occurs from July 15 to September 15, several breeders believe that mares should be sheltered during the day time, to be turned out only at night. As Peterson remarks, the mares may have access to a shed where they may shelter readily when flies are bothersome. Presumably, a shelter is located on the pasture and mares turned loose when they are idle may come to the shed any time they please. At the Holbert Farms working mares are also pastured, but only at night.

In response to the question asking the approximate area of paddock or pasture necessary for the mare throughout the year, three farms—the Santa Anita Rancho, Oaklawn Farm, and the Gossard Breeding Estates—place it as of one acre; three others—the Maple Lawn Farm, Truman's Pioneer Stud Farm, Lakewood Farm, and Michigan Agricultural College concur on allotting two acres; and two farms—the Raboin Pioneer Homestead Farm and Selma Farm—advocate the apportionment of three acres. The Chestnut Farms use the three-quarter-acre lots, and according to Peters it should be one and a half to two acres of pasture for each mare throughout the year, while Trowbridge favors the employment of two and

a half acres. At the Woodside Farm and at Iowa State College a four-acre ground is favored, and at the Longview Stock Farm a still larger pasture of five acres is allotted to each mare.

8. FEEDING

Ritchie and Kiddoo describe the condition of their brood mares as "ordinary," while at the Hawthorn Farm, Arngibbon Farm, Purdue University, Lefebure Sons' Co., Cornell University, Rookwood Farm, Santa Anita Rancho, and Irvinedale Farm the mares are maintained in "premium" condition or "medium flesh." Edmonds, Augustin, and Pallister mention that brood mares should be kept in "moderate" condition. At the Waddington Farm, Raboin Pioneer Homestead Farm, and Woodside Farm "fair" condition or "fair flesh" of brood mares is favored. Fuller desires that they should be kept from "fair to good" condition, while a number of studs—the Gossard Breeding Estates, University of Minnesota, Holbert Farms, Maple Lawn Farm, Hayfield Farm, Truman's Pioneer Homestead Farm, Pentoila Stock Farm, Selma Farm, and Lakewood Farm—keep their brood mares in "good" condition or "good flesh." At Central Kentucky Farms mares are also maintained in "good" condition. The Andrews, Good, and Stericker put the breeding condition of mares as "healthy" or "thrifty," but Good and Stericker point out the inadvisability of letting them go to excessive fatness. Serven and Holbert also disfavor the overly fat brood mares. At the Michigan Agricultural College the brood mare's condition is a little better than "good working flesh," and according to Henderson, their mares are "kept in a healthy condition, with lots of range." In this connection it may be said that Oaklawn Farm mares are not worked. At the Longview Stock Farm, Iowa State College, Thompsondale Farm, and the University of Missouri mares are so handled that they maintain "working" condition. At the latter stud the condition of their mares is thinner in winter time to be fattened some in summer.

At Cornell University working mares are given eight to nine pounds of timothy hay in the morning and a like amount of the roughage in the afternoon per head daily. The grain mixture consists of oats and hominy in half-and-half combination. Of this five to six pounds are given each feeding, morning, noon, and afternoon, and on Saturdays four pounds of bran mash is substituted for the afternoon feeding. No grains are fed idle mares on pasture. For feeding mares that are suckling foals a grain mixture composed of 30 per cent bran, 30 per cent oats, 30 per cent hominy and 10 per cent oil meal is used. Three to six pounds of this are fed each time in the morning, noon, and afternoon. For roughage timothy hay is employed.

At the Chestnut Farms, working mares are fed hree times a day. Thus, in the morning four quarts of oats and one quart of corn, four quarts of oats at noon, and at night mixed bran, rolled oats and "chop" are supplied to each mare during the day. No mention is made as to the kind and amount of roughage given. Suckling mares are given alfalfa and clover hay at the rate of fifteen pounds each feeding, one in the morning and another in the afternoon. For grain feeds each mare gets a mixture of five quarts of oats and four quarts of bran (dry) in the morning, and at night bran, rolled oats, and "chop" are supplied in a damp form. Idle mares are not grained at all, but when the weather is too "rough" and the grass is short during the winter, eight ears of corn are given per head daily. Corn and any oil containing feeds are discriminated against in feeding pregnant mares.

At the Gregory Farm brood mares get no corn, but are fed from one to one and a half gallons of rolled oats each, two times a day. No hay is provided for, but, instead, their roughage allowance is made up of the grass they get from the pasture, because those mares are turned out to grass

night and day, even in the winter season whenever it is possible to do so. In winter grain feeds consist of one gallon of rolled oats and three or four ears of corn per head for each feeding. They are fed twice daily. During this season fodder for roughage is supplied at will.

At the Gossard Breeding Estates the system of feeding of brood mares follows: Working mares are fed fourteen pounds of rolled oats or barley, twelve pounds of bran and one pound of oil meal per head daily, divided into three feedings, morning, noon and evening. As much hay as the mares will clean up is supplied. Mares that are idle on the pasture get cracked corn, rolled oats, and barley, in equal parts, four pounds in the morning and the same amount in the afternoon. They get hay at will from a rack. Mares suckling foals have available for them timothy and clover hay placed in racks also. The grain feeds consist of one part of corn, three parts of oats, two parts of barley, three parts of bran, and one part of oil meal, all mixed together. Of this mixture, sixteen pounds is allotted per head per day and given in two feedings, morning and afternoon. Mares that are idle in winter get hay at will and for their concentrate a mixture of corn, oats and barley, in equal parts, is given, and twelve pounds of the grain mixture is fed per head daily, morning and evening. Such feeds as cottonseed meal and bad and moldy hay, and also too much corn are disliked for feeding pregnant mares.

At the J. H. Serven and Son working mares are given hay of any kind, but for grains corn and oats are used. These are fed three times a day. Mares on pasture get other feeds than what they graze. Mares that are nursing their foals and those being wintered through are given also oats and corn, the same as are fed to working individuals, while for their roughage they get hay of any kind, too, and besides, some corn fodder and ensilage.

According to McMillan, working mares at the Lakewood Farm get three feedings a day, corn being given twice daily and some oats, too, are fed. The roughage feed consists of hay which is made accessible at all times. Idle mares on pasture are grained in the morning and night, while mares that are being wintered through and not working get all the roughage they want and two grain feedings.

Feeding the brood mares at the Maplegrove Farm follows a simple procedure: Pregnant mares are turned out to grass in summer and given grain allowance of two feedings a day, morning and evening, at the rate of one pail of a mixture of half oats and half bran per head each feeding. When winter comes the same method of grain feeding is followed, but for roughage hay is given at will. Non-pregnant mares subsist only on grass and are not grained in summer, while in winter, although they get all the hay they want, the amount of grain fed is reduced to one-half.

The systems of feeding brood mares at the Maple Lawn Farm are as follows: The working mares are fed one gallon of oats and one-half gallon of corn morning, noon and afternoon, and hay of any kind is supplied in the same hours and all that would be cleaned up. Idle mares on pasture each get a gallon of oats in the morning and in the afternoon, and all the hay they will clean up once a day, besides the grass on the pasture. Mares suckling foals get all the hay they will clean up once a day, and a gallon and a half of grain each feeding, one in the morning and another in the afternoon. Once a day hay is fed to idle mares in winter, and for grain one gallon of oats is fed in the morning, and the same amount in the afternoon. Dusty and moldy hay, and too much corn, are chiefly disfavored in feeding in-foal mares.

At the Oaklawn Farm mares that are not nursing foals get hay once daily. As soon as cold weather comes about five ears of corn are supplemented to the ordinary ration. It is to be understood, as has been pre-

viously referred to, that mares in this stud are not worked. Suckling mothers get four quarts of oats and two of bran per head each feeding, together with hay supplied at will, or pasture.

Dix says that mares at the Pentoila Stock Farm are fed three times a day, morning, noon and night, when they are being worked, while idle mares on pasture get but one morning feeding of grain per day. Mares that are idling through the winter get but one grain feeding when on pasture and two when in the barn.

At the Rookwood Farm working mares get three feedings of corn at the rate of ten ears per head each time, morning, noon and night, and for roughage mixed clover and timothy hay are supplied at will. To idle mares on pasture two grain feedings—in the morning and at night—are provided for, at the rate of seven and a half ears of corn per head each feeding. Grass forms the sole source of bulk. Mares that are nursing their foals get a grain mixture of four quarts of oats and two of bran, of which six quarts is fed per head at each feeding, three times a day. Mixed hay is likewise supplied at will as in the case of working mares. During the winter idle mares are fed on corn fodder, as much as three bundles per head daily, in which an average of fifteen ears of corn are present. This fodder is given once a day in the morning. In this farm no horses are ever allowed to have access to silage.

At the Raboin Pioneer Homestead Farm working mares are fed timothy or clover hay for roughage and half and half of corn and oats, mixed, for grain. Idle mares on pasture are grained morning and evening, and idle mares in the winter season get their feeds the same hours. Moldy feeds are looked upon with suspicion in feeding pregnant mares.

At the Santa Anita Rancho, working mares are usually fed three times a day, idle mares on pasture once, usually in the morning, while idle mares being wintered get very small grain allowance in the morning and night feedings.

The feeding practices at the University of Wisconsin follow: Working mares are grained with oats three times a day, five to seven pounds in the morning, six to seven pounds at noon, and five to seven pounds in the night time. For roughage legume hay is supplied twice, eight pounds in the morning and the same quantity at night. Idle mares on pasture get no other feed, except, perhaps, straw, than the grass available, but during hot spells they are stabled in the daytime and given grain morning and afternoon. During the winter season idle mares subsist on eight pounds of mixed hay in the morning and the same amount of this hay is fed at night. Four pounds of straw or second-quality hay is given for the noon feeding. Oats alone supplied at the rate of five to seven pounds in the morning and the same quantity in the night make up the grain allowance. Suckling mares get a grain mixture of 80 per cent of oats and 20 per cent of bran, fed eight pounds in the morning, six pounds at noon, and eight pounds at night. Legume or mixed hay is given as roughage. Eight pounds of this are fed in the morning, four pounds at noon and from eight to ten pounds at night. In feeding pregnant mares care must be taken that the feeds are not very low in protein content, moldy or spoiled.

Trowbridge states that the general method of feeding brood mares at the University of Missouri is to feed working mares three times a day, and those that are idled through the winter two times a day, in the morning and evening only. Idle mares on pasture get grain once a day in the morning only. According to Butler, the mares at the Woodside Farm are fed but hay and oats, whether they are working, suckling, or idle on pastures. Nothing is mentioned regarding the kinds of feeds supplied in winter. The working mares are fed three times a day and idle mares on pasture receive two grain feedings a day. Idle mares in winter get only two feedings also. No feeds at all are objected to in feeding pregnant mares.

It is the practice at the University of Illinois to give working mares three feedings. For roughage alfalfa makes one-half of the bulk and the remainder may be oat straw, corn stover or timothy. Oats and bran are fed in sufficient amounts as would keep the mares in moderate condition. Suckling mares are given alfalfa hay, morning and night, and for grain they receive oats, ear corn, and bran. Idle mares on pasture, if fed at all, get two grain feedings a day, in the morning and at night, while mares being idled in the winter get hay twice per day. Moldy feeds are rejected for feeding in-foal mares.

During the summer time the mares at the Irvinedale Farm are fed whole oats twice a day, as much as two and a half gallons each time. For roughage, of course, they get grass on the pasture. When winter comes twenty ears of corn are provided for daily, these being furnished twice a day. Timothy and clover hay as roughage are supplied at will.

In a general way, in the feeding practice at the Lefebure Sons' Co., more corn is given during the winter to brood mares and more oats in summer. The standard feed consists of rolled oats mixed with chopped mixed hay.

According to Moon, working brood mares at the Longview Stock Farm are fed three times a day with four quarts of oats and two quarts of corn each time, in the morning, noon and night feedings, and for roughage hay and straw are supplied in the morning, afternoon and night time. Idle mares on pasture are given four quarts of corn and the same quantity of oats in the morning only, with roughage being supplied at will. Mares that are nursing their foals get clover and timothy at will, and alfalfa, the latter forming only half of the feed. The concentrate feeds consist of six quarts of oats and two quarts of corn for each feeding, given in the morning, noon, and at night. Hay and straw for coarse feeds are supplied at will in the winter season to mares that are idle, and for their grain feeds six quarts of oats and two quarts of corn are given at each feeding, in the morning and at night time. Too much corn is considered undesirable for pregnant mares.

The feeds given to brood mares at the Oakdale Farm are the same as the stallions get, and during the winter recess they are run on pasture and given a grain allowance of two gallons of oats each feeding per head three times a day.

For working mares Ritchie uses oats, some corn and bran as grain feeds, and straw, a little hay and corn fodder for roughage. These mares are fed in the morning, noon and at night. Straw and corn fodder are also employed in the feeding of idle mares on pasture, and for their concentrates they get oats and corn, but not much of these. The allowance for the suckling mare consists of oats, bran, oil meal and a little corn, and timothy, straw, alfalfa and sweet clover for bulk, the latter being supplied at will. Idle mares in the winter season are given straw, hay and fodder, together with corn and oats for concentrates. The feeding of too much corn or oil meal to pregnant mares is not favored.

The general feeding method followed at the Top Notch Stock Farm is as follows: The brood mares are fed in the same way as the stallions, excepting only that the amount is less. In winter they are kept in the barn and are given practically the same feeds, although more bran. In winter the mares also work less. During "fly time" the mares are turned out in the pasture only at night.

At the Arngibbon Farm the mares being wintered get four quarts of oats and a few ears of corn daily, and hay in the night feeding and sorghum in the morning for roughage. During the summer time the mares are housed in the day time and turned in the pasture at night. They get grain and sorghum in the morning and grain and hay at night. Suckling mares get more oats and are fed three times a day.

The feed allowance for brood mares at the Hawthorn Farm includes a grain mixture of three parts of oats, three parts of barley and one part of corn, all of which being crushed; and for roughage timothy, alfalfa or clover hay is used. Suckling mares get the grain mixture, while mares that are not nursing any foal and not worked subsist only on grass. Rye is discriminated against in feeding in-foal mares.

At the Waddington Farm the following system of feeding is in vogue: For grain feeds the working mares are fed four quarts of crushed oats each time, in the morning, noon and evening, and besides three to four ears of corn are provided for daily. Mixed hay and alfalfa are used for roughage. Idle mares that are wintered through get all the hay they will clean up and three or four ears of corn at night. Neither grains nor roughage are given idle mares on pasture or to mares suckling foals.

Holbert reports in the practices at the Holbert Farms of feeding the brood mares, as follows: Idle mares are fed during winter on hay and sorghum for roughage and corn and bran for concentrates. Carrots are also provided for. Hay is supplied in the morning and at night, while sorghum is given at will, at noon, afternoon and on the pasture at night. Four ears of corn and three or four quarts of bran are fed in the morning per head, and if the animals are thin the same amount is again furnished at night. For summer feeding grass is all that idle mares get, but the pasturage must be good, while mares with colts are fed once or twice daily, depending on the kind of pasture growth, with corn and bran in amounts as are indicated for idle mares in winter. Working mares get hay in the morning and at night and sorghum at noon. These mares are generally given four to five ears of corn, two to three quarts of oats, and four to five quarts of bran each feeding per head three times a day, morning, noon and night. Just a little less than the allowance for work mares is fed to mares with foals during winter, but in addition the latter get carrots. Mares that are fat and idle in winter subsist mostly on hay and sorghum, which are supplied at will unless the animals are getting too fat, and also a minimum of corn or oats and bran are fed to give variety in the ration. Holbert considers all laxatives and feeds especially rich in protein, such as linseed oil meal, etc., as undesirable for feeding pregnant mares.

