THE MARE AND FOAL.

The Breeding-stud.

The breeding of horses, whether as a branch of agriculture or as a separate and distinct enterprise, has always been looked upon as more or less a lottery, not only as regards the type of the animals produced, but also in respect to the financial success of the undertaking. The frequent contradiction of the old maxim that like begets like—that, as the parents, so the offspring—has upset the calculations and destroyed the confidence of many an enthusiastic devotee in the service of horseflesh. If, however, the practice of breeding has not been removed altogether from the sphere of speculation, the fact has become more and more appreciated and accepted that the foundation of success must be laid in the judicious selection and mating of parent stock, not only in regard to conformation and physical capabilities, but also, and in the highest degree, to constitutional soundness. Important as this initial step may be to the production of a sound and useful race of horses, it is but the beginning of a difficult and delicate enterprise—difficult, because of the scope and variety of knowledge and experience necessary to successful breeding and stud management; delicate, because it contemplates the perpetuation of animal life and the evolution of man's ideal of equine beauty and power.

Breeding, employing the term in a physiological sense, is not too much in evidence in papers of this kind. It may not be without interest, therefore, to those who would take a wider view of the subject, to consider briefly the functions of gestation and parturition; in other words, the embryo and its life-relations with the parent,

Female Organs of Generation.

In order to render this branch of the subject intelligible to the general reader it will be necessary to briefly consider the female organs of generation. These comprise: 1. The ovaries. 2. The Fallopian tubes. 3. The uterus or womb. 4. The vagina or genital passage. 5. The vulva and clitoris.

The *Ovaries* (figs. 1 and 4) are the essential organs of generation, in form and character resembling the testicles of the male. They are two ovoid bodies suspended from the spine immediately behind the kidneys. In structure they consist of interlacing bundles of connective tissue, branching blood-vessels, and nerves, in the midst of which are embedded a number of small bladder-like bodies, termed Graafian vesicles or ovisacs (fig. 1). These are chiefly located near to the circumference of the organ, and vary in size with their age and progress towards maturity. The younger and smaller ones are placed near the surface, while those further advanced in development are more deeply situated. When fully matured they are filled with a transparent yellowish fluid of the consistence of water, and contain also the ovum or egg, out of which is developed the future horse.

The *Ovum* (figs. 2 and 3) is a small cell or sac about $\frac{1}{100}$ of an inch in diameter. When ripe it escapes from the ovary by the bursting of the Graafian vesicle, an act always associated with the condition termed œstrum, or horsing. On leaving the ovary the extruded egg enters the Fallopian tube, and by it is conducted into the uterus.

The *Fallopian Tube* (fig. 4) is a narrow duct extending in a wavy course from the extremity of the horn of the uterus, where it is small, to the ovary, where it spreads out like the wide end of a trumpet. The purpose of this duct is, as just stated, to convey the discharged egg from the ovary into the uterus; but before this can be done the ovum must first be secured, or it will fall into the cavity of the belly. To guard against this the free, broad end of the duct is thrown like a mantle over the egg at the moment of its escape, and in this way it is secured against loss and enters the orifice of the tube.

The *Uterus or Womb* (fig. 4) is an irregular cavity into which the discharged ovum is conveyed by the Fallopian tube to be fertilised and afterwards nourished during fœtal development. It is situated in the cavity of the belly beneath the loins, and is held in position by two broad ligaments which suspend it from the spine. Anatomically considered, the uterus is divided into a body; two branches, termed cornua or horns; a cervix or neck; and the *os uteri* or mouth. The mouth is

the opening by which the cavity of the uterus communicates with the vagina, and through which the fœtus escapes in the act of parturition. The neck is the constricted portion situated immediately behind the mouth. Beyond this is the body, or cylindrical portion of the organ, extending forward, and dividing into two long branches or horns. These latter curve upwards towards the spine, and each communicates by a small orifice with

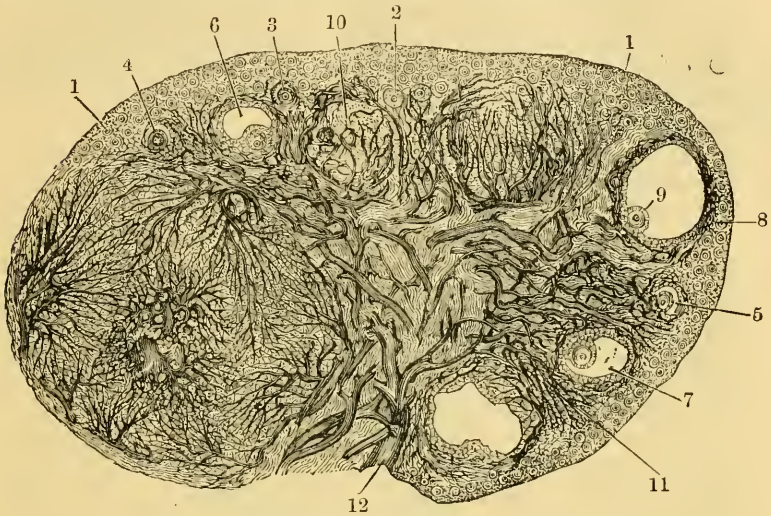

FIG. 1.—Section of the Ovary.

1, Small Graafian vesicles; 2, Larger Graafian vesicles; 3, 4, 5, 6, 7, 8, Vesicles in various stages of development; 9, Ovum *in situ*; 10, Non-ruptured vesicle surrounded by a network of blood-vessels; 11, Connective tissue in which the vesicles are imbedded; 12, Blood-vessels entering the ovary to break up as shown into a number of branches.