Working mares at the Iowa State College are fed three times a day, morning, noon, and night, during which five quarts of whole oats and two quarts of shelled corn are given per head at each feeding. Mixed hay is fed only in the morning and at night, at the rate of six pounds and fifteen pounds, respectively. Suckling mares are turned out in the pasture at night, but in the daytime they are kept indoors and the same allowance of mixed hay which working mares get is provided for, fed also in the morning and at night. For grains these mares get six quarts of oats and two quarts of bran each feeding, morning, noon and night. Mares that are idle through the winter are supplied with corn fodder twice a day, in amounts as they will eat up clean, and for concentrate they get twelve ears of corn per head at each feeding, also twice daily, the feeding periods being in the morning and at night.

At the Michigan Agricultural College working mares are given crushed oats in allowances of five quarts in the morning, the same at noon, and one quart additional, or six quarts, at night. For roughage ten pounds of clover hay is supplied in the morning, five pounds at noon and again ten pounds at night. The last feeding of clover hay is given in the grass paddock. Idle mares on pasture are given but one morning feeding, five pounds of clover hay and five quarts of crushed oats per head daily. Nursing dams are fed six pounds of crushed oats and bran each feeding, morning and night, per head daily, and for roughage each gets ten pounds of clover hay in the morning, and at night fifteen pounds. During

the winter season idle mares are fed three quarts of crushed oats in the morning and six pounds of ear corn at night per head daily. Sorghum is supplied at will and at night ten pounds of clover hay are provided for each head. Neither silage nor too much corn is fed to pregnant mares.

At the Truman's Pioneer Stud Farm the feeds of the working mares consist of crushed oats and corn, fed at the rate of fourteen pounds per head each day, and for roughage cut alfalfa hay, sorghum, cane fodder and timothy hay. These mares are fed three times a day. Mares that are idle on the pasture each gets crushed oats and corn, about eight pounds a day, divided into the morning and evening feedings. Alfalfa hay and sorghum fodder are made available in racks. Mares that are suckling foals are also fed twice a day. Each head gets fourteen pounds of crushed oats mixed with cut alfalfa hay daily. When being wintered idle mares subsist on crushed oats and a little corn fed twice daily, and on alfalfa hay and sorghum fodder. Corn is not liked for feeding pregnant mares.

The grain mixture for working mares at the University of Minnesota consists of thirty parts of corn, forty parts of oats, twenty parts of bran and ten parts of linseed oil meal. For roughage timothy and clover hay are fed. The feeding is made three times a day. Mares that are idle on the pasture get only oats for grain once daily as a morning feed. A mixture of eighty parts of oats and twenty parts of bran forms the grain feed of mares idling through the winter. This mixture is fed in the morning and afternoon at the rate of five pounds per head each feeding. Roughage consisting of timothy, clover or sometimes prairie hay is furnished, six pounds in the morning and from twelve to fifteen pounds in the afternoon per head. Such roughages as are of poor quality and corn are not looked with favor as feeds for pregnant mares.

The general practice of feeding brood mares at the Central Kentucky Stud Farms, according to Hooper, consists of feeding the working mares three times a day, while idle mares on pasture are grained but once, at midday, provided that the pasture is good. Idle mares being wintered receive corn stover, some clover hay and grass pasture, and besides, in some cases, they are also fed grain. No other feeds than too much corn are discriminated against in feeding pregnant mares.

Going into the practices described by a few of the leading Percheron breeders in Sander and Dinsmore's "A History of the Percheron Horse," on the feeding and management of brood mares, we find the following quotations:

In Fletcher's words, the "brood mares not in the harness should be kept in pasture as much as possible at all seasons of the year. The expectant mother should be given a well-ventilated, roomy boxstall and permitted to run out as much as possible. Feed clean, fresh hay, ground oats and bran, and such green feed as the season affords. Mares should be kept in healthy condition, neither too fat nor too thin. As foaling time approaches a night watch should be kept. During the period of suckling the mare must be fed well on milk-producing feeds, such as dampened ground oats or bran. Keep in the pasture as much as possible."

Prichard's views follow: "We prefer to keep our mares in harness almost up to foaling time, working them carefully, slowly, and in moderation. The feed before foaling is on the laxative order—oats and bran, not too much hay. We have fed our mares some silage for some time before foaling and like it very much; about 12 pounds twice a day make a reasonable feed. The silage must be absolutely free from mold."

The Robisons dwell comprehensively on the feeding and management of brood mares as follows: "Producing matrons must not be allowed to take on a load of fat. Thrifty, vigorous, muscular, big-boned mares are easy feeders, and a kind-hearted attendant may get them so fat that they will not breed regularly. It is best to have them come through the win-

ter in moderate flesh. Then during the spring on bluegrass pasture they are fed corn generously, perhaps ten ears a day, so as to be gaining in flesh at the time of breeding. By this plan they get in foal much more promptly and surely. We never pasture timothy and clover in the spring, for the mares do not breed so well on anything but bluegrass. Those that have foals are left on the pasture all summer, and fed sufficient corn to keep them in strong flesh, but not fat. Oats are not so good for this purpose, as they are apt to cause colic in horses getting early summer grass. After August 1 we feed some oats. Mares that are not suckling foals are given no grain when on pasture. They are, however, usually put in the harness and worked through the season.

"After the foals are weaned in October, and the milk-flow is dried up, the mares are turned on good pasture and fed five or six ears of corn and three quarts of oats apiece twice a day for sixty days, to build up their flesh in good shape for the winter. After that they get no grain until spring. During the winter they run on bluegrass pasture and second-crop timothy in the meadows, but are not allowed in stalk field. We are also careful to keep them out of oats stubble fields late in the fall, for frosted green oats cause abortion. Besides the grass from which they often paw the snow, the mares have free access to stacks of timothy hay, with just a sprinkling of clover in it. Sometimes they are fed a little cane, but never any corn fodder. Fodder with the ears on is a dangerous feed for a band of mares, because at some time one of the mares is almost sure to get too much corn and lose her foal as a result.

"The brood mares have no shelter in winter, other than the haystacks for a windbreak. They will crowd in quite closely and quietly around the stacks during a storm. When we have tried turning them to the sheds they at once begin to fight for a monopoly of the shelter. In that case, a big shed only protects the 'boss' mare anyway, and there is the danger besides of injury from kicking. The mares that run out all the time do not mind the cold. On some of the coldest nights they will be found far out in the field, and when the snow is deep they are out early, pawing away the snow to get at the grass beneath. The water tank for the mares has a heater which is kept burning all winter, so that they cannot become suddenly chilled by taking a big drink of icewater. We see to it that they come up to drink twice a day. Drinking cold water is more likely to cause a mare to lose her foal than exposure to a rain or snow storm, even with extreme cold weather immediately afterward."

9. THE FOALING MARE AND THE NEW-BORN

Abortion

The different systems of feeding in-foal mares a few days before and after parturition, while tending to purport the same end, yet the details hardly concur. Briefly stated, these may be given below:

NAME OF FARMS	FEEDING SYSTEM BEFORE AND AFTER FOALING
Cornell University	The grain feed is cut off just before foaling and a hot bran mash is given instead. After foaling she is gradually put on ground feed.
Chestnut Farms	If the mare has not been pastured she is given very little hay and light feeding of a grain mixture of 1 part of oats and 3 parts of bran.
Gossard Breeding Estates	"Feed a few good bran mashes and let mare have plenty of exercise."

- J. H. Serven and Son
 "Feed the same kind of feed before foaling as you are going to feed after, but feed light after for a few days."
- Leslie Farms
 When about to foal, that is, 3 to 7 days before parturition, feed hay only. Afterwards feed lightly on oats and bran for 10 days. Subsequently heavy feeding should be instituted.
- Maplegrove Farm
 Before foaling the feeds consist of bran and grass, a pail of bran mash each feeding twice a day. Shortly after delivery the mare gets two bran mash feedings a day, and afterwards she is fed oats and bran, one-half pail of the mixture being given the first time and the amount is then increased gradually on. The mare is kept indoors until the third day.
- Maple Lawn Farm
 "The mares are fed very sparingly before and after foaling of steamed oats and bran."
- Rookwood Farm
 Ten days before foaling 6 quarts of a mixture of 2 parts of bran and 4 parts of oats are given, together with one-third pound of oilmeal per head at each feeding. After foaling the mare is not fed the first day; afterwards she is given full feed of oats and bran without oilmeal.
- Raboin Pioneer Homestead Farm
 "Bran is fed with oats if not on pasture."
- Santa Anita Rancho
 University of Wisconsin
 "Very light-laxative ration."
 The ration is not changed, but if the mare is a heavy milker the feed is reduced in quantity.
- University of Missouri
 Light rations of bran and crushed oats.
- Woodside Farm
 "Cut feed one-half three days before and after foaling."
- White Oak Stock Farm
 University of Illinois
 "Cut feed about half."
 "We prefer to feed lightly on grains a few days before and after foaling. Bowels should not be constipate in the least."
- Irvinedale Farm
 In this stud the pregnant mare is brought to the foaling boxstall 15 to 20 days before parturition. During this period she is fed rolled oats and clover hay, three times daily. The ration amounts to 3 gallons of oats and 30 pounds of clover hay. After foaling she is given a like

	amount of the same kinds of feeds for ten days, after which the feed is raised to 5 gallons a day per head, feeding twice a day. Also, just after foaling she gets lukewarm water and this is continued for 3 or 4 days. Cold water should never be given to mares just after foaling. The mare is taken away from the foaling boxstall to another barn 3 to 9 days after foaling.
Longview Stock Farm	"Less grain and mostly bran."
Ritchie Stock Farm	"Oats and bran, 50-50, and a little oil-meal."
Waddington Farm	"No change at all unless the mare shows a tendency to constipate; then a bran mash is given."
Iowa State College	Three or four days before and a week or so after feed light on sloppy feed—little more bran than before.
Michigan Agricultural College	"No corn within 2 months of foaling. No grain but bran and carrots for 1 week before foaling. No grain for a day after."
Purdue University	The feeds are frequently reduced to at least one-half the amount, and only light feeds are given. Bran, oats and mixed hay compose the ration.
Truman's Pioneer Stud Farm	"Bran more or less for a few days before due to foal."
University of Minnesota	All feeds are slightly reduced and after foaling bran mash is given as the first feed.
Central Kentucky Farms	The mares are kept on pasture, and if the grass is short some oats and mixed hay are supplemented.
Holbert Farms	"Cut down the feed—no rich feed, as too much and too rich milk scours colt."

As to the care of the foaling mare, there are those which remark that a constant watch is given to the foaling mare. This is true of such farms as the Arngibbon Farm, Hawthorn Farm, Ritchie Stock Farm, Thomas Kiddoo Farm, Iowa State College, Rookwood Farm, Longview Stock Farm, Lefebure Sons' Co., White Oak Stock Farm, Oakdale Farm, Selma Farm, University of Missouri, University of Illinois, and Michigan Agricultural College. According to Truman, it is the practice at the Truman's Pioneer Stud Farm to put a man in charge in a day or two before foaling, keeping his eye on the mare at all times. At the Wisconsin University, University of Missouri, Purdue University, Waddington Farm, Central Kentucky Farms, Woodside Farm, Cornell University, and Hayfield Farm help is generally indicated in case it is imperative. From the Michigan Agricultural College comes the suggestion that mares be "watched sufficiently to see that delivery is quickly made," and at the Santa Anita Rancho it is pointed out that no help should be given unless the difficulty could be discerned by close observation. At the Gossard Breeding Estates it is

believed that the mare should rather be left alone if best results are expected, provided that other conditions are normal; otherwise the watchman may lend his aid whenever necessary. At the Minnesota University no help is instituted unless the mare is exhibiting abnormal delivery, while at the Lefebure Sons' Co. it is indicated that foaling mares should get the aid of caretakers if strained, which is, however, of seldom occurrence, and Peterson claims that help should also be extended when the mare gets cast in the stall, or if in any way she needs any. Henderson advises to keep the mare warm and quiet while foaling. According to Serven, it is the practice at the J. H. Serven and Son to help the mare deliver the foal, while Holbert says: "Be with her and help deliver colt if necessary and break sack over head, cut and disinfect navel when pulse stops."

Fifteen farms answer negatively to the question, "If any drugs are administered before foaling, give the names," and only the University of Illinois reports that sometimes Epsom or Glauber's salt is given to mares before foaling.

Nine farms—the Waddington Farm, Thos. Kiddoo Farm, Woodside Farm, Arngibbon Farm, Selma Farm, Maple Lawn Farm, Oakdale Farm, Lefebure Sons' Co., and Oaklawn Farm report that abortion does not occur in their herds. While a number of farms give varying percentages of abortion as well as various causes of the malady. These farms are indicated in the following:

FARMS	PERCENTAGE OF ABORTION AND CAUSES
Cornell University Chestnut Farms	Very few. In 1917 it is claimed that after returning from the International there were 9 cases of abortion in 6 days. The cause was pink eye, distemper or the so-called stock yards fever. Since then, however, no more were lost, inasmuch as no pregnant mares were afterwards shipped out to Chicago. Influenza vaccine is claimed to cause abortion.
Gossard Breeding Estates	2%; caused by rough usage, careless teamsters, fighting mares in the herd and feeds that are unfit for pregnant mares, as has been referred to already.
Santa Anita Rancho	Approximately 5%; caused by injury, badly cured feed or infection.
University of Wisconsin	Some; cause unknown.
University of Missouri	5%; by bad handling.
White Oak Stock Farm	Caused by accidents.
University of Illinois	2 cases in 10 years; cause unknown.
Longview Stock Farm	2%; caused by twin fecundation.
Ritchie Stock Farm	1%; unknown cause.
Hawthorn Farm	1 or 2 annually.
Holbert Farms	From 3 to 10%; caused by accidents, or of unknown cause.
Iowa State College	One time 11 cases; due probably to feeding of cane.

FARMS	PERCENTAGE OF ABORTION AND CAUSES
Michigan Agricultural College	Not over 2%; usually caused by careless driving when mare is working.
Truman's Pioneer Stud Farm	"Seldom one occurs."
University of Minnesota	About 20%; cause unknown.
Central Kentucky Farms	10%; contagious.

The care and handling of the foaling mare as set forth by some of the leading Percheron breeders are reproduced in the following paragraphs from quoted statements by Sander and Dinsmore in their "A History of the Percheron Horse."

Prichard's views on this subject follows: "We prefer to keep our mares in harness almost up to foaling time, working them carefully, slowly, and in moderation. The feed before foaling is on the laxative order—oats and bran, not too much hay. We have fed our mares some silage for some time before foaling and like it very much; about twelve pounds twice a day make a reasonable feed. The silage must be absolutely free from mold.

"When the mare foals, if we are present and the afterbirth is separated from the navel, we disinfect the navel at once with a good disinfecting powder and repeat the treatment until the cord is dried up. We give the mare tepid water to drink, a little at a time for three or four hours until her thirst is quenched. One should be sure that the foal sucks within a reasonable time. Give it a chance to nurse without assistance if possible. Do not be deceived by its nosing around the mare's udder; be sure that it is nursing. We always give a foal about an ounce of castor oil before it sucks, if we see it in time. This assists in regulating the bowels. The foal should be watched for the first three days quite closely to see that the bowels are working properly. Make sure that the mare cleans in a couple of hours after foaling. One can usually remove the after-birth by taking a round stick and wrapping the point of the afterbirth around it and winding it up and out of the mare slowly. Examine the after-birth carefully to see that it is whole and complete. If fragments are left, infection will follow and the mare may be lost. Feed her moderately for a couple of weeks, until the foal is old enough to take the milk freely."

According to White, "About one week before foaling the mare's feed should be oats and bran, largely bran, so that her bowels may be in good condition. If one is sure that the foal will receive proper attention, especially the navel, the mare may be put to work within two weeks after foaling; otherwise, I prefer to have her remain idle until the navel has healed. On my farm the mares carrying foals are not worked, but this is because of my inability to secure reliable labor. When they are suckling I feed my mares oats and bran and mixed hay, half timothy and half clover or alfalfa. When flies are bad the mare and foal have a boxstall during the day and are turned out at night."

Singmaster makes recommendations on the feeding and handling of the mare, both before and after foaling, thus: "Thirty days before the foaling date the mare should be fed on bran mash and clean, sweet hay, with a light ration of oats. Two days before foaling she should be placed in a thoroughly cleansed and disinfected boxstall, not less than 12 by 12 feet. A thick bedding of clean, bright straw is to be placed for her. If this is looked after one need use only a drying powder on the navel. It is the filthy condition that is usually responsible for the deaths that annually occur from navel diseases."

McLaughlin points out that "cleanliness and antiseptic conditions are essential at foaling time. If the mare's bowels are not sufficiently loose from the feed and grass, Epsom salts should be given to make them so. The mare should have a thoroughly clean box in which to foal. If the season and conditions are right, the pasture is just as good or better. The navel cord should be immediately treated with iodine or something

similar in order to prevent infection. Just so soon as the colt can eat it should be fed all that it can handle in addition to his mother's milk. The dam should be fed grain, in addition to the pasture, in order to increase the flow of milk."

Corsa writes extensively on the handling of the foaling mare and the new-born: "If one wants to make some preparation for the early foals, it is all very simple and inexpensive. A small building containing two boxstalls, each 18 by 20 feet, separated by a space 6 feet wide, serves every purpose. The south half end of the space may be enclosed to make a very comfortable place for a man to wait for the expected newcomer. The building should face south, and entirely across the front should run a strip of 4 or 6-pane window sash, so that every bright hour may bathe the stalls in sunshine. This simple structure should be placed a short distance from other buildings and away from other horses. Adjoining it should be provided a nice lot, where the mother and her baby may enjoy themselves free from the danger and annoyance of other horses.

"But whenever and wherever the foal comes, when the mare lies down it must be somebody's business to be on the spot ready to help the mare and take care of the foal. Inexperienced men, either through excitement or through ignorance, too often unduly hasten the coming of the foal. This is bad for the mare and often fatal for the foal. The rope is frequently called into use too soon, and more often is used too severely and without judgment. Give the mare a little time; nature will assist powerfully if left to herself.

"The navel cord of the foal should be left untied. Paint at once with iodine and completely cover with some drying powder. The powder should be applied repeatedly until the cord has entirely dried up and healed. In aggravated cases give the iodine treatment once or twice a day, spraying the interior of the cord if the trouble is extreme, and apply the powder three or four times a day. Beware of the little pus pockets. As a further precaution against navel-ill, give the first bacterin treatment in 24 hours; repeat in six days and again when the foal is about a month old. Fortunately for men remote from a veterinarian, this treatment does not require professional services. Anyone with ordinary horse experience can do the work.

"As soon as the foal is able to stand, it should be given an injection of warm castor oil or warm, soapy water, preferably castor oil. This should be repeated, if necessary, until the caretaker is satisfied that all the little hard lumps have been expelled. Many foals are lost because the caretaker is too quickly satisfied with the results of one injection."

The method of feeding and handling the foaling mare, her previous and after care, in the manner described by the Robinsons follow: "In the spring the mares that are soon to foal are kept in pastures near the barn. At night those that are soon to foal are put in a little pasture near the house, and someone goes to look at them about four times during the night, or even every hour in some cases. This attention is absolutely necessary, if one would avoid the frequent loss of foals and sometimes the loss of a valuable mare. Whenever help is needed it is needed at once. If the afterbirth does not all come away naturally within a day, the uterus is flushed full of warm, antiseptic water and the membrane removed carefully by hand. The mare is fed lightly at first after foaling. She is not given much grain for the first two weeks. If she is fed heavily there is too copious a flow of milk, and the foal is likely to develop digestive disorders, and may die. Mixed timothy and clover hay is about all that is needed at first."

The Hodgsons, in dwelling on the management of the foaling dam, write: "Under conditions prevailing in our latitude, it is possible for our mares to foal out on pasture after April 15, and they do foal on pasture in the great majority of cases. A good bluegrass pasture, well exposed to

the sun, is the safest place we have found in which to have a mare drop her offspring. We let the mare run out day and night, unless a bad storm comes up, in which case we put her in a boxstall if she is near foaling. In such case we take particular pains to see that the stall is thoroughly cleaned and disinfected with one of the coaltar dips. We then put in some clean straw and sprinkle more disinfectant over this. Our plan of having the mares foal on pasture when it is possible, and to put them in thoroughly cleaned, well-disinfected stalls in the few instances when it is necessary to have them foal inside, has enabled us to reduce the loss through navel-ill to a minimum.

“We keep careful records of the breeding date of our mares. We know when they are about to foal, and from long experience we have learned to tell quite accurately about when they are to drop foals. We make it a rule to be with the mare when she foals, whether in the pasture or in the barn, either night or day, for if a mare does not foal safely within thirty minutes from the time she starts, intelligent help must be given.”

III MANAGEMENT OF THE FOAL

1. THE SUCKLING FOAL

At the Ritchie Stock Farm, Selma Farm, Cornell University, Hayfield Farm, Holbert Farms, and White Oak Stock Farm the nursing foals get grain as soon as they nibble on it. Other farms reporting differ in each individual case as to the age when the suckling foals are fed grain. From the Gossard Breeding Estates comes the statement that nursing colts are fed on grain as early as 7 days old, while at the Waddington Farm it is claimed that the first grain feed provided for their colts is given a month before weaning time. According to Cooley the nursing foals at the Purdue University get their first grain when only 2 to 3 weeks old; at the Pentoila Stock Farm, when 4 to 6 weeks old; at the University of Missouri, as 30-day-olds; at the Michigan Agricultural College, at the age of 3 to 4 weeks; at the Minnesota University when 6 to 8 weeks old; at the Maple Lawn Farm, as 3-weeks-old; at the Central Kentucky Farms, Woodside Farm, and Lefebure Sons' Co., when a month old; at the Santa Anita Rancho, at the age of 2 to 4 months; at the Raboin Pioneer Homestead Farm, Iowa State College, Rookwood Farm, and Maplegrove Farm, when 2 months old; at the Wisconsin University and J. H. Serven & Son, when 2 to 3 months of age; at the Lakewood Farm, as 3-month-olds; at the Illinois University, when 3 to 4 months old; and at the Longview Stock Farm, at the age of 3 to 6 months.

Eighteen breeding establishments report on feeding their suckling foals all the grain they will eat. These include the Maplegrove Farm, Maple Lawn Farm, Woodside Farm, Holbert Farms, Minnesota University, Pentoila Stock Farm, University of Missouri, Michigan Agricultural College, Waddington Farm, Lakewood Farm, White Oak Stock Farm, Cornell University, Ritchie Stock Farm, Truman's Pioneer Stud Farm, Hawthorn Farm, Raboin Pioneer Homestead Farm, Illinois University, and Longview Stock Farm. In a specific way, reports from the Hayfield Farm and Iowa State College state that their nursing foals are fed all the grain they will eat up two times daily, and likewise at the Chestnut Farms they get all they will eat three times a day. At the Selma Farm nursing foals are also fed grain three times daily. At the Santa Anita Rancho the practice is to furnish grain only in the morning and at night. According to Hooper, at the Central Kentucky Farms, nursing colts receive their grain feed in creeps and sometimes on the pasture, but more frequently in the former. They get one pint of grain at first. At times they may be fed in boxes in the mother's stalls. Foals at the Thos. Kiddoo Farm also feed in creeps. At the Oakdale Farm the suckling foals get the same feed as the mare three times a day all that they will clean up in an hour. Similarly, at the Wisconsin University the suckling colts are fed the same time and as often as the mother, and so, too, at the Arngibbon Farm they eat grain with their dams. At the Gossard Breeding Estates the suckling colts are fed also at the same time as their dams in the feed manger, but they are separated by tying the mare. At Purdue University the nursing colts get from one to three grain feedings a day.

At the Gossard Breeding Estates, Longview Stock Farm, Lakewood Farm, Hawthorn Farm, Lefebure Sons' Co., Michigan Agricultural College, Truman's Pioneer Stud Farm, Illinois University, and Hayfield Farm, nine breeding establishments in all, the nursing colts are fed on oats as the sole grain feed. At the Hawthorn Farm and Lefebure Sons' Co., reports specify that the oats fed are rolled and at the Truman's Pioneer Stud Farm, Illinois University, and Hayfield Farm the oats are fed in a

crushed form. Michigan Agricultural College mentions of feeding the oats whole. In ten farms—the Raboin Pioneer Homestead Farm, Maplegrove Farm, Iowa State College, Purdue University, Pentoil Stock Farm, Waddington Farm, Oaklawn Farm, Woodside Farm, Maple Lawn Farm, and Santa Anita Rancho—oats and bran form the grain mixture given to suckling colts. Others responding give other combinations of grain feeds. Several of the farms reporting on the different proportions and nature of components used in the grain combinations employed for feeding the suckling colts are:

FARMS	GRAIN MIXTURE
Cornell University	3 parts ground oats, 3 parts hominy, 3 parts bran and 1 part oil meal. After they get started eating also whole oats.
Chestnut Farms	Oats, ground barley and oil meal.
J. H. Serven and Son	“All the oats they will eat and a little corn.”
Maplegrove Farm	Equal parts of oats and bran.
Maple Lawn Farm	Oats and bran, half and half.
Pentoil Stock Farm	Oats two-thirds, bran one-third.
Raboin Pioneer Homestead Farm	Oats and a little or $\frac{1}{3}$ of bran.
Santa Anita Rancho	Usually oats (rolled) and bran (flake).
University of Wisconsin	4 parts oats, 1 part bran, 1 part corn.
White Oak Stock Farm	Bran, oats, alfalfa meal and corn.
Ritchie Stock Farm	Oats, bran and oil meal.
Waddington Farm	Equal parts of crushed oats and bran.
Thos. Kiddoo Farm	Oats, a little corn and bran.
Holbert Farms	Bran, ground oats, oil meal.
Iowa State College	2 parts of whole oats, 1 part of bran.
Purdue University	Oats and bran, half and half.
University of Minnesota	20 parts corn, 50 parts oats, 20 parts bran, and 10 parts oil meal.

2. THE ORPHAN FOAL

Thirteen stud farms respond on the raising of orphan foals, giving a brief account of the procedure. Among these are the following:

The Chestnut Farms recommend the use of cow's milk diluted with water, the whole sweetened with a little sugar. After three weeks of age the foals may be allowed to get as much as they will consume. But it is claimed that hand-raised orphans do not attain the same development as those that get their mother's milk.

At the Gregory Farm, the orphan foal is raised on cow's milk and oatmeal at first, and later, when capable of eating grains, rolled oats are fed two times a day, all that they will clean up, together with hay or pasture for roughage.

At the Lakewood Farm, the orphan foal is fed on cow's milk with sugar, by means of the bottle. For his grain feed he gets bran, a little oil meal and oats.

From the University of Wisconsin comes the “prescription” that to raise the orphan foal the latter is placed in a foaling box stall, where he is taught to drink out of a bucket just as a calf. He is fed five or six times

in twenty-four hours, and if young, he is started on low-testing milk, lime water and sugar.

The Lefebure Sons' Co. claim that orphan foal handling does not lead to much success unless the youngster is already a month old, and thence he should be fed cow's milk and oats, together with hay pasture for roughage.

McLay of the Arngibbon Farm states that orphan foal on this farm gets cow's milk three times a day, and oats, bran and hay.

Wood of the Hawthorn Farm gives account of the system of orphan foal handling pursued in this stud: The foal is started on a teacupful of molasses every feeding, together with cow's milk; this at the rate of six quarts a day three times a day. Three quarts of oats are supplied three times a day after the milk has been fed, and mixed hay is given for bulk twice a day.

At the Thompsondale Farm orphan foal management follows: Cow's milk diluted with 50% of water is taken. To this 5% of granulated sugar is added and the solution is made blood warm. At the beginning this is given every two hours and afterwards the intervals between feedings are lengthened. As soon as the foals will "nose on" grains they are given oats and bran.

Holbert describes the practice of feeding orphan foals at the Holbert Farms, and says: Bran and oats and a little of oil meal are provided for three times a day, besides cow's milk, which is supplied twice or three times daily.

At the Iowa State College orphan foals are started on cow's milk with a little sugar or molasses, the amount to be increased as the colt grows older.

The Michigan Agricultural College directs that the orphan foal should be taught to drink from basins five times daily at first, giving him cow's milk diluted with one-half of water and sweetened.

According to Truman, to bring up an orphan foal at the Truman's Pioneer Stud Farm, he is generally nursed by another mare, but in the event that this is not possible, he is raised on bottle at first, and then, later, taught to drink from the pail, giving him milk and oatmeal, and, later on, crushed oats.

Peters sets forth the method employed in raising successfully a good, healthy orphan colt at the University of Minnesota: For the first month's allowance cow's milk with sugar and lime water was used. This was fed during the first two weeks six times a day, and for the remainder of the time the feeding was made four times a day. At the end of the month the colt began drinking from the pail and the use of sugar and lime water was discontinued then. At this time clear cow's milk, together with grain, formed the ration, and hay was afterwards furnished as soon as the colt would eat it.

In the raising of orphan foals, Stericker's recommendation is also brought here. He advocates the feeding of cow's milk, to which a little sugar and boiled oil meal have been added. The feed is given a little at a time.

From the Gossard Breeding Estates comes the word that "very seldom one is raised unless you can place them onto another dam," and Haxton of Hayfield Farm says, "Try to get them foster mothers or bring them up by hand." Hooper, in speaking for the Central Kentucky Farms, states that orphan foal management in these studs rests on the use of cow's milk. The Oaklawn Farm makes the same report. At Cornell University modified cow's milk is employed, while Kiddoo mentions cow's milk and grain as the feeds used in raising their orphan foals.

IV

MANAGEMENT OF THE WEANLINGS

1. WEANING AGE AND METHOD

Twenty-one farms in all, the majority number of those that report on the weaning of the foal, favor the practice of separating the foal from the mother as early as six months of age. Among these are the Waddington Farm, Rookwood Farm, Iowa State College, Thos. Kiddoo Farm, Raboin Pioneer Homestead Farm, Longview Stock Farm, White Oak Stock Farm, Ritchie Stock Farm, Arngibbon Farm, Woodside Farm, Pentoil Stock Farm, University of Illinois, Selma Farm, Truman's Pioneer Stud Farm, Oakdale Farm, Lakewood Farm, Missouri University, Leslie Farms, Maplegrove Farm, Gossard Breeding Estates, and Chestnut Farms. At the Irvinedale Farm and the University of Minnesota, the colt is weaned even as early as five months of age, while at Purdue University, Michigan Agricultural College, and Top Notch Farm, these three establishments are all of the opinion to take away the foals from their dams at from six to eight months old. Both the Santa Anita Rancho and Gregory Farm place the weaning age when 5 to 6 months. The earliest weaning age is shown by Hayfield Farm's report giving it as early as from 3 to 6 months. At the Lefebure Sons' Co., colts are weaned at from 4 to 5 months of age; at the Cornell University, from 4 to 6 months; at the Wisconsin University, from 4½ to 6 months; at the Holbert Farms, at about 6 months, or sometimes longer; at the J. H. Serven & Son, from 6 to 8 months; at the Maple Lawn Farm, at 7 months; while Hooper speaks of the weaning period in Central Kentucky Farms being carried on in the month of September.