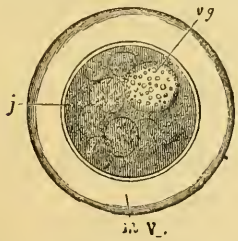

FIG. 2.—Constituent parts of entire Ovum.

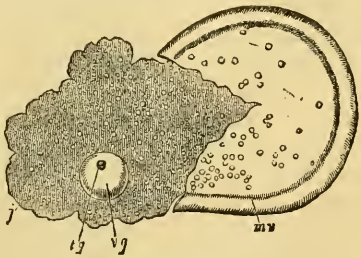

FIG. 3.—A Mammalian Ovum ruptured, with the contents escaping.

mv, Vitelline membrane; *j*, Yolk; *vg*, Germinal vesicle; *tg*, Germinal spot.

the Fallopian tube. The lower surface of the uterus is in contact with the bladder, while the upper surface is in apposition with the rectum. It is important to recognise these two facts, inas-

much as undue fulness of the bladder or the rectum, or both, at the time of delivery, may impede the passage of the fœtus. Structurally, the uterus is made up of three layers :—

1. The outer, or serous layer.
2. The middle, or muscular layer.
3. The inner, or mucous layer.

The serous layer is a thin, transparent membrane which not only covers the uterus, but more or less completely invests all the abdominal organs. It is lubricated and kept constantly moist by a watery secretion of its own, by which its smooth surface is permitted to move over the adjoining organs and parts with the least possible friction.

The muscular layer is much thicker and stronger, and forms the chief bulk of the uterine wall. The muscle of which it is composed is of the involuntary order, and is arranged in layers of fibres. The superficial, or outer layers, take a longitudinal direction, while the ones within them are disposed in circles. During pregnancy the muscular fibres of the uterus are very considerably augmented, both in size and number, in order to allow the organ to enlarge for the accommodation of the fœtus without becoming unduly attenuated, and ultimately to assist by their contraction in expelling the fœtus in the act of parturition.

The mucous layer is a thin vascular membrane of a pale pink hue. In this respect, however, it varies with the state of the organ, and in the impregnated womb becomes not only much thicker, but of a deep red colour, while at the same time the vessels are largely increased in number and in size, having now to furnish not only materials for the nourishment of the young, but to provide, in addition, a constant supply of oxygen for fœtal respiration. In order that the latter may be carried on, the fœtal membranes, or "afterbirth," are everywhere attached to the inner surface of the uterus, and as the fœtal blood circulates through them, it is brought into close proximity with that portion circulating in the vessels of the parent, so that the carbonic acid contained in the blood in the one set of capillary vessels is given up to that in the other set in exchange for oxygen, with which the latter freely parts.

The *Vagina* (fig. 4) is a membranous canal of some considerable capacity, extending from the neck of the uterus backward to beneath the anus, where it ends in a vertical opening—the vulva. It is by this opening the urine escapes after leaving the bladder. In the act of copulation the vagina receives the organ of the male, and through it the fœtus escapes in the act of parturition. Figs. 1 to 4 are from Chauveau's "Comparative Anatomy."

Puberty.

When the organs of generation have arrived at maturity and become capable of exercising the reproductive function

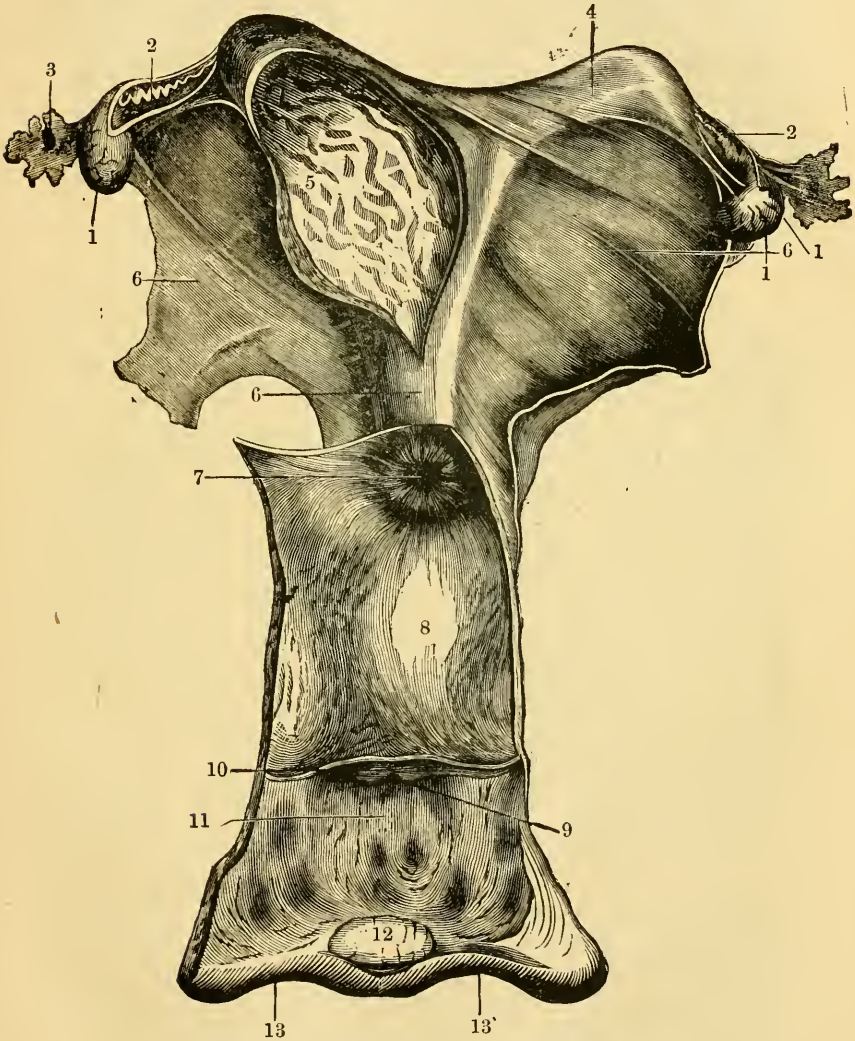

Fig. 4.—Generative Organs of the Mare, Isolated and Partly Opened.