While the general procedure of weaning the foal is much the same in a number of instances, the survey bears out that the details do not superpose each other in the different farms responding. The systems in vogue are exemplified in the discussion below:

Chestnut Farms. "Foal taken away and mother isolated for a short time."

J. H. Serven and Son. "Take colts away from mare one day on start, then let suck, and make it a little longer each time until the mare is dry, so not to spoil bag."

Leslie Farms. When the foal is being weaned he is tied near the mother at the boxstall and fed separately. He is not allowed to suckle and the mare is milked by hand twice daily. By the time the mare is dry the colt knows enough to stand tied, and when the mare is taken to water the colt is led also by the side. In about a week after the mare is dry the two are separated from each other.

Maple Lawn Stock Farm. "Gradually getting the foal accustomed to be away from the mare."

Pentoil Stock Farm. The mare is separated from the foal every 12 hours, continuing this for the first week, and then, afterwards, they never see each other any longer.

Rookwood Farm. The dam is removed from the foal once and for all, and twice or three times she is milked every other day.

Raboin Pioneer Homestead Farm. "We run our weanlings in a large, open shed, and keep them through the first winter this way."

Santa Anita Rancho. "After becoming accustomed to grain ration, colts are liberally fed in large paddock, quite away from hearing of mares."

University of Wisconsin. "Foal is separated from dam and kept inside in a boxstall for three or four days, then turned out in a paddock."

University of Missouri. "Take them away from mares. Keep mare's udder in good shape."

Woodside Farm. "Remove the mare and milk the mare intermittently."

University of Illinois. Foals are weaned when they are eating well. The mares are fed lightly before and after weaning. When the two are separated they are removed in such a place so as to be out of sight and hearing to each other.

Lefebure Sons' Co. The foals, a couple of them together, are taken away from their dams. The process is made gradual.

Longview Stock Farm. Foals that are being weaned are shut in paddocks, with oats, hay and water.

Ritchie Stock Farm. "I let them suck the mare once a day for a week."

Waddington Farm. Simply separate them so that they cannot see nor hear each other."

Thos. Kiddoo Farm. "If they are eating, usually mares wean them alone."

Holbert Farms. "First half day away from mare, gradually longer—feed mare no grain. Milk her as necessary until dry."

Iowa State College. The mare is taken off altogether and the foals are placed together in a roomy place. It is pointed out that to keep the mare away from the hearing of the foal is the best practice.

Michigan Agricultural College. "Mares are moved to another barn, where they do not see or hear colts, and mares always worked."

Purdue University. The colt is taught to eat before he is weaned, and then, when being separated, he is permitted to nurse the mare occasionally.

Truman's Pioneer Stud Farm. "Simply taken from the mares, foals left in pasture and mares put in stalls."

Central Kentucky Farms. Here the system is simple. The mares are separated from their foals, but before the time comes the foals should have previously been trained to eat grain. The same holds true of the systems followed at the Lakewood Farm and Hayfield Farm.

At the Arngibbon Farm, Cornell University and University of Minnesota the foals are simply taken away from the dams, and the same is true at the Irvinedale Farm and Gossard Breeding Estates, but in the latter two the dams are dried up.

2. FEEDING AND HANDLING

The systems of feeding the grains to the weanlings may be considered under two captions, one in which the feeding is made at stated periods and the other at will. The breeding establishments following the system of keeping the grains in front of the colts at all times, or at will, are the Lakewood Farm, Thos. Kiddoo Farm, Truman's Pioneer Stud Farm, Irvinedale Farm, University of Minnesota, Longview Stock Farm, and Chestnut Farms. Of those adopting the method of feeding at stated periods are the Waddington Farm, Michigan Agricultural College, Penttoila Stock Farm, Michigan Agricultural College, Penttoila Stock Farm, J. H. Serven & Son, Santa Anita Rancho, and University of Missouri, six in all, in which the grains are given twice daily; the Arngibbon Farm, Wisconsin University, University of Illinois, Selma Farm, Holbert Farms, Rookwood Farm, Iowa State College, Cornell University, and Maple Lawn Farm, or nine establishments, in which the feeding is made three times daily; and at the Hayfield Farm and Ritchie Stock Farm twice daily. At the Purdue University the weanlings get their grains also at regular periods, two or three times daily.

Five breeding establishments report on feeding the weanlings oats, two of which—the Lefebure Sons' Co., and Irvinedale Farm—use the rolled

oats, the Truman's Pioneer Stud Farm employs the crushed form, while two others—the Oakdale Farm and Longview Stock Farm—feed oats, but no mention is made of the form in which the grains are prepared. Stericker recommends crushed oats, while Hooper states that in Central Kentucky Farms the weanlings get oats also.

Nine stud farms favor the use of oats and bran grain combination for weanling feeding, but the proportions in which these components are present vary. At the Pentoila Stock Farm, the grain mixture consists of two-thirds of oats and one-third of bran, and at the Purdue University the proportions are the same, but in this case the report emphasizes that the figures are based on weight. At the Waddington Farm two quarts of crushed oats are mixed with one quart of bran; at the Maple Lawn Farm, the combination is made half of oats and half of bran; and at the University of Illinois the mixture is made up of crushed oats, together with 20% bran. The weanlings at the Selma Farm get crushed oats and bran combination, all they will clean up, three times a day; at the Arngibbon Farm, they get three quarts of the same mixture per head each feeding three times daily; and the same grain mixture is also furnished to weanlings at the Hawthorn Farm. At the Iowa State College the weanlings get all they will eat of a mixture of four parts of oats and two parts of bran.

At the Leslie Farms the weanlings, during the summer, get oats about what they will clean up two times a day, and grass. They consume at the rate of two bushels for every six yearlings a day. When pasture is dry bran is supplemented. The six yearlings then would eat as much as one and one-half bushels of oats and one and one-half bushels of bran daily.

At the Maplegrove Farm, a grain mixture of one-half of oats and one-half of bran is kept before the colts just after weaning until they are yearlings. When past a year the colts get three ears of corn in the morning and the same amount in the afternoon, per head, and besides one-half of a pail of grain mixture of oats and bran in fifty-fifty combination is fed to each head each feeding.

Several stud farms use other grain combinations for feeding the weanlings: At the J. H. Serven and Son, the weanlings are fed on oats and corn all they will clean up; at the Iowa State College, the grain mixture consists of three quarts of oats and one quart of bran, to which a handful of oilmeal is added; at the Michigan Agricultural College, the grain is composed of three pounds of crushed oats and one or two ears of corn; at the Ritchie Stock Farm, the mixture composed of two parts of oats, one part of bran and a handful of oilmeal, with some molasses poured on the mixture; the same grain feeds as when nursing is employed at the University of Minnesota, viz.: corn, 20 parts; oats, 50 parts; bran, 20 parts; oilmeal, 10 parts. Holbert Farms also uses corn, oats (ground), bran and oilmeal, one-third of each by weight, in their grain mixture, besides molasses which is added later; at the Wisconsin University, the mixture includes four parts of oats, one part of bran, and one part of cracked corn, to which cut clover or alfalfa hay is mixed; at the Gossard Breeding Estates, two parts of oats and one part of corn make up the grain mixture, to be fed all they will clean up; Oaklawn Farm uses 2 parts of rolled oats, 1 part of bran, and 1 part of cottonseed; at the Cornell University each weanling gets 2 pounds of a grain mixture composed of 3 parts ground oats, 3 parts hominy, 3 parts bran, 1 part oil meal, twice a day, besides 2 pounds of whole oats once a day; and at the University of Missouri the weanlings are fed twice a day with a grain mixture consisting of 2 parts corn, 2 parts oats, and 1 part bran, the mixture being fed all they will eat or as much as 5 to 8 pounds a day.

Reviewing replies on the age of separating colts from fillies to prevent mating, the survey shows that the range of variability in the practices pursued extends from the low figure reported by the Top Notch Farm, where separation is made at 3 or 4 months of age, to Maple Lawn Farm's

figure of 2 years or sooner. Stericker recommends that colts be taken away from the company of fillies when rising two years of age. According to Hooper, in Central Kentucky Farms the colts are separated from fillies in late summer; at the Cornell University the time is placed at 6 months of age, and at the Hayfield Farm a little later or at the end of 6 months. Four farms—the Longwood Farm, Thompsondale Farm, Selma Farm, and Chestnut Farms give the separation age just after weaning. At the Woodside Farm they are separated in January following foaling time and at the Truman's Pioneer Stud Farm in the same winter that they are foaled in spring. According to Cooley colts should be removed from the fillies when they reach the age of 8 to 10 months, while at the Michigan Agricultural College they are placed in a separate enclosure at the age of 10 months. The separation age at the Wisconsin University and Maplegrove Farm is at 10 to 12 months, and at the Irvinedale Farm in the latter part of March or fore part of April, when the weanlings are 11 months old. Before they get to be a year old colts and fillies are separated at the Oaklawn Farm and Arngibbon Farm. However, the rule is to separate the colts from the fillies when they become yearlings, as evidenced by 21 farms, viz.: the Gregory Farm, Holbert Farms, J. H. Serven and Son, Thos. Kiddoo Farm, Leslie Farms, Iowa State College, University of Missouri, Lefebure Sons' Co., Lakewood Farm, University of Minnesota, Pentoila Stock Farm, University of Illinois, Gossard Breeding Estates, White Oak Stock Farm, Oakdale Farm, Hawthorn Farm, Longview Stock Farm, G. Andrews & Son, Raboin Pioneer Homestead Farm, Ritchie Stock Farm, and Waddington Farm.

Whether the weanlings should be mixed with mature horses or given separate lots, an overwhelming number of stud farms, 26 altogether, all agree in their practice: that the mature horses should be separated from the weanlings. The same practice is followed by Central Kentucky Farms. At the Hawthorn Farm even the weanlings themselves are kept separate, according to the different ages, and at the Michigan Agricultural College the 1 and 2-year-olds are placed together. Only at the Oakdale Farm and Maple Lawn Farm are the weanlings mixed with the mature horses, but at the latter stud they are kept separate at feeding time.

That foals should be trained to lead from birth is the advice of the Lefebure Sons' Co., and, similarly, Good says this may be done when foals are only a couple of days old. Hooper reports that in Central Kentucky Farms training the foals to lead starts when they are only from 3 weeks to 3 months of age. Hanmer advocates the starting date when 4 weeks old. At the Chestnut Farms they are taught to lead at 2 months of age, at the Arngibbon Farm at 2 or 3 months, at the Top Notch Farm and Woodside Farm, at 3 or 4 months, at the Hawthorn Farm at 5 months, at the Oaklawn Farm and Holbert Farms around 6 months, and at the Irvinedale Farm at 12 to 15 months. It is during the first winter that foals are started to lead in the University of Minnesota and Maple Lawn Farm, while at the University of Missouri training is made while nursing. Just before the colts are weaned they are taught to lead at the Waddington Farm, but at the Hayfield Farm and Rookwood Farm this is done soon after weaning. The University of Illinois and Raboin Pioneer Homestead Farm follow the system of training foals to lead before weaning age, while the majority of those reporting—the Selma Farm, Longwood Farm, Wisconsin University, Michigan Agricultural College, G. Andrews & Son, and Longview Stock Farm—are inclined to institute the training at weaning time. Stericker believes in the same way. Cornell University starts their foals to lead as soon as possible before reaching a year old. The training age at the Maplegrove Farm, Lakewood Farm, and Pentoila Stock Farm comes when they are a-year-olds. At the Gossard Breeding Estates they make it a point to begin to lead their foals as soon as they are strong enough to be haltered. At the Ritchie Stock Farm, Gregory Farm, Leslie Farms, and Truman's Pioneer Stud Farm colts are

not trained unless they are to be taken to show, and at the latter stud they are also subjected to the same ordeal if to be fitted for sale.

As to other training given to foals other than to lead, the Lefebures and Thompson emphasizes the necessity of teaching them to mind the groom at all times when being handled. Stericker brings out that foals should also be taught to stand tied, and Sanborn points to the importance of handling their feet. At the Michigan Agricultural College foals are also accustomed to have their feet handled, and, besides, they are taught to come to the door of the boxstall to be bridled. Good says that colts should also be taught to lead at the walk and trot, and, furthermore, they should be trained to stand. Henderson insists on a like procedure, and adds that colts should also be taught kindness. Besides leading the foal Raboin states that the groom should also be able "to handle their feet while trimming and paring same." At the Chestnut Farms other training which foals get include the holding of the head to stand, walk, and trot, all to be executed properly. According to Kiddoo, the foal should also be accustomed to grooming. Holbert says that foals need no other training unless they are to be shown, and in this regard foals at the Rookwood Farm are taught to pose if they are to be taken to show.

Seven stud farms—the Thompsondale Farm, Hayfield Farm, Raboin Pioneer Homestead Farm, Oakdale Farm, Truman's Pioneer Homestead Farm, Pentoila Stock Farm, and Ritchie Stock Farm—start their fillies in harness as 2-year-olds and the same is true of fillies in the Central Kentucky Farms. Edmonds, Serven and Trowbridge believe that this should not be done until they are past 2 years old. White mentions that fillies at the Selma Farm are not put to harness until they are 2½ years of age and at Purdue University at the age of 2½ to 3 years. At Cornell University and Lefebure Sons' Co., fillies are harnessed for the first time at 2 to 3 years old. Stericker puts it at the same period. The greater number of breeding establishments, among those reporting, bear out that at 3 years should be the age at which to commence the fillies on the harness. This report comes from the Arngibbon Farm, Iowa State College, Thos. Kiddoo Farm, Holbert Farms, Rookwood Farm, Longview Stock Farm, G. Andrews & Son, Lakewood Farm, Santa Anita Rancho, Gossard Breeding Estates, White Oak Stock Farm, Oaklawn Farm, Maple Lawn Farm, Irvinedale Farm, Woodside Farm, University of Minnesota, University of Wisconsin, 18 stud farms in all. Pallister believes in extending the period of harnessing the filly until she is 3 to 4 years old.

The clipping of a colt's coat is nowhere practiced among the 28 stud farms answering, and Hooper states that it is also not done at the Central Kentucky Farms. But at the Maple Lawn Farm the hair of show colts is clipped once in summer.

The trimming of a colt's feet is not a regular routine, but rather an occasional job which is attended whenever the condition of the hoof demands it. This is the answer obtained from several stud farms, including the Hayfield Farm, J. H. Serven & Son, Purdue University, University of Wisconsin, White Oak Stock Farm, Thompsondale Farm, University of Missouri, Truman's Pioneer Farm, Cornell University, Ritchie Stock Farm, Waddington Farm, and Maple Lawn Farm. At the Pentoila Stock Farm and Central Kentucky Farms colt's hoofs are also trimmed. At the Holbert Farms and Rookwood Farm, however, this practice is not followed, Holbert stating that plenty of exercise wears them down. Other farms specify the intervals at which the hoofs of their colts are trimmed, and, in some cases, the time at which hoof trimming commences is also mentioned. These are indicated below:

FARMS	BEGINNING AND INTERVALS OF HOOF TRIMMING
Chestnut Farms	Every 30 days.
Gossard Breeding Estates	3 or 4 times a year.