1, Ovaries; 2, Fallopian tubes; 3, Fimbriated extremity of Fallopian tube, with opening for entrance of ovum in the centre; 4, Cornu or horn of the uterus entire; 5, Cornu or horn of the uterus laid open; 6, Broad ligament by which the uterus is suspended; 7, Cervix or neck and mouth of the uterus; 8, Interior of the vagina; 9, Urinary meatus, or passage to the bladder, covered by a small fold of mucous membrane; 10, The vulva; 11, Interior of the vulva; 12, Clitoris; 13, Labia of the vulva.

animals are said to have reached the period of puberty. The age at which puberty is attained varies in different species, and, in the same species, it varies according to different circumstances of climate, food and management. In the mare a disposition to receive the horse may appear as early as at a year old, and is invariably established between that time and the completion of the second year. The duration of this propensity and the continuance of the procreative function present wide divergencies in different individuals. Some mares cease to breed at a very early period, while others continue to be fruitful until over thirty years of age.

Œstrum or Horsing.

With the advent of puberty the female begins to manifest a periodical desire for the male, in which state she is said to be at œstrum. In regard to the mare it is more commonly spoken of as "horsing," or being "in use" or "in season." In ordinary circumstances this condition appears only in the spring and summer months, when it recurs at intervals of about three weeks, and continues each time for a period of two to three days, but in this respect great variations are noticeable in different animals. In some exceptional cases it appears and disappears in twenty-four hours, while in others it may continue for five or six days. The appearance of œstrum is a sign of the ripening and escape of an ovum from the ovary or egg-forming gland, and is attended by considerable excitement of the sexual organs. The manifestation of its presence is marked by an irritable and restless state. The mare whinnies and shows an irrepressible desire for the male. The coat stares, and there is a slight rise of temperature—which, however, soon subsides—and the appetite becomes more or less subdued. The genital parts, especially the vagina and vulva, are swollen and congested, and a discharge of a whitish glutinous secretion is frequently emitted from them. Staling is repeatedly attempted, but only small quantities of urine are discharged, and this is followed by a succession of spasmodic movements of the clitoris and vulva. Suckling mares fall off in their milk, and the quality of the secretion would seem to undergo some sort of change, as it is frequently the case that during the œstral period foals suffer relaxation of the bowels, and sometimes experience a sharp attack of diarrhœa.

In the case of mares not suckling foals the mammary gland at this time flushes and becomes somewhat increased in size. Some animals develop great excitability at the time, and kick, and

squeal, and become dangerous both to approach and to drive. It must not however be supposed that the signs of œstrum as here given will be uniformly present in all cases. Great variations may be expected to come under notice from time to time, depending in a large measure on the idiosyncrasy and bodily condition of the animal. Some mares when loaded with fat, and others of a sluggish temperament or low in flesh, may pass through the œstral period without exhibiting any striking indications of their condition, and require therefore the most careful watching in order that they may not be overlooked. It is in the writer's experience that even the closest observation may sometimes fail to detect a mare's fitness for service, and in such cases nothing short of being presented to the horse will disclose her amorous state.

The Ovum Fertilised.

If, while at œstrum, copulation be permitted, the ovum of the female becomes fertilised by the sperm elements of the male and acquires the power, which it did not possess before, to grow and, under favourable conditions, to reproduce the species. Where, however, intercourse is not allowed, the ovum, on reaching the uterus, is expelled or perishes, and undergoes disintegration and decay.

A fertilised ovum possesses no means within itself by which growth and development can be carried on to its ripening stage, and it becomes necessary, in order that it may prove fruitful, that it should be grafted on to the parent, from whose store of nutriment it can obtain the materials requisite for the building up and sustenance of its complex structure. This union of the one with the other is effected by certain changes which go on simultaneously on the outer side of the ovum and the inner surface of the womb, resulting in the former becoming intimately attached to the lining membrane of the latter (fig. 5).

Function of the Fœtal Membranes.

The medium through which this union of the fœtus with the mother is effected is afforded by the fœtal membranes, or, as they are commonly termed, "afterbirth." The fœtal membranes are three in number, and are respectively named (1) the Chorion, (2) the Allantois, and (3) the Amnion. The chorion is a highly vascular structure, the outermost of the three, and is everywhere attached to the lining membrane of the uterus. The nature of this attachment is such as to bring the bloodvessels of the young into close relation with the blood of the dam, by

which means the necessary exchanges concerned in respiration and nutrition are carried on.

To fully appreciate these facts it must be understood that the blood circulating in the body of the fœtus is constantly passing out of it through the umbilical opening or navel, and being distributed by branching vessels over the entire surface of the chorion, where, on being brought into relation with the maternal blood, through the medium of the walls of the capillaries, it gives up to it its carbonic acid, and takes in oxygen in exchange. In addition to this it also receives from the same source the materials of nutrition. With this fresh charge of oxygen and foodstuff the blood is now gathered together by the union and reunion of the divided vessels, and returned to the body of the fœtus by the umbilical vein to be again distributed through its various organs and tissues. It will thus be seen that the outer membrane or chorion is the one through which the fœtus is supplied both with food and air. The other two membranes need not be considered here, beyond stating that they form a cavity in which the fœtus is enclosed, together with a considerable amount of straw-coloured fluid. This fluid is important on account of the purposes it serves in fœtal economy—first, in protecting the fœtus from outside concussion, such as would be inflicted on the belly of the dam in passing through gates; and secondly, in warding off the effects of inside concussion, such as would result from galloping down hill. In both these cases the water softens the shock, and preserves the fœtus from injury.

But it is not only during gestation that this water proves of service in the mechanism of reproduction, for, in the act of parturition, while the throes of foaling are taking place, it forces out the membranes or "afterbirth" in which it is contained, as a bladder-like protrusion, and in so doing opens the mouth of the womb, and widens the genital passage for the escape of the fœtus. It is this water contained in its sac which, when protruding from the vagina at the time of foaling, is spoken of as the "water-bladder." More than this, it lubricates the genital passage, and thus further facilitates delivery.

Fig. 5 represents the horse embryo, natural size, at seven weeks old.[1] It is seen to be enclosed in a sac, *am*, containing fluid, and to have attached to its abdomen a short stalk, or rudimentary umbilical cord, connected with an orange-shaped sac, *y s*. These parts are surrounded by a membrane composed

[1] Fig. 5 is from *A Critical Period in the Development of the Horse*, by Professor J. C. Ewart, M.D., F.R.S., who kindly supplied the original drawing for the illustration.—Ed.

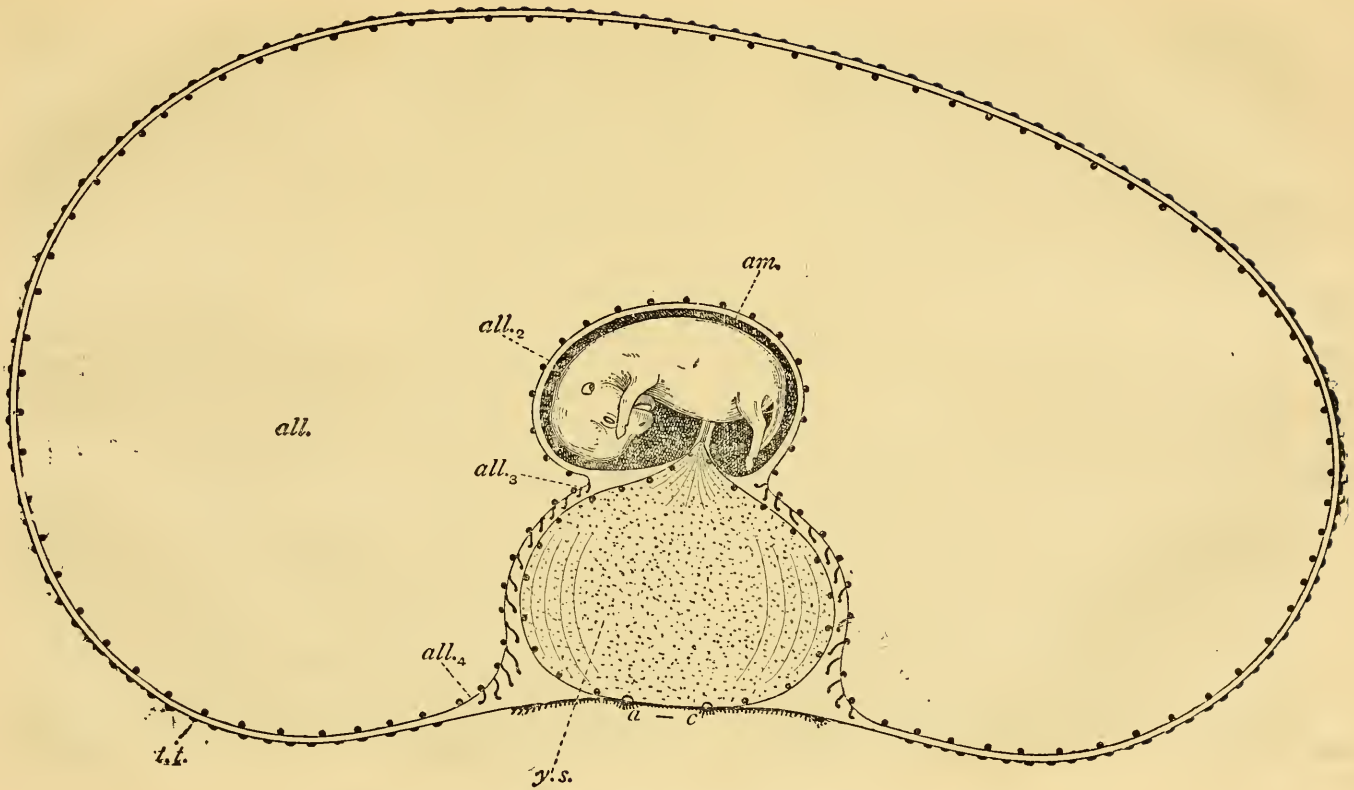

FIG. 5.—Seven Weeks Old Embryo of Horse, Natural Size.
t, Embryonic sac; *all*, all_2, all_3, all_4, Allantois; *am*, Amnion; *y s*, Yolk sac; *a c* Absorbing area.

of two layers, termed respectively the embryonic sac, *t t*, and the allantois, *all*, all_2, all_3, all_4.

In the early weeks of gestation the fœtus is anchored on to the uterus between the points marked *a* and *c*, and by this means is enabled to draw its nourishment from the dam. The nutritive matter there obtained first enters the yolk sac, *y s*, and is afterwards taken up by the vessels distributed through its walls, and by them conveyed to the embryo.