Lakewood Farm	Twice a year.
Maplegrove Farm	Begins when a year old.
Oaklawn Farm	Begins when about 3 months old.
Raboin Pioneer Homestead Farm	Monthly.
Selma Farm	Monthly if needed.
Santa Anita Rancho	Every 4 to 6 weeks.
Woodside Farm	Monthly.
University of Illinois	Every 6 or 8 weeks.
Irvinedale Farm	Begins when 2 months old and then every 2 months.
Lefebure Sons' Co.	Begins when 6 months old and then every 2 months.
Longview Stock Farm	Every 2 to 4 months.
Oakdale Farm	Begins when 2 months of age.
Arngibbon Farm	Once in summer and once or twice in winter.
Hawthorn Farm	Every two months.
Iowa State College	Once a month.
Michigan Agricultural College	Twice a year.
University of Minnesota	Every two months.
According to Stericker	Begins at weaning time and then every 30 to 60 days thereafter.

To cite again from Sander & Dinsmore's quotations in their "A History of the Percheron Horse," the practices advocated or followed by a number of leading breeders with regard to handling the sucklings and weanlings are hereon presented in the following paragraphs:

On this subject Fletcher writes: "The stallion colts should be thoroughly halter-broken at or before weaning time. After taking the colt from its mother, he should be placed in roomy, well-ventilated pens or boxstalls that adjoin clean, well-drained yards or pastures, where he may have plenty of exercise. These yards or pastures should be fenced, either with boards or closely woven heavy wire of such weight as to discourage any disposition to get out. They should be located also on dry, well-drained ground. The stable should be kept clean. The colt must have sufficient feed to keep him in a healthy and growing condition, but not too fat. It is a mistake to permit colts to go back after weaning time through lack of feed. A colt stunted at this time will never recover his lost ground.

"I believe a ration of ground oats and bran, with plenty of sweet hay, the best for colts. After the first winter place them in a well-fenced pasture, with ample shed protection from bad weather. Do not locate this pasture adjacent to one in which mares are kept. Have plenty of fresh water always accessible and feed enough grain to keep the youngsters in a healthy, growing condition.

"I should handle my colts in this manner, with proper winter protection, until they are 2½ years old, and then place them in roomy boxstalls and feed them for market. Stallion colts kept in confinement and highly fed easily become blemished. Through lack of exercise they do not develop proper bone and muscle, and rarely reach their full size. They are also inclined to bad dispositions."

Prichard discusses this phase of horse management rather at length, and says: "It goes without saying that a stallion foal should get a good start in life while by the side of his mother. He should know how to eat grain before weaning time, so that when weaned he will hardly miss his mother's milk. After weaning he should have a grass lot with feed and water always before him and should be halter-broken and stabled at night. Have oats, corn, bran and good hay, clover or some alfalfa, always available. We aim to have grain before our weanlings so that they can get it as they want it.

"When spring comes our yearling stallions are placed in a pasture by themselves. They are fed grain three times a day and have good water always available. If the grass is not plentiful enough, we give hay or silage to supplement it. In other words, we give them plenty to eat and the freedom of the pasture for exercise. When winter comes again the yearlings are run in a 20-acre bluegrass pasture and fed sorghum, silage, hay and grain in a roomy barn where they go in and out at will. The next spring they are coming 2-year-olds. In March and April they are kept off the pasture and yarded about the barn. When grass is good in May they are turned on the pasture and grained three times daily. We had twelve 2-year-olds running together last season. They get exercise, sunshine and shade as they want it, and they grow and grow . . . Last summer was dry and hot and the late pastures were bare, but we planted some sweet corn which ripened early enough to cut. With that and our silage the colts managed to squeeze through and those who see them seem to think they look very well. At one time our 2-year-olds and yearlings were running on sweet clover up to their knees, and liked it immensely. We sowed sweet clover in oats last spring and it looks like a success.

"Our 2-year-olds have not been housed in a closed barn since the first winter, and then only at night. A variety of feeds is essential—oats, corn, bran, silage, timothy hay, sorghum, sweet clover, bluegrass, and alfalfa."

In the opinion of White, "The stallions and fillies should be separated when not more than 7 months old. This is before there is a possibility of any of the fillies coming in heat and causing the stallions to fret and worry. If a stallion is never allowed to get near enough to a mare in heat to smell her, he will run in a pasture with a number of others nearly as contented as the same number of geldings. These stallions should have abundance of range." He goes on to say, "I prefer a field about twice as large as would be necessary to furnish them sufficient pasture, and I put in the pasture a like number of cattle. When running in large pasture the colts are able to take abundant exercise and will consume large amounts of oats and bran, of which they should be given all they will clean up nicely.

"For pasture I prefer bluegrass on limestone land, with running water at hand. My colts run together in such a pasture until they are about 27 months old. The flies then compel me to stable them during the day. I find that when they are separated during the day they get more rough when turned together at night than when allowed to remain together all the time.

"When it is not practicable for small breeders to make ample arrangements for raising their colts, I would advise selling the stallion foals at weaning time. I should like to see some man in every breeding community engaged solely in the purchase and development of these youngsters."

"The feeding and care of the foals after weaning," according to DeLancey, "is almost as important as the selection of the sire and dams. The foals should be weaned at 5 months old, having had oats for four months prior to weaning time. After weaning they should have the run of a grass paddock, when flies are not bad, and be fed liberally on grain. We have never been in favor of over-feeding either stallions or colts, but there is little danger in giving too much grain the first year. After that feed them liberally, but not all that they will eat. Many good colts have been ruined by over-feeding. It is advisable to let from two to six stallions run together until 2½ years old; then separate them.

"It is next to impossible to overfeed a colt running on grass. The feed given them then will give best results, but when they are taken up greater care should be used in selection of feeds. And always give plenty of exercise. The word exercise should be strong in the mind of every breeder of Percherons. Without it one grows a small-boned, soft-musclcd, blemished colt."

In the words of Dunham, "For proper development it is necessary that the young stallions have pasture and space to run in. They should be well fed and kept in growing condition. The great fault of our American breeders is that they keep their stallion foals too much in the barn, where they cannot possibly develop the bone and substance which is necessary to make them first-class horses. Colts should run at large as much as possible; the exercise, the grass and the extra feed they get make them grow into desirable horses. The importance of exercise and grass cannot be dwelt upon too much. It is lack of these which prevents so many of our American-bred colts from developing into the kind of horse which they should be."

McLaughlin is here cited to say: "In developing the colts I would advise feed, more feed, and still more feed, with oats, if possible; oats are the great developer of hard, clean, flinty bone. If oats are not available, feed corn, and plenty of it. For the first two years of its life a colt cannot be fed too much grain, as this induces early maturity, great size and heavy bone.

"During the fall and winter after weaning the colt should be fed all the grain he will eat, with enough succulent feed, such as bran, and clover or alfalfa hay, to keep his bowels in good condition. When the colt is turned out to pasture in the spring he should still be fed grain in order to make him grow properly. I always prefer a hill pasture for yearlings, as it induces great muscular development. The winter that the colts are rising twos they should run in a paddock or field together, and should be fed all the grain they will eat. The spring and summer when they are 2-year-olds they should still run together in pasture, with plenty of grain; the exercise that they take playing with each other adds greatly to their development.

"The fall that they are 2-year-olds, when it becomes necessary to separate them, they should be placed in boxes with paddocks, if possible, and fed all they will eat. A few carrots do them a great deal of good at this time."

Corsa presents the system of colt management to be found at the Gregory Farm, thus: "Foals are inquisitive youngsters, and when only a few days old, will begin nibbling around the box. From the time they are 2 weeks old, they should have their daily chance at the 'wee bite,' and as they get older do not make the bites too 'wee.' Crushed oats and bran make excellent feed. There may be a better combination, but we need not worry about that. About this time the foal on most farms is having its troubles. Often the mare and foal have to fight it out with too many others of the same kind or with mixed lots of horses. The ideal arrangement is for the mare and her foal, with no other horses, to be placed in a grass lot that has not been pastured by horses for at least a year. The nearer this condition can be obtained the better the foal thrives and the freer it is from infection and trouble.

"The next critical period for the foal is at weaning time. Then the ravages of distemper are most threatening, and an unchecked outbreak is always frightful and frequently fatal. However, with the colt long since a good feeder and carrying considerable immunity from previous bacteria or serum treatments, it only remains to reinforce the immunity against distemper by vaccinating a week before weaning and by following with the same treatment a week after weaning. The colt, with his companions, is now headed for winter quarters. Before going, however, there is another good foot trimming and leveling, and, if it has not been done previously, he is neck-branded. The brand, usually a herd number, is made a part of the owner's records.

"Just a last word about the little fellows as they are taken from their mothers and put in their winter home. This has been freshly prepared for them, thoroughly cleaned and disinfected. Throughout the winter it

should be regularly cleaned and occasionally disinfected. Arrange the quarters, if possible, so that the colts may go in or out at will, except in stormy weather, when a gate may be used to keep them within shelter, where they will be out of drafts, but supplied with an abundance of fresh air. If the gate to the shelter opens out on several acres of grassland, where the colts may play tag and nibble a little lunch between their two regular daily feeds of grain, there will be some very happy and probably very profitable colts. And profitable colts are the controlling and compelling argument in favor of the use of draft mares on the farm."

The Robisons give a lengthy account of the feeding and management of colts in vogue at the Leslie Farms, as follows: "The earliest foals are taught to eat at 4 weeks old by putting a little bran, whole oats, shelled corn and alfalfa-molasses meal in a little feedbox just out of reach of the mares. In the pasture a feed trough is kept in a pen, with a creep provided, so that foals can go in, but the mares cannot. After the first foals learn to eat, they are fed twice a day in this trough, and the later foals learn to eat by imitation. Sometimes they begin at 2 weeks old. They are given all the grain they will eat twice a day, and, after they get well accustomed to eating, the feed is mainly oats. There is no danger of overloading them with fat or injuring the joints when they are running out day and night and get plenty of exercise.

"All the foals that are as much as 4 months old are weaned about October 1. To do this each mare is tied at the feed trough in a long shed and her foal is haltered and tied alongside with a rope it cannot break. Of course, it pulls and tugs at it for a while, but no damage is done. The mare is right there and the youngster soon settles down to good behavior. As the foals are all thoroughly accustomed to dry feed, they do not miss the milk much, but go right on eating and growing. The mares are fed timothy hay alone and milked dry twice a day for a few days. It helps if one greases the udders with warm lard. After the milk is dried up the mares are turned out on pasture and fed grain in preparation for winter. The weanlings are given the open shed for shelter and run on pasture for sixty days, with grain. They are likely to get wormy at this time and rock salt is a useful preventive.

"Beginning in December the colts are put in boxstalls, two or three together, at night, and turned out to pasture in the daytime. They are fed oats, bran, shelled corn, chopped cane, oil meal and alfalfa hay, all they will eat. The colts grow faster and develop a greater feeding capacity on alfalfa hay than they used to have when we fed mixed timothy and clover. Their grain is principally oats. The first winter is a critical time with a colt. If fed so as to grow well up to the age of 12 months, the colt may be kept going easily enough on good pasture in summer and rich hay in winter, supplemented with enough grain to maintain a good degree of flesh, so that there is no lack of nourishment at any time in the year."

"When the foal is 30 days old," says Lee, "put some oats where it can nibble at them; increase the amount as it cleans them up, until oats may be left in the box for the foal to eat any time." And further on, he writes: "As time goes on and the baby is left at the stable, try turning it out in a small pasture with a few calves or foals where it can eat grass and get plenty of exercise. When the foal is 2 months old it will not be necessary to let it nurse between regular meal times, but you will have a better colt if you do. After the foals are 6 months old and weaned, turn them on alfalfa pasture, if possible, and feed them grain twice each day. When the pasture is killed by frost or is too closely cropped, take them to their winter quarters, preferably a place where they can have plenty of exercise all day and a shed to shelter them from storms at night. Do not start to put them in the closed barn or shed; let them run in and out at any time; have plenty of clean alfalfa where they can run to it, and feed grain twice a day.

"One reason that the colts in this country do not mature so quickly as imported stock is that we are too stingy with our feed. However, most of the imported stallions have their growth at 2½ years, while our stallions will continue to grow until 5 years of age. We always feed plenty of oats and very little corn to growing colts. Oats make bone and keep them growing, while corn makes fat, and, in time, will burn out their stomachs.

"We let our colts run together until the December or January before they will be 2 years of age, and then put them in boxstalls and give plenty of clean straw, alfalfa, oats, bran and some chop feed wet, three times a day. The barn man should take them out of their stalls every morning and clean them well, even their hoofs. Arrange so that they have a paddock to run in at least every other day.

Teach the colt to stand when out of the stall, and teach him to move. Let the barn man start with him, and follow, not with a whip, but with a cornshuck to make a shuffling noise, something new to the colt. After a few times he will be moving like a coacher when he hears the shuffling of the shuck, and will never know how he learned it. Whips in the show ring have lost more blue ribbons for horses than they ever won."

From Augstin's experience the following remarks are presented: "Since we began treating our foals at birth with antitoxin streptococci and having them come when the mares can get on the grass, we have had practically no deaths. We give them an injection of this antitoxin when they are a few hours old and then again in about a week. Altogether too many breeders make the mistake of having their foals come too early in the spring. They are inclined to be constipated because their mothers have been on dry feed so long. There is also much more danger of other complications setting in when the dam and youngster must be in a stall for some time without exercise.

"I am sure, from my own experience, that a far larger percentage of the foals born during the latter part of April and May live than of those that come in February and March."

As to the management of foals Augstin goes on to discuss: "Just so soon as the foal shows sign of wanting to nibble grain I tie the mare up and give it a box to itself. It gets all the oats and bran it will eat from that time on. We sprinkle a little shelled corn on the oats and bran. Our foals seem to like a little corn particularly well. To this we add a little alfalfa meal in the winter, but not in the summer, as the molasses is likely to sour to some extent, and sweet feeds draw flies around the feed box. A foal always does better if fed in a clean box. Good alfalfa and clover hay are the best roughages. We use these feeds for all our animals, even our mature show horses. We never use black strap molasses, as it always causes more or less digestive troubles. It is not any trouble to get a horse fat if it is healthy and has plenty of clean feeds, with good water to drink.

"For best results one should keep the idle mares that are nursing foals in the barn in the daytime during the hot weather and turn them out at night on good pasture. Generally speaking, we never let our foals go hungry from the time they will eat until they are well along toward maturity. We push our stallion colts harder than we do the fillies in order to make them salable sooner. One cannot feed a colt too much of the right kind of feed, if he gives it plenty of exercise. We feed all our weanlings all they will eat, but keep them out of doors in large paddocks and pastures every day, unless it is storming badly. Open sheds or large boxstalls, with doors opening into a large lot, are most suitable for developing colts of this age. In fact, we handle all our stallion colts in this way until the winter before they are 3 years old. Of course, if we have a colt which we wish to fit for the show, we keep him by himself. In the main we run out stallion colts together, even though we intend to show them. It is useless to

expect that one can put on as much flesh that way, but he can unquestionably grow a more rugged and sturdy colt.