As growth becomes more active the connection of the embryo with the uterus becomes more extensive and secure, and about the eighth week the entire surface of the embryonic sac contracts a union with the uterus by branching off-shoots which bury themselves in the mucous membrane. The blood-vessels of the former are now brought into contact with those of the latter in such way as to allow an abundant supply of nutriment to pass through the walls of the vessels from one to the other, and, at the same time, to insure the necessary supply of oxygen for the purposes of respiration.

Pregnancy and its Signs.

When the fertilised ovum has contracted a physiological union with the uterus the animal is said to be pregnant, or "in foal," and the process of gestation has begun. It is always a matter of concern with stud managers and breeders to be assured that all is well in this connection. But, although there are certain signs commonly indicating the pregnant state, they sometimes appear in such a variable and dubious manner that correct diagnosis becomes very difficult or, it may be, impossible; and this is especially the case in young mares with their first foal, who do not "let down" freely, and in old mares who have a naturally deep and pendulous abdomen, made still more so by long-continued breeding.

In ordinary circumstances, however, conception is followed by well-defined changes in the temperament and susceptibilities of the subject, as well as in the volume and form of certain parts, and later in the greater activity of particular organs. In addition to this, information may be gathered at various stages of gestation from observations directed to the movements of the fœtus as seen from without, and from explorations made by the hand within. One of the earliest, if not the most reliable, indications of conception is the cessation of œstrum, or horsing, and the mare's refusal to accept service after recent copulation. Instances to the contrary, however, have been known to occur again and again, and every breeder of experience can furnish examples of

mares returning to the horse when, according to the time when they foaled down, they must have been pregnant. Some mares, indeed, will receive the sire repeatedly after a fruitful service, but many horses will refuse to serve a mare in foal.

Another and a very notable sign of pregnancy is the marked change in temperament and behaviour. Any disposition to skittishness and irritability that may have existed disappears, and the animal becomes quiet, even approaching to dulness. Her movements, too, are less active and energetic, and she is often described as lazy. Moreover, she rests, takes food with unusual zest, and, unless unduly worked, lays on flesh. Some mares become ravenous in their feeding, and occasionally filthy. Sooner or later, the period depending on age, condition and management, an increase is observed in the size of the belly, and subsequently in its form. In this connection, young mares carrying their first foal show but little change until pregnancy has far advanced, and in some cases doubt may exist even to within a few weeks of parturition. When in regular work and receiving a liberal amount of corn, aged mares do not so soon and so obviously "let down" as do others at pasture. The snugness with which the foal is carried depends a great deal on the bracing influence of "condition." As to the form of the barrel it is noticeable, as gestation proceeds, that there is a gradual break in the uniformity of the enlargement resulting in the under surface of the belly becoming strikingly prominent with a tendency to an angular outline. This departure from the maiden form is very pronounced in some mares at an early period after conception, while in others it is only seen in the later months of pregnancy.

Should the outward signs of pregnancy not be conclusive, reliable information may usually be obtained by rectal or vaginal exploration.

Rectal Exploration.—As already pointed out, the rectum or posterior bowel is situated immediately above the uterus, so that by passing the hand into the former the contents of the latter may be felt. The anatomical relation, therefore, of these two organs renders the diagnosis of pregnancy comparatively easy, but it should be understood that for three months, and sometimes longer after conception, the fœtus is too small to be identified through the thick walls of the two organs, and often too far away in one or the other of the uterine horns to be reached by the hand of the explorer; success in this examination depends accordingly on the size and position of the foal. Even when of considerable growth it may be quite out of arm's reach, especially in some old roomy mares where it sinks to

the bottom of a pendulous abdomen. It is related, indeed, by a distinguished member of the veterinary profession that on one occasion, being called upon for an opinion as to the pregnancy or otherwise of a mare, he made a diligent and careful examination per rectum, and, failing to find the fœtus in the uterus, expressed the opinion that the mare was barren. Imagine his surprise and consternation when, three months later, he was informed that she had been delivered of a fine colt. As to the desirability and safety of this mode of investigation, it may be said that when pursued with due care, and with proper regard to the subject to be examined, it is quite free from danger, but when practised on certain excitable temperaments, or in a rough and careless manner, even in animals of a placid disposition, abortion may sometimes be induced.

Rectal exploration is an operation requiring not only nice discrimination and care, but some knowledge of anatomy as well. As a preparatory step the animal should be allowed to fast for twelve hours, so that the posterior bowel may empty itself and room be afforded for play of the hand. If the foal cannot be felt in the natural position of the mare, she may be made to stand on a sloping surface with the hind quarters lowermost, and it is also recommended by some to raise the floor of the belly by means of a rug placed beneath it, aided by an assistant on either side.

Vaginal Exploration.—Here the desired information is sought by introducing the hand into the vaginal passage, and carrying it forward as far as the neck of the uterus, which in this instance is the part to be inspected. If the womb is empty the neck will be found projecting into the vagina, while in advanced pregnancy it is shortened to the last extremity and almost entirely obliterated. Vaginal exploration, unless performed with the greatest possible care, involves considerable risk of exciting abortion, and especially in young mares and others of an excitable disposition. It is neither so safe nor so reliable as exploration per rectum, and should not be resorted to save in very special cases.

Beyond these means of diagnosing the pregnant state some observers have succeeded in hearing the fœtal heart beat through the abdominal walls of the parent. For this purpose the instrument termed the stethoscope is interposed between the ear of the listener and the flank of the mare. By moving it about from place to place, and concentrating the attention on the sounds conveyed through it, the pulsations of the fœtal heart may sometimes be heard as the subdued ticking of a watch. Many very excellent obstetricians, however, have failed to identify the

heart's beats amidst the noise and rumbling of the bowels, and under the most favourable circumstances the operation is a tedious and protracted one.

Signs of approaching Parturition.

As gestation draws to a close indications of the pregnant state become more and more striking. The belly lets down and bulges at the flanks, where the fœtus may sometimes be seen to give an occasional jump, especially after the ingestion of cold water following upon exertion. Later the udder flushes, and becomes large, full and tense, the milk ducts are plugged with a wax-like secretion, and the ligaments of the pelvis relax, producing that condition of the croup known as "dropping of the bones," "falling in at the hips," &c. Coincidently the vulva or external genital parts swell, the lining membrane assumes a red colour, and a viscid secretion is discharged from the vagina.

At the end of the term certain well-known signs of its completion are presented. Among them the mare is noticed to become restless and to cease feeding, the face wears an anxious expression, and she will repeatedly neigh and paw the ground. Urine and fæces are frequently discharged in small amount, and later on there are signs of colicky pains when she lies down and rises again. Straining now sets in, and a bladder-like extrusion appears at the vulva. This is the "water-bladder," or more properly the fœtal membranes forced out by their contained fluid which, as we have already explained, serves to enlarge the passage and prepare the way for the foal. As the throes or "pains" become more and more energetic, the protruding membranes having done their work, break, and the water gushes out in considerable quantity.

Period of Gestation.—The period of gestation in the mare is about eleven months, being sometimes a little under and at others a little over. The average number of weeks given by different Continental observers is variously stated to be between forty-eight and forty-nine. In thirty-three thoroughbred mares at the Middle Park Stud, Dr. George Fleming found the average duration of pregnancy to be 335½ days, "the shortest periods being 316 days (one instance) and 318 days (one instance), and the longest 354 days (one instance) and 348 days (one instance)." With regard to sex, statistics in this stud bore out the result of general experience, that colts are carried longer than fillies, but not to a great extent. In sixteen of the former Dr. Fleming found the average duration of gestation was 336½ days, while in seventeen of the latter it was 334.

Parturition.

Parturition is the act of giving birth, or, as it is commonly termed in respect to the mare, foaling. If the foal is in a natural and proper position the fore feet are first presented at the vaginal outlet, and these will be quickly followed by the nose resting upon the cannon bones, and then the head appears, and by a series of forcible efforts the body as a whole is gradually pressed through the passage. With comparatively few exceptions the parturient act in the mare is commenced and completed without extraneous aid. It is usually effected in a standing posture, and under normal conditions seldom occupies more than ten to twenty minutes. The fœtal membranes or "afterbirth" may escape with the fœtus, or be retained for a short period until the uterus recovers its power, when further contraction of its walls suffices to expel them. This regular course of events, however, is liable to interruption from various causes, with which the breeder of horses should be acquainted.

In natural parturition the forces engaged in the act are the contraction of the uterus in the first place and in the first degree, and the contraction of the muscles of the belly in the second. By the exercise of this primary and auxiliary force, feeble and of brief duration at first, but gathering strength and endurance with each recurring throe or pain, the fœtus is ejected from the uterus. It is on these natural efforts, supplemented by one or another of the artificial means presently to be described, that the obstetrist relies for success in overcoming impediments to birth.

Natural parturition results when the size and position of the fœtus bear a suitable relation to the genital passage, and the powers of the dam are in no way impaired by debility or disease. In the presence of these conditions no extraneous aid is called for. Perfect quiet, ample room, a clean and airy box away from the filth and noise of the crew yard, coupled with judicious supervision without unnecessary interference, are the chief requirements of the pregnant mare. As we have just pointed out, parturition in the mare under normal conditions is an act of brief duration, sometimes occupying only a few minutes and seldom exceeding half an hour. The preparatory widening of the passage for the escape of the foal is brought about by the outward pressure of the "water-bladder," and the more completely this is done the more easy will natural delivery be rendered. This fact is emphasised because the practice of "letting out the waters" before they have done their work is far too common, and cannot be too much condemned. In young

mares who have not previously borne a foal, and whose parts are in their maiden condition, this act on the part of the attendant may be followed by serious consequences both to the dam and offspring.

Difficult Labour.

As we have already seen, under ordinary circumstances the mare delivers herself without extraneous aid. Where, however, the act of parturition is unduly delayed, and the efforts of the mare fail to effect delivery, the time will have arrived when a careful examination should be made of the genital passage and the parts within it. It is most desirable that the relief of difficult labour should be undertaken early in the parturient period, while the mare is in the fulness of her strength and her throes are vigorous and prolonged. In the absence of a veterinary surgeon the person who undertakes this duty should be selected on account of his former experience, general intelligence, and tact, added to which nothing is more valuable than a long arm and a strong one. Some stud grooms and cowherds are very clever manipulators, and readily recognise the parts of the fœtus with which their hands come into contact. This is of the first importance as a means of bringing the foal into a position favourable to delivery. As a safeguard against injury to the mare the hands and arms of the operator should be thoroughly cleansed and well saturated with oil, in which a little carbolic acid has been previously mixed. The nails, if overgrown, should be cut down short, so that no injury may be done to the delicate parts within. These preliminaries over, the hand is carefully introduced into the vagina and carried forward into the uterus. After the genital parts have been examined for any possible obstruction, such as tumours, constrictions, deformities, &c., the situation and condition of the fœtus, the position of the limbs and the kind of presentation, are then to be determined. If the presentation is found to be a natural one—*i.e.*, both fore limbs and head fair for the passage—and all else besides favourable to delivery, inability to foal will be found to result either from a disproportion between the size of the fœtus and the passage, or to constitutional weakness and lack of strength on the part of the dam.