"Every man who raises colts in this way knows that he has more or less trouble with sore heels. The fact that such colts take an abundance of exercise, which gives them a strong appetite to consume more feed than they otherwise would, clearly overshadows such an annoyance as sore heels. We even run our 2-year-olds, weighing 1,700 to 1,800 pounds together, but they do not look their best in the showing. I know, however, that they are worth more to the man who buys them than if they were kept up in boxstalls all the time. By raising my colts in this way I have very little difficulty with filled hocks. It is more economical to develop them by such a method, because it requires less labor.

"Farmers are comparatively busy most of the year and have not the time, and in many cases lack the help to give their stallion colts the exercise they need if they are kept shut in a barn. Every farmer can provide his colts a good grass paddock, however, and let them do their own exercising while he does something else. Here is where the French breeders have the advantage of us. They have unusually fine pastures, and, furthermore, every effort is made to improve them, because the French breeders fully realize the importance of developing draft colts out of doors. My long experience has taught me the importance of liberal feeding, but there must be an abundance of outdoor exercise, preferably in good pasture."

For a detailed and comprehensive treatise on the management of foals and yearlings, the following paragraphs are given in the words of the Hodgsons: "After the foals are dropped, they run with their mothers in pasture night and day until hot weather and flies begin to cause trouble. They are started on grain feed when they are about 4 weeks of age. As soon as the mares begin to bunch up in the pasture and fight flies, we adopt the plan of housing the mares and foals in a cool, partially darkened barn, during the daytime. They are put in about 7 o'clock in the morning and left in until 4 or 5 o'clock in the evening. Each mare is tied in a roomy double stall, which has two feed boxes and a manger for hay. The mares are fed grain twice a day, and as soon as the foals have learned to eat they are given some grain in a separate feed box beside their dams. The youngsters are not tied up, but run loose in the barn, which has a wide central alleyway where they are at liberty.

"For roughage we place mixed clover and timothy hay in the mangers for the mares and foals. We also place some bright alfalfa hay in a separate place where the foals have access to it. Both mares and foals have or are allowed all the hay they will eat, but when they are on good pasture they do not utilize very large amounts. Our grain ration is the same for the mares and foals, and consists of bran and oats mixed in the proportion of two bushels of oats to one of bran. This is mixed and fed dry. The mares are allowed a moderate ration of this—about a half pound per one hundred pounds live weight. A mare weighing 1,600 pounds will receive about eight pounds of the grain ration per day. This is divided into two feeds, morning and evening. The foals are allowed all of this grain mixed that they will eat up at two feeds per day, although we take the precaution to see that they are not given enough to cause them to leave any grain on their feed boxes from one feed to the next.

"Both the mares and foals are turned out about 4:30 or 5 o'clock in the evening, and run on bluegrass pasture all night, being taken in again in the morning. This general policy is continued throughout the entire summer. The barn doors are closed in the daytime, and the barn is partially darkened, so that the flies cause little trouble.

"We do not work mares that are nursing foals, as we usually have enough dry mares or young horses to do our farm work. We believe that we get better results with the foals by not requiring the mares that are nursing them to do anything while they are raising their offspring. Our

policy of giving some grain to the mares while they are nursing foals may be objected to by some, but we have found that it increases the milk flow and contributes materially to the rapid development of the youngsters.

"We make it a rule to wean the foals about November 1. They have been haltered some time before this, but are not tied up until we are ready to wean them. We place a strong leather halter on each one, but also take the precaution to run a rope through the halter rings and tie it around the neck, fastening it to the manger, so that there is no possibility of a colt's breaking loose when first tied, thereby acquiring bad habits. The mares are turned out in pasture, but are brought back the following day and the foals are allowed to strip them out once. After this the mares are turned back in a separate pasture, and do not see their young again for some weeks. The foals are kept tied up for two or three days, until they have become accustomed to the halters and have forgotten in some degree about their mothers. We then begin turning them out during the daytime, keeping them tied up at night. We take the time at this period in their growth to halter-break them thoroughly. From this time until the following May they are turned out regularly on bluegrass pasture every day and are kept in at night. The only exception to this is in case of a cold, wet storm during the winter. They are kept in out of the storm.

"From the time the foals are weaned until the following spring we give them alfalfa hay for roughage, and for grain allow each about three ears of corn per day, and, in addition to this, all of the oats and bran mixture they will eat. This system is followed until the pasture grass is very good the following spring, usually about the 10th or 15th of May. From this time until the hot weather and flies begin to bother the colts they are allowed to run out on pasture, both night and day. The stallions are separated from the fillies about this time, and the yearling stallions are kept in the barn during the day. We have a half-basement barn which is fairly cool during the summer, and turn the yearling stallions into it during the day. This is partially darkened and some burlap strips hanging down to protect the colts from the flies. Our yearling stallions receive the oats and bran mixture, fed three times a day throughout the entire summer and fall. They are given about all they will clean up. In addition to this, they have access to mixed clover and timothy hay, and alfalfa when we have it. This is given to them in the mangers during the day in the barn. At night they run out on bluegrass pasture.

"We usually have from six to twelve yearling stallions that are handled in this way. They are all allowed to run together. It occasionally happens that one will get his heels tramped on by some of the others, but by watching closely and by taking such a colt out immediately we have little trouble. It is, of course, necessary to use some carbohc salve, or something of the kind, on the injured part until it heals up, but as soon as this is done, the colt is turned out again with the rest of the bunch. We have not had much difficulty on this score.

"The yearling fillies are usually turned with the 2-year-old fillies into a separate pasture, where they run out both night and day throughout the entire summer. We do not feed any hay to the fillies, but give them a moderate ration of the oats and bran mixture. This is given twice a day. Their allowance probably amounts to half a pound per 100 pounds of live weight per day.

"In November or December we begin tying up the yearling stallions at night, but allow them to run out during the day. From this time until the following spring, or until they are sold, these stallions coming 2 years old receive about five ears of corn each per day, and, in addition, all of the oats and bran mixture that they will clean up. They are fed three times per day. For hay, we continue with the mixed clover and timothy, although we would feed alfalfa if we had enough of it to supply all of our

horses. So far we have not had enough, and so have retained it for the younger colts.

"The fillies coming 2 years old are tied up, when we have room. If we do not have enough room, they are allowed to run loose in the shed, where they are protected from the cold storms, and where they may take refuge during the night, but they are out every day during the winter on pasture.

"By following these general methods we have made excellent gains on our foals and yearlings. We have found it very advantageous to keep the mares and foals in and protected from the hot weather and the flies, as our own experience and our observation of operations on other farms have satisfied us that extreme heat and flies materially retard the development of foals. We have been able to secure quite satisfactory growth in bone and muscle. Our colts have matured into rugged, heavy-boned, massive draft horses, standing from 16¼ to 17 hands in height by the time they are 24 months of age. The weight varies with individual colts, but they are deep-bodied, well-proportioned, and with size and weight enough to balance their height and general developments. We believe our policies of feeding and management of yearlings and weanlings are justified by the results. We seldom have had any 2-year-olds left unsold. If we do carry over a colt, it is usually one that we want to develop or use in our own stud. We have realized substantial prices for the colts of our own breeding and raising by the time they were from 20 to 24 months of age."

V

COMMON DISEASES AND AILMENTS

As to the common diseases and ailments attacking mares and colts, and preventive measures and remedies thereof, these are indicated following the stud farms mentioned below:

Cornell University—1. Navel infection. The navel is disinfected and the stalls cleaned. Veterinary aid is advocated. 2. Diarrhoea. "Don't overfeed and have mare cool when brought in." Castor oil is recommended.

Gossard Breeding Estates—1. Colic. As a preventive the animals should be carefully fed, while for remedy Gile's medicine and new warm milk are prescribed. 2. Diarrhoea or scours. Careful feeding of healthy animals is emphasized in order to evade the malady, and for remedies various means are employed.

Lakewood Farm. 1. Navel infection. To prevent the occurrence of this thorough disinfection is enforced during foaling time. 2. Scours. The patient is given good physic by using castor oil to be followed by raw eggs. 3. Constipation. Castor oil is also employed and also warm soap-sud injections.

Santa Anita Rancho—1. Ordinary colds. The animals should be sheltered from cold rain and wind. During the attack the patient should have good care and simple aids. 2. Influenza; and 3. Strangles, for both of which the veterinarian should be consulted.

University of Illinois—1. Influenza. Preventive. Horsemen are warned not to mix horses of the home herd with strange ones. 2. Colic. Proper feeding is a precautionary measure to be followed in order to evade this. 3. Diarrhoea. The mares should be fed on dry feed not laxative in nature.

Lefebure Sons' Co—1. Navel disease. Iodine is used for this. 2. Distemper. For this Spohn's cure is applied.

Iowa State College—1. Distemper. For prevention keep healthy ones separate from infected individuals. The remedy adopted is to open abscesses, if any, and to keep the animal from exposure in bad weather. 2. Colic. Plenty of exercise and laxative feed will act as preventives. For cure, sweet spirits of nitre and ginger are used. 3. Joint evil. Prevention—cleanliness and vaccine. For remedy the veterinarian is consulted. 4. Navel infection. The same preventive as of joint ill. Remedy: Cauterize end with tincture of iodine or phenol. 5. Diarrhoea (attacking foals, 3 or 4 months of age). Remedy: Take mare off pasture and put on dry feed. Then the colt is doctored.

Michigan Agricultural College—1. Navel disease. Chloroform and turpentine are recommended to close the navel. Streptococcus vaccine is employed.

Augstin states that by adopting a system of vaccination a most efficient measure of preventing the occurrence of diseases among mares and colts is obtained. Ritchie mentions distemper as the common disease affecting his mares and colts, which is, however, avoided by vaccination, and in the event of its introduction, the Spohn's distemper cure finds use. At the Minnesota University it is claimed that abortion and navel ill cause the greatest trouble, while Dix says it is influenza that is observed commonly attacking mares and colts at the Pentolia Stock Farm. For influenza the serum treatment is mentioned as the means of preventive. Holbert mentions colic, scours and injuries (caused by accidents) as the common troubles at the Holbert Farms. According to Truman, mares are not attacked by any common disease, but a number of joint ill cases of foals

have resulted in serious and fatal termination. At the Central Kentucky Farms, according to Hooper, mares commonly suffer from vaginal diseases.

Those reporting on the disease or ailments of colts alone are: The Hawthorn Farm mentions distemper as the usual scourge of the stud, but now it is extinct since the adoption of antitoxin application, which is done by veterinarians. At the Arngibbon Farm the navel disease is a bugaboo from which no case has as yet been saved, and a so-called "kidney trouble" is also a common ailment for which physics are recommended. Good reports on colic and distemper as the common maladies occurring at the Oakdale Farm, while Henderson mentions distemper alone. Stericker considers joint or navel disease as a common disease of foals. He prescribes the use of either iodine or corrosive sublimate to be applied to the cord until leaking stops.

To secure information on the practices of different studs with regard to the preventive measures and remedies, or other similar steps taken in connection with such ailments as joint or navel ill, influenza, strangles, colic and diarrhoea, or the opinion of the breeders on the same, a question on the subject was included. Such stud farms as have more fully responded have been selected and their answers given herein below:

Cornell University

AILMENT AND DISEASE	PREVENTIVE	REMEDY
1. Joint or navel ill	"Disinfect navel and have clean stall"	Consult veterinarian
2. Influenza		Consult veterinarian
3. Strangles		Consult veterinarian
4. Colic	Take care not to over-feed	Consult veterinarian

Chestnut Farms

1. Joint or navel ill	"Clean stables. Bedding disinfected. Clean stalls daily."	
2. Influenza	"Never mind the temperature. Use stimulants. Keep the horse eating. No aconite."	
3. Strangles	"Blister the throat. Keep eating by use of stimulants"	
4. Diarrhoea (in young foals)		"2 oz. of pure castor oil generally cures this. If foal gets weak mix 2 eggs with pint of mare's milk and drench"

Gossard Breeding Estates

1. Joint or navel ill	Cleanliness at foaling time and also treatment of mare previous to foaling	Jointine (best remedy used)
2. Influenza	Disinfection of cars and proper care in handling newly bought horses	Various
3. Strangles	Disinfection of cars and proper care in handling newly bought	Plenty of pine tar smeared on tongue

AILMENT AND DISEASE	PREVENTIVE	REMEDY
4. Colic 5. Diarrhoea in young foals	horses Careful feeding	Giles and new milk Mix flour with hot water and give as gruel
<i>Maple Lawn Farm</i>		
1. Joint or navel ill 2. Influenza 5. Diarrhoea		Iodine and healing powder Spohn's remedy Whites of egg or boiled milk
<i>Santa Anita Rancho</i>		
1. Joint or navel ill	"Immediate disinfection of umbilicus at birth and continued applications till healed."	
2. Influenza	"Bacterin, etc., administered by qualified V. S., together with such other simple aids and care as may be indicated"	
3. Strangles	"Mixed infection bacterin and good nursing"	
4. Colic		"Some convenient, reliable antiseptic, such as P. D.'s colic mixture, which may be given without drenching, with a 2-oz. dosage syringe"
5. Diarrhoea (in foaling)		"First reduce feed. Give dose of castor oil (2 to 4 oz.) in emulsion with equal parts hot water beaten to creamy consistency, with syringe—followed in severe cases with one teaspoonful of: Bismuth subnitrate, 1 oz.; Salol, 1 oz.; soda bicarbonate, 3 oz. Mix. Dose: 1 teaspoonful, 3 or 4 times daily, if indicated"
Addenda: At this rancho the following is also indicated: "Give enema to all new-born foals as a routine treatment—(say bland oil and warm water, equal parts—4 to 6 oz.) and repeat, if necessary, to remove all the meconium and save many foals."		
<i>University of Wisconsin</i>		
1. Joint or navel ill	"Clean stall, apply antiseptic on navel"	

AILMENT AND DISEASE	PREVENTIVE	REMEDY
2. Influenza	"Isolate sick ones. Inject influenza vaccine"	Where there is fever inject influenza vaccine, give plenty of fresh air, do not work and water often. The consumption of water is high
3. Strangles	Inject vaccine	
4. Colic	"Regular feeding, avoid mouldy feeding"	
5. Diarrhoea (in young foals)	"Be sure that the mare has cleaned properly after foaling"	"Give castor oil, eggs, or flour, etc. Cut the mother's ration in two if she is a heavy milker."
<i>Longview Stock Farm</i>		
1. Joint or navel ill	Almost hopeless	
3. Strangles		Mustard and plaster
5. Diarrhoea (in young foals)		Raw egg and black pepper
<i>Truman's Pioneer Stud Farm</i>		
1. Joint or navel	"Thorough disinfecting stalls and bedding, mare's tail, etc."	
2. Influenza	Our veterinary attends the cases	
3. Strangles		
4. Colic		"We use Truman's English colic cure; it never fails"
5. Diarrhoea (in young foals)		"Give a little wheat flour"

VI

VETERINARY EQUIPMENT

THE "MEDICINE CHEST"

An effort to delve into the veterinary "holdings" of different studs have been made. These are shown in the subsequent tabulations:

TABLE III

Showing Veterinary Apparatuses Owned at Different Stud Farms

FARM	VETERINARY APPARATUSES
Gossard Breeding Estates	Forceps (for extracting teeth), floats, dose syringe, hypodermic outfit.
J. H. Serven & Son	"All kinds, but the most important is a syringe . . . and a foot knife . . ."
Lakewood Farm	Dose syringe, injection syringe, syringe for washing out, lances, needles, operating knives and all shoeing tools.
Maple Lawn Farm	Stomach pump, rectal syringes, hypodermic syringes, mouth gags, drenching bottles.
Oaklawn Farm	Sling, tooth forceps, hoof clippers, veterinary knife.
Pentola Stock Farm	Dose and hypodermic syringes.
Santa Anita Rancho	Operating table; slings; sets of dental instruments; infection pump; fountain syringes; dosage syringes; emasculator; set of surgical instruments.
University of Wisconsin	Slings, casting harness, set of veterinary instruments and horseshoeing outfit.
Woodside Farm	Syringe, extractor, hypodermic, slings, set of surgical lances, speculum.
University of Illinois	Knife, shears, needles, probe, etc., all for minor surgical work; pump, can and pure rubber hose for irrigation; tank for heating water; milk fever outfit; full set of horse-shoer's tools; twitch; graduated glass; dose syringe; bottle for drenching.
Lefebure Sons' Co.	Thermometer, syringe, microscope.
Oakdale Farm	Dose syringe, fever thermometer, pump, blankets, bandages, iron, and practically all other veterinary instruments.
Ritchie Stock Farm	Syringe and vaccinating outfit.
Longwood Farm	Sling, medicine gun, thermometer, douch bag, tubing, dental tools—

FARM	VETERINARY APPARATUS
Thos. Kiddoo Farm Holbert Farms	all used only at the direction of veterinarian. Thermometer, syringe, balling gun. Buggy pump with rubber hose for injections; large rubber hose and stick for giving balls; hypodermic syringe; dose syringes; microscope for testing stallion's semen; impregnators; thermometers; surgical knives, etc.
Iowa State College	Impregnator, syringes, thermometer, scissors.

TABLE IV

Showing the Kinds of Drugs and Disinfectants Kept in the Farms

FARM	DRUGS AND DISINFECTANTS
Cornell University	Iodine (for sores and callouses); alum, tannin, etc. (for foal's navel), oils (for physic). Giles' formula for colic.
Gossard Breeding Estates J. H. Serven & Son	"All kinds, but the most important is a good colic medicine and raw oil (linseed) for colic and impaction."
Lakewood Farm	Colic medicine, fever medicines, blisters, iodine, sulphur, blue vitriol, iodine (for all open sores and light blister), coal tar dip (for ordinary disinfecting).
Maplegrove Farm	Creso dip solution used in breeding operation; sweet spirits of nitre, for colic and fever; aconite, for fever; Spohn's, for distemper; vaccines, for distemper, pink eye, shipping fever, and for blood conditioning.
Maple Lawn Farm	Ward's disinfectants, for general use; Spohn's distemper remedy, for coughs and colds; Groul's remedy, for shipping fever, etc.; sulphur and alum, for sore heels, etc.; oil of sassafras, for bruises and general liniment; extract of witch hazel, for bruises and general liniment.
Oaklawn Farm	Sulphur, Epsom salts, fever medicine, colic medicine, saltpeter, raw linseed oil, blue vitriol, carbolic acid, iodine, vaseline.
Pentoila Stock Farm	Tincture of iodine, colic remedy, disinfectant.
Raboin Pioneer Homestead Farm Selma Farm	Colic medicine and disinfectant. Iodine, bichloride, salts, oil. Creso dip or other similar product for general disinfection. Iodine solution or tincture—for nail punctures, foul wounds, etc. Nitrate

FARM

DRUGS AND DISINFECTANTS

	of potash, diuretic and alterative; raw linseed, castor and other oils—purgatives, etc. Sulphate of soda (Glauber's salts), laxative and alterative.
Santa Anita Rancho	P. D. Colic mixture. Hyposulphite of soda—intestinal antiseptic and anti-ferment. Iodine of potash—diuretic, alterative and absorbent. Saloli bismuth subnitrate and bicarbonate of soda—for diarrhoea in foals. Argyrol solution—inflamed eyes. Boric acid, zinc oxide (powdered) and tannin—antiseptic dusting powder. Zinc sulphate } Acetate of lead } “White solution” —cooling astringent lotion for bruises and superficial wounds and abrasins, etc.
University of Wisconsin	Coal tar disinfectant, raw linseed oil, turpentine, hoof packing, flaxseed, flower of sulphur, charcoal, castor oil, salt petre, ether, cannabis, indica, aromatic spirits of ammonia, sweet spirits nitre,, etc.
Woodside Farms	Iodine, nux vomica, colic remedy, turpentine, sulphur, spirits of nitre, creolin.
White Oak Stock Farm University of Illinois	Gile's remedy; vaccine; disinfectant. Tincture of iodine and iodine salve, for wounds, enlargements, navels, etc.; white lotion, for astringent; Glauber's salt; laudanum and ether, for colic; turpentine; bichloride of mercury, for disinfectant.
Irvinedale Farm	Abbot's pyrobacteria (for naval ill); Bowman's naval ill remedy; Spohn's distemper cure; disinfectant.
Lefebure Sons' Co.	Tincture of iodine, creso dip, white-wash, Spahn's distemper compound.
Oakdale Farm	Physic ball and Epsom salts for purgative; Sloan's cure for colic and indigestion; spirits of nitre and salt petre (diuretic) for individuals that are droopy and out of condition; carbolic acid and lime, considered best of dips on account of lack of odor; acetanilide and quinine for fever; and potassium iodide for navel ill.
Ritchie Stock Farm	Barrel dip; iodine; Spohn's distemper cure; liniments, colic remedy; medicated alcohol; barb-wire medicine; healing powders; salves, etc.

FARM	DRUGS AND DISINFECTANTS
Arngibbon Farm	Coal tar preparation, creosote.
Longwood Farm	Iodine, creoline, sulpho-naphthol. B-X, and besides other drugs which are, however, used only at the direction of the veterinarian.
Hawthorn Farm	Colic medicine, fever drugs, salves (for bruises), creolin.
Thompsondale Farm	Spohn's distemper compound for all coughs and colds; Kreso dip No. 1, and lime for disinfecting; lysol for washing wounds of navel ill, etc.; absorbine for all muscular and tendon lameness, also to reduce soreness in shoulders, etc.; carona wool-fat for cuts and "hairing" over; Bickmore gall cure.
Thos. Kiddoo Farm	Note: "Very few drugs used—we feed considerable bran and generally find our horses physically fit." Ordinary dip, for disinfecting; lime, as a germicide; iodine, for bumps, bruises, etc.; sulphur, for cuts and skin eruptions.
Iowa State College	Therapogen—for general disinfection; castor oil and Epsom salts, as cathartics; Saltpetre as diuretic; sulphur for general use; sweet spirits of nitre for colic; tincture of iodine for wounds, etc.; Spohn's distemper cure; Blackhawk dip and lime, for disinfecting; and sugar of lead for healing wounds.

VII

STALLION AND FOALING BOX STALL

For the size and construction of the stallion box stall see Appendix I.

Different dimensions of the foaling box stalls have been reported by the sixteen stud farms responding. At the Waddington Farm the size is 10 by 10 feet; at the Raboin Pioneer Homestead Stud Farm, 12 by 12 feet; and at the Longwood Farm, 12 by 14 feet. Four farms—the Thompsondale Farm, University of Missouri, Holbert Farms, and the Ritchie Stock Farm—give the size as 12 by 16 feet. At both the Woodside Farm and University of Minnesota the dimensions are 14 by 14 feet. The foaling boxstall at the Pentoila Stock Farm, Maple Lawn Farm and Selma Farm, three farms in all, occupies as large a space as 14 by 16 feet. A larger one is to be found in three other farms—th Lakewood Farm, Truman's Pioneer Stud Farm, and University of Illinois—the size being 16 by 16 feet, while at the Longview Stock Farm the most spacious maternity boxstall, 18 by 20 feet, is reported.

VIII

SUMMARY

To summarize, the writer finds but a few words to say: That while a few common practices may be the rule in all farms surveyed, yet it is safe to say that, in general, the breeding, feeding and management of purebred draft horses in the leading stud farms in the United States follow no one "prescription," so to speak, whether it be in the systems of breeding employed, on the care and handling of the stallion, of the brood mare, of foals and of weanlings, whether it be on the handling of diseases or other afflictions, on the provision for drugs, disinfectants and veterinary apparatuses, or on the material and plans of construction of boxstalls and barns. An attempt to reduce the findings to a point-to-point brief is not countenanced or else, practically a repetition of the same discussion may have to be dwelt upon.

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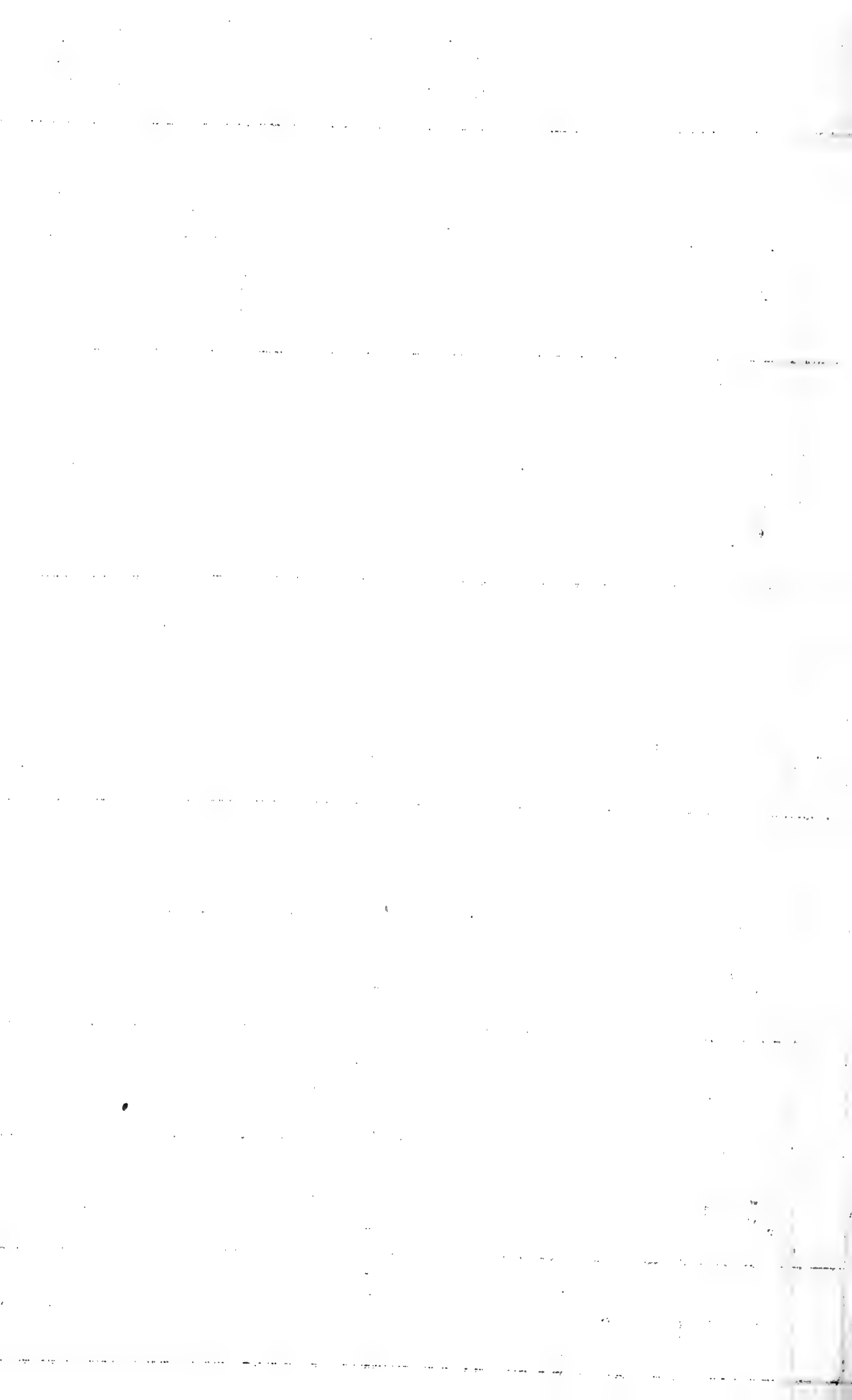
VITA

Valente E. Villegas was born in Los Banos, Laguna, P. I., May 21, 1893. He attended the Manila High School preparatory to his entrance to the College of Agriculture, University of the Philippines, in June, 1908. He was granted the degree of B. Agr. in April, 1913. Soon after graduation he entered service in the Bureau of Agriculture; was assistant agricultural inspector, July 1 to July 9, 1913; agricultural assistant, July 9, 1913, to August 16, 1917; and agricultural inspector, August 16 to December 4, 1917. During his connection with the Bureau of Agriculture he was delegated to San Francisco, California, U. S. A., as one of the Philippine agricultural representatives in the Panama-Pacific International Exposition in 1915. On December 6, 1917, he was appointed instructor in animal husbandry, and later, on May 4, 1918, instructor in agronomy in the University of the Philippines. On July 8, 1919, he was granted scholarship to study abroad by the University of the Philippines, and began his advanced studies in animal husbandry at the Iowa State College in September, 1919.