In regard to the limbs presented there should be no mistake as to their being fore limbs, nor should any doubt exist as to their belonging to the same fœtus. In certain malpositions, and in the case of twins, a hind limb and a fore limb may first come to hand, and even where two fore limbs present themselves one may belong to one fœtus and the other to another. In either

of these cases delivery would not only be impossible, but any attempt to bring it about would add very considerably to the difficulty of the situation, if it did not jeopardise the life of both dam and offspring. Whether the presentation be a forward or a backward one, the same precautions should be observed to guard against these untoward results.

Employment of Force in Delivery.

The amount of extraneous force necessary to effect delivery will depend upon circumstances. It may be only as much as a fairly strong man can alone supply, or it may require the combined efforts of two or several. Whether it be the one or the other, there are certain rules of guidance in the application of the force used that should be strictly observed.

In the first place, it should be steady, regular, and continuous—in other words, "a long pull, a strong pull, and a pull all together." Jerky and spasmodic traction is not only in a large measure force thrown away, but is actually injurious both to the dam and offspring, for in failing to co-ordinate with the efforts of the animal it delays delivery and tends to disarrange and damage the soft and sensitive parts of the passage.

Whether the force employed be manual or mechanical, it should be so timed as to commence with each throe or labour-pain as it occurs, so that the outward effort and the inward effort shall combine and operate simultaneously. So long as the mare is able to render assistance and her powers bear a fair proportion to the energy required, this rule should be rigidly observed. As to the direction which the outward force should take, this is a matter of very considerable importance. At the outset, and until the head has passed through the vulva, the line of traction should be directly backwards. At this time the withers will be entering the pelvic inlet, and in so doing tend to interfere with the onward movement of the fœtus by jamming against its upper boundary. To guard against this the traction should now be slightly inclined downward. As the shoulders come into the pelvic outlet the resistance will be materially increased, and may be best overcome by pulling first to one side and then to the other; and the same movement may be practised where, as sometimes occurs, the hips are unusually wide and drag in the passage.

Protracted labour, whether it results from disproportion of size between the fœtus and the passage, or from malposition or other causes, inevitably tends to weaken the powers of the mare and to materially discount the efforts of outside help. In this

case the strength must be upheld by the administration of stimulants, and a short period of rest must be allowed when exhaustion threatens. It should, however, be pointed out that in all cases of this kind there should be no lack of assistance present. Plenty of force early in the task, while the mare is fresh and full of energy, is of all requirements the most essential to success. Many mares are annually lost from neglect of this provision, and the protracted abuse to which it leads. Veterinary surgeons rightly complain that, if delivery is not rendered altogether impossible, the life of the mare is often jeopardised by the "pulling about" she has suffered for want of sufficient and well-directed force at the outset.

Abnormal Presentations and Malpositions of the Fœtus.

Anterior Presentations.

The obstacles to delivery are many and various. Some of them are connected with the fœtus, others with the mare, while in exceptional cases both contribute to render parturition protracted and troublesome, or even impossible. For reasons, some of which remain to be discovered, the position, or form of presentation of the young to the uterine outlet, is liable to variations of an extreme character, rendering delivery not only difficult but dangerous alike to the mare and the offspring, one or both of which are frequently sacrificed in the attempt. Thus, instead of the fore feet first entering the passage as in the natural form of presentation, they are sometimes found to be turned backward and resting beneath the elbows. In this position the head is presented alone, and the tendency of the throes is to drive the bent knees into the passage, where they become wedged and immovable, or against the brim of the pelvis, where they offer an obstinate resistance to delivery. A modification of this presentation, and one more difficult to deal with, is that where the head is fair for the passage but both the fore legs are directed backwards beneath the abdomen, and the feet opposed to the flank; or it may be that one fore leg is presented with the head in a natural position while the other is carried back towards the hind ones.

The head, like the extremities, is also subject to certain forms of deviation from the normal position and direction, whereby labour is seriously protracted, and in some cases rendered impossible. Such examples will be serious in proportion to the degree and kind of displacement existing. In this connection it is found that the head may be flexed upon the neck, and doubled under the brisket, between the two fore legs

which occupy the passage ; or it may be deflected to the right, or to the left, so as to rest on the side of the chest, or still further back towards the abdomen ; or it may be carried upward and backward to the full length of the neck. In rare instances the fœtus is brought into the extraordinary and almost unalterable position of having the head and all four limbs directed towards the passage. Besides these abnormal positions of the fœtus in its forward presentations there are also others equally difficult and embarrassing to the veterinary obstetrist in the breech or backward presentations. Of these the first and most tractable is that in which the hind limbs are directed backward with the feet in the passage, and the body extended in a forward direction with the back uppermost. A less favourable position results when, in addition to a backward presentation, the fœtus is found to be lying on its back. Here delivery is attended with considerable, although not necessarily, insuperable difficulty, so long as the hind limbs are accessible, and can be brought into the vaginal passage. The chief obstacles to delivery in this position are the hocks and the croup, which may successively become jammed against the brim of the pelvis.

One of the most difficult and dangerous presentations, both as regards dam and fœtus, is that in which the croup and buttocks first approach the pelvic inlet, while the hind limbs are extended forward beneath the abdomen. A less serious, though always troublesome, form of posterior presentation results when, instead of the hind limbs being extended backwards in the line of the pelvic outlet, they are directed forwards in such a way that the hocks are flexed at an acute angle on the lower thigh, and the latter on the upper thigh.