APPENDIX I, SHOWING SIZE AND DETAILED CONSTRUCTION OF STALLION BOX STALL

FARMS	SIZE OF BOX STALL		MATERIAL OF CONSTRUCTION						DOOR			WINDOWS					MANGER		HAYRACK		MANGER WINDOW		Location of Salt Box			
	Width	Length	Partition	Sides	Floor	Door	Manger	Hayrack	Location	Width	Height	Number	Width	Height	Height of bottom from floor	Distance apart	Location	Height of top from floor	Location	Height of bottom from floor	Width	Length				
Chas. Brown & Sons	12'	14'			Dirt					3' 10"	10'		24"	48"												
Cornell University				Wood	Clay	Wood	Wood	Hay feed in manger	Beside manger	3'	7'	2	2'	3'	4.5'	2'	At alley								At side of manger	
Chestnut Farms	14'	30'	Hardwood and iron	Hardwood and iron	Dirt or clay	Wood	Wood	Wood	Center of stall [5 doors outside]	4'	8'	5	22"	36"	8.5'	7'	Full length across stall	4'		Hayrack use for manger	None	None			None	
Gregory Farms	Carnot's 17' 12" x 19' 17"				Earth or clay					4'	7'															
J. H. Serven & Son	14'	14'	3"x12" Hardwood	Concrete 4'		2"x6" and 3"x14" Lumber			1 door to alley 1 door to paddock	4'	7'	1	1'	2'	Just under beam		Next to alley	3'								
Gossard Breeding Estates	16'	16'			Dirt	2"x4"	2"x12"			4 1/2'	6'	1	3.5'	2'											Corner of manger	
Lakewood Farm	14'	14'	Planks	Planks with iron rods	Dirt	Planks with iron rods	None	None	Corner	4'	8'	1	20"	24"	6'											
Leslie Farms	16'	20'																								
Maple Grove Farm	9' 1"	12'							Corner	4' 1"	6' 6"		46"	20"												
Maple Lawn Farm	16'	16'	Wood	Wood	Dirt	Wood	Wood	Wood	Side	6'	7'				5'		Corner	3'	Corner	To the floor	26"	29"			None	
Oaklawn Farm	15'	17'			Gravel 1/2 Clay 2/3	Wood	Wood	Wood		4' 4"	7' 4"		32.7"	60"							43.3"	18.5"	19.7"			
Pleasantview Farm			Wood	Wood	Dirt	Wood	Wood	Wood	Corner	4' 2"	5' 8"	1	36" [3 glass]	12" [Panels]			Front		Front		24"	10.2"				
Pentola Stock Farm	12'	12'	Oak	Oak	Dirt clay	Sliding	Oak	Oak		4'	7.5'	1	24"	32"	4.5'										Wall	
Rookwood Farm	11'	13 1/2'		Wood and iron	Dirt	Wood	Wood	Wood	Corner	8' 5"	6.25'	1	41"	21.5"	5.25'		Middle of side [Width]	3.9'	Corner	On ground						
Raboin Pioneer Homest'd Farm	15'	16'	Hard Lumber	Hard Lumber	Dirt	Hard Lumber	Hard Lumber	Hard Lumber	Behind horse	6'	8'	2 in one	20"	30"			One Corner	4'			18"					
Selma Farm	12'	18'	Heavy Oak	Heavy Oak	Dirt or clay	Heavy Oak	Wood	None																		
University of Wisconsin	12'	14'	2" Hardwood	Wood	Dirt	Wood	Wood	Wood		4'	8'	1	2.5'	3'	5.5'		Either across side or end	3.5'			8"	12"			Usually small iron box	
University of Illinois	16'	16'	Planks & 1" pipe	Plank	Clay	Dutch door and oak slats	Pine plank oak capped	Pine plank oak capped	Inside and outside	4'	7'				5'		Corner side alley	Varied		Use manger for hay and grain						
University of Missouri	12'	14'	Wood	Wood	Concrete	Wood	Wood	Wood		4'	To ceiling						On feeding alley		Corner of stall		None	None			Corner	
Woodside Farm	14'	14'	Maple	Pine planks	Clay	Maple	Iron	Maple and iron pipes	Front side	4'	10'	1	3'	3'	6'		23"	4' 2"								
Irvindale Farm	Alfred de Bree Eyck's 12' x 16' x 14' 9"		Wood and wire	Wood and wire	Dirt	Wood and wire	Wood																			
Lefebure Sons' Co.	9' 4"	17'	Board and iron rod	Board and iron rod		Board and iron rod	Board	Board	Corner	3' 9"		1	2 panes 4' 4"		65"		Middle of side next to door		Corner		1' 11"	2' 10"				
Longview Stock Farm	16'	18'	Plank	Plank and rods	Dirt	Planks and rods	Plank	Plank	Corner	5'	8'	2	14"	18"	5'	6'	Corner	4'	Same as manger	On floor					In manger	
Oakdale Farm	Farceur's 16' x 20' x 14'		Board cement	Board and cement	Dirt	Board			Corner	3' 2" 10'		1	24"	32"			Corner			Hay fed on grounds						
Ritchie Stock Farm*	19'	12'	2x4 native	Board	Dirt	2x4 native	Board			4.5'	7'	2	2'	2'	5'	8'	Corner	3.5'		Manger used as hayrack					Corner	
Arngibbon Farm		12'	Wood	Wood	Dirt	Wood	Wood	Wood		4'																
Longwood Farm	12'	20'	2" plank	2x4 sheathed 2 sides	Dirt	Batten	Iron	Iron	Center of stall from walk and paddock	6'	6' 10"	1	2' 6"	2' 7"	5'		Corner	3'	Corner		4' 6"					
Hawthorn Farm	12'	14'			Corked brick																					
Thompsondale Farm	12'	16'		2" plank	Sand and Clay mixed			Upper corner	Close to Corner	4'	8'	2	24"	30"	4' with bars across			Upper corner not above grain box	5'		Open at top				Small corner partitioned off from grain box	
Waddington Farm	10'	15'	Hollow tile 3 ft. high	Wood	Dirt	Wood	Wood	Wood	North	5'	7'	The door is open at all times, allowing the horse to exercise in paddock					Left of door entering	4'		Right of door in back corner	4.5'				In manger	
Thos. Kiddoo Farm	12'	12'	Oak	Oak		Oak	oak	Oak				2	2'	2.6'	7.6'	6'	Corner									
Holbert Farms	8'	16'	Plank	Plank	Clay around plank, center over cesspool; two barns with cement floors drained in center of each	Grate Gate and board doors			Outside and Inside	4'	8'-9"	1	2 1/2'-3'	1 1/2'-8'	3 1/2'-6'		Opposite door	2' 9"-3' 6"		Same as manger	None					
Iowa State College	9' 10"	15' 11"	Wood	Wood	Dirt	Wood and iron	Wood and iron	Wood	Inside Corner	3' 9"	7' 7"	2	2' 9"	1' 10"	6' 8"		Corner	3' 4"	Corner	Resting on floor						
Mich. Agr. College	14'	14'	Yellow pine	Yellow pine	Cresote blocks	Yellow pine	Yellow pine	2" yellow pine	Middle partition	4'	6.5'		3'	4.5'	4'		Front corner	3.5'	Corner	1'					Side wall	
Truman's Pioneer Stud Farm	12'	12'	Oak and iron grating	Oak plank	Clay	Oak and iron grating	Oak plank	Iron corner	Left-hand side of stall	4'	8'	2	Four glass sheet				Left-hand corner of stall		Corner right hand. One rack for two stalls		Rest on floor	None	None		Left-hand corner	
Univ. of Minnesota	14'	16'	2-inch plank	2-inch plank	Clay	2-inch plank	2-inch plank	2-inch material		3' 6"	8'	1	2'	2'	5' Protected with bars		Front of stall next to alley	3'								

*The size of box stall is claimed to be one-half of what it should be.



APPENDIX II
HORSE FEEDING AND MANAGEMENT

Name of the farm-----
Owner of the farm-----
Manager of the farm or breeder-----
Location of the farm-----
Breed raised -----

GENERAL QUESTIONNAIRE

1. What is the size of the farm?-----
2. How long has the farm been engaged in horse breeding?-----
3. What are the names of the principal horses? (If any prizes were won, mention the kind, place and the year when such premiums were obtained. With undefeated or regular winners give the outstanding premiums or those won recently.)

4. How many colts are foaled yearly? (Average)-----
5. How many horses are sold yearly? (Average)-----
6. What system of breeding is practiced? (Is it inbreeding in which the sister and brother, the son and his dam, or the daughter and her sire are mated together; or, is it the line-breeding in which individuals of distant relationship are mated together?)

7. Is artificial insemination practiced on the farm? If so, how many mares are treated at the same time?

8. What instruments are used in artificial insemination?

9. Describe briefly how artificial insemination is practiced.

10. What is the average death rate among the horses on the farm?

11. How many barns are on the farm for horses only?-----
 12. Give the number, approximate size and the capacity of each paddock or pasture for horses.

	NUMBER	SIZE OF EACH	CAPACITY OF EACH
For the stallions-----	-----	-----	-----
For the mares-----	-----	-----	-----
For the colts and fillies-----	-----	-----	-----

13. What other structures are on the farm for horses? (Give a diagram of any special structure, if possible.)

Diagram

- 14 Describe the standard horse barn on the farm.

Location -----

Type basement, one-story or shed, or two-story or loft)-----

Approximate dimensions: Length-----Width-----

Height of ceiling-----

Number of box stalls-----

Alley: Width-----Height (from floor to ceiling)-----

Material of construction of floor-----

Doors (on each end): Width-----Height-----

Material of construction (in a general way)-----

Ground floor sketch of barn, if possible

15. Describe the standard box stall.

Stallion box stall: Width-----Length-----

Material of construction of partitions-----

Of sides-----Of floor-----

Of door-----Of manger-----

Of hayrack-----

Door: Location-----

Width-----Height-----

Windows: Number-----Width-----Height-----

Height of bottom from floor-----

Distance apart-----

Manger: Location -----

Height of top from floor-----

Salt box, if any: Location-----

Manger window, if any: Width-----Length-----

Foaling box stall: Width-----Length-----

Height (from floor to ceiling)-----

Material of construction: Of sides-----

Of floor-----Of hayrack-----

Of manger-----Of door-----

Door: Location -----

Width -----Height-----

Windows: Number-----Width-----Height-----

Height of bottom from floor-----

Distance apart -----

Manger Location -----

Height of top from floor-----

Hayrack: Location -----

Height of bottom from floor-----

Salt box: Location-----

Manger window, if any: Width-----Length-----

16. What veterinary apparatus are kept on the farm for emergency and ordinary purposes and give the use of each one?

NAME	USEFULNESS
------	------------

17. What drugs and disinfectants are kept on the farm for ordinary or emergency purposes? Give the usefulness of each one, especially the drugs.

NAME	USEFULNESS
------	------------

MANAGEMENT OF THE STALLION

1. What is the stud fee?-----
2. On what contracts does the farm enter into in breeding outside mares?

3. During what month of the year is the breeding season on the farm?

4. In what condition of flesh is the stallion maintained??
During the breeding season-----
During the non-breeding season-----
5. What are the principal points looked for in selecting a breeding stallion?

6. What principal points are discriminated against in selecting a breeding stallion?

7. What unsoundnesses, diseases and other defects are deemed sufficient to bar a stallion from breeding purposes?

8. When are the stud colts separated from the fillies to prevent mating?

9. When is training to lead begun?-----
10. What other training is given to the stud foals?
11. Describe briefly the different kinds of training if any of the procedures followed are an improvement over the ordinary methods?

12. At what age is the stallion allowed to breed for the first time?

13. At what age is the stallion considered mature?-----
14. What is the number of services allowed the stallion each year at different ages until and including the age of maturity?

AGE

NUMBER OF SERVICES

15. What is the maximum number of services allowed a mature stallion throughout the year

16. What is the limitation regarding the number of services in a day?

17. At what age is the stallion considered in his prime for breeding purposes?

18. When is the stallion considered too old to breed?-----
19. Is any difficulty found in making the stallion cover the mare? If so, what is the probable cause and how is it remedied?

20. Is any stimulant used to induce the stallion to mate? If so, what specific one?

21. Is it advisable to employ a "teaser"?-----
22. How many services are generally needed before the mare settles?

23. About what percentage of the mares bred settle after one service?
----- After three services?----- After four services or more?-----
24. Is any "wash" used for the sheath and penis of the stallion at each breeding operation? If so, what specific one and when is it applied, before or after each service?

25. Is the stallion exercised? If so, what is the nature of the exercise?

26. Is the stallion worked? If so, what is the nature of the work?

27. How many times and at what time of the day is the stallion fed?

28. When is water given—before or after feeding?-----
29. What rations and about what amount of each constituent are given to the stallion at each feeding?

DURING THE BREEDING SEASON

Roughages

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If any roughages are given at will, indicate so, or if given in a mixture, give the proportion of each constituent and the amount given of the mixture at each feeding.)

Grains
AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture, give the proportion of each constituent part and the amount of the mixture given at each feeding.)

DURING THE NON-BREEDING SEASON

Roughages
AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If any roughages are given at will, indicate so, or if given in a mixture, give the proportion of each constituent and the amount given of the mixture at each feeding.)

Grains
AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture, give the proportion of each constituent part and the amount of the mixture given at each feeding.)

30. How are the roughages furnished—cut or not? If cut, what is the approximate length of the cut material?

31. If cut roughages are given, are they mixed with the grain part of the ration and in what proportion?

33. If corn is fed, in what form or preparation is it given-----
34. If molasses is fed, in what form and how much of it is given at each feeding? -----
35. Are the grains fed in a dry or mash form?-----
36. Is any kind of salt given to the stallion? If so, what kind, how much and in what manner is it furnished?

37. Is any silage or green cut forage furnished to the stallion at any time

of the year? If so, which ones, how much and when are these fed?

 38. What is your opinion regarding the feeding of alfalfa or clover hay to the stallion as part of the ration?

 39. What is your opinion regarding the feeding of cotton-seed meal to the stallion as part of the ration?

 40. What is your opinion in regard to feeding corn to the stallion as part of the ration?

 41. Are any commercial "stock tonics" fed to the stallion? If so, which ones?

 42. Does the stallion receive any grooming? If so, how often?

 43. Is it advisable to keep the stallion shod? If so, how many times in a year is shoeing done?

 44. Is it advisable to keep the stallion shod? If so, how many times in a year is shoeing done?

 44. Is it advisable to clip the hair of the stallion? If so, how often?

 45. What are the common accidents to which the stallion is subject?

 46. What are the common diseases or ailments generally attacking the stallion?

 47. What diseases or ailments of the stallion may be treated without the aid of the veterinarian with safety?

 48. Have any vices been developed by the stallion? If so, which ones and how have those been remedied?

MANAGEMENT OF MARES AND COLTS

1. In what condition of flesh are the brood mares kept?-----

2. What are the principal points looked for in selecting brood mares?--

 3. What principal points are discriminated against in selecting the brood mares? -----

4. What diseases, unsoundnesses and other defects are considered sufficient to bar the mare from breeding purposes?

5. At what age does breeding begin with the fillies?-----
6. At what age are mares considered in their prime for breeding purposes? -----
7. When are mares considered too old to breed?-----
8. Are mares worked? If so, what is the nature of the work?-----
9. Are mares suckling foals worked? If so, what is the nature of the work? -----
10. Are mares suckling foals kept in the barn or run in the pasture during the "grass season"?-----
11. At what age are fillies first trained to lead?-----
12. At what age are fillies started in harness?-----
13. What is the approximate area of the paddock or pasture sufficient for the mare throughout the year?-----
14. How many times and at what time of the day are working mares fed?

15. How many times and at which feeding (morning, noon or night) are idle mares on pasture given grain?

16. How many times and at what time of the day are idle mares fed during the winter?

17. What rations and about what amount of each constituent are given to the mares at feeding time?

WORKING MARES
Roughages
AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the roughages are given at will, indicate so, or if given in a mixture, give the proportion of each constituent and the amount of the mixture at each meal.)

Grains

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture, give the proportion of each grain constituent and the amount of mixture fed each time.)

IDLE MARES ON PASTURE

Roughages

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the roughages are given at will, indicate so, or if given in a mixture, give the proportion of each constituent and the amount of the mixture given at each feeding.)

Grains

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture, give the proportion of the grain constituents and the amount of the mixture fed each time.)

MARES SUCKLING FOALS

Roughages

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the roughages are given at will, indicate so, or if given in a mixture, give the proportion of each constituent and the amount given of the mixture at each feeding.)

Grains

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture, give the proportions of the grain constituents and the amount of the mixture fed each time.)

IDLE MARES IN WINTER

Roughages

AMOUNT FED IN

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

Grains

KIND	MORNING	NOON	AFTERNOON	NIGHT, IF ANY
-----	-----	-----	-----	-----

(If the different kinds of grains are given in a mixture give the proportion of each grain constituent and the amount of mixture fed at each time.)

18. Describe briefly the methods of feeding a few days before and after foaling.

19. What particular feeds are discriminated against in feeding pregnant mares?

20. If any drugs are administered before foaling, give the name.

21. State briefly the aid or attention given to the mare while foaling.

22. What is the percentage of abortion cases on the farm and what is the common cause?

23. At what age are suckling foals started to feed on grains?-----

24. Are the grains fed to the suckling foals given at will?-----

25. If the grains given to the suckling foals are given at stated periods, how often and at what time of the day?-----

26. What different kinds of grains and how much of each are given to suckling foals at each feeding?

27. If the grains are fed in a mixture, in what proportion are the grains present and what amount of the mixture is fed each time?

28. At what age are foals weaned?-----

29. Describe briefly the method of weaning?

30. Are weanlings given grain at will? If not, how many times daily?

31. What grains and how much of each are given to weanlings at each feeding

32. If the grains are fed in a mixture, in what proportion are the grains present and what amount of the mixture is fed to weanlings each time?

33. Are weanlings left with the mature horses, or given separate lots?

5. Diarrhoea (in young foals

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