Besides these and other malpositions of the fœtus there are also many and various malformations, the result of either disordered development or disease, which oppose and render abortive the normal efforts of delivery. Thus in the one we have the different forms of monstrosities in which the extremities, or the head, or both, are numerically in excess, or the spine is partially double. These forms of obstruction are much less frequently met with in the mare than in the cow, but when existing they form serious obstacles to delivery, and the life of the mare will often depend on their being early discovered and promptly dealt with.

Obstructions, the result of disease, are seen more especially in those cases where the head or the abdomen of the foal is increased in volume by the presence of large quantities of fluid, constituting in the one case hydrocephalus, or dropsy of the brain, and in the other dropsy of the belly. Moreover,

a universal dropsy of the entire body may exist and render parturition impossible without expert help. Besides deformities and diseases of the fœtus, birth may be more or less interfered with by excessive general development, when the fœtus is found to have grown out of proportion to the dimensions of the genital passage. In this connection Dr. Fleming observes there are instances recorded of the fœtus of the cow and mare weighing 117, 165, and 189 pounds. It may therefore be readily understood that the greatly exaggerated volume which this weight represents must meet with much resistance in passing through a canal which in ordinary circumstances gives exit to a fœtus weighing from 56 to 80 pounds.

Impediments not less serious than those which appear in the fœtus may also occur in the dam. Of the latter, some are physiological and others structural. Of the first kind illustrations are found in those cases where, as a result of general weakness or exhaustion, the expulsive efforts of the parent are altogether insufficient to effect the discharge of the fœtus. The mechanical impediments resulting from disease, deformity, and displacement of the maternal parts are too many and varied to allow of more than a bare reference to examples of the several groups. As a whole they represent a source of considerable trouble and loss to the breeder, but they cannot be said to be of frequent occurrence individually. In the matter of disease, obstruction to delivery may be induced by tumours affecting the pelvis, or others growing in or out of the walls of the uterus or the vaginal passage, in rare instances also in the cavity of the bladder. Rigidity of the neck of the uterus as the result of past injury is also among the causes of difficult parturition arising out of disease. Deformity of the maternal organs finds expression in the bones of the pelvis, either as a congenital condition or as a consequence of fracture or some such deforming disease as rickets. It has also been observed that the uterus, for reasons but little understood, sometimes, though rarely in the mare, becomes twisted on itself in such manner and degree as to occlude the outlet and prevent the escape of the fœtus. The pregnant uterus is also liable to displacement when, as in rupture of the walls of the belly, it loses its natural support, and, falling from its place in the abdomen, remains suspended by the skin.

From a consideration of the foregoing references and illustrations the breeder will realise, as he may not have done before, the difficulties which beset the path of the veterinary obstetrist, and the danger incurred by delay in seeking his assistance and advice.

Rectification of Abnormal Presentation.

It would be impossible in the space allotted to this paper to consider all the various forms of malposition in which the fœtus may be found, but a brief reference to the more common ones may be of practical service to those engaged in stud management. In fig. 6 is depicted an anterior presentation, with the fore limbs flexed at the knees and the head fair for the passage. To effect delivery in this case it is necessary to secure the legs and to bring them into the position of a natural presentation—*i.e.* beneath and in advance of the head of the fœtus. For this purpose the cannon bone must be straightened

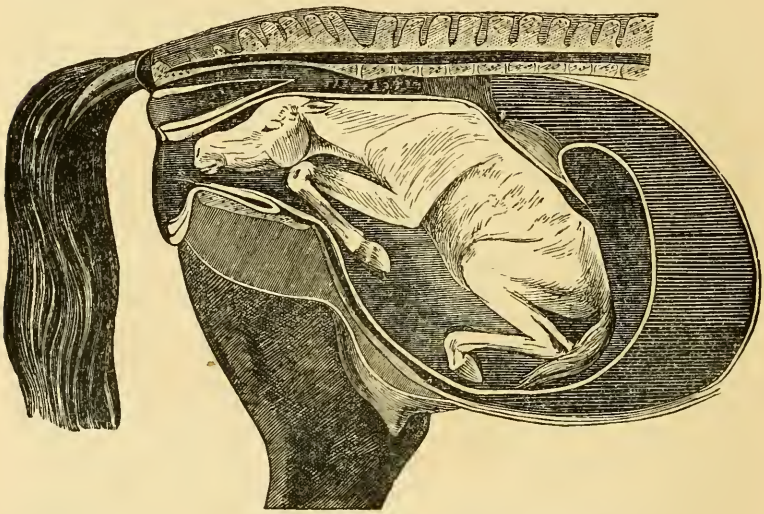

FIG. 6.—Anterior Presentation. Head and Knees in the Passage.

on the knee and the leg extended. Whether the right or the left limb should be first dealt with must depend upon its position. That one which is most easy of access and may be recovered with the least trouble is the one to be preferred. Where the head occupies the passage, it will require to be pushed back by planting the flat of the hand in front of the face. If a further backward movement is required, it may be effected by means of a crutch applied to the front of the chest. At the same time the hand is carried along the under side of the neck, until the forearm is reached and grasped, and after being pushed as far as may be required in a backward direction, it is then raised upward, so that the leg may be brought bodily forward. The

cannon is now seized, the knee is pushed up towards the neck, and the hand, drawing the limb forward, gradually moves towards the pastern, which it grips, and after bending the fetlock-joint draws the foot carefully into the passage. The limb should now be secured by cords and the recovery of the next one proceeded with, after which delivery may be effected in the usual way.

As already pointed out, a more difficult presentation is met with where, as in fig. 7, the head is presented and the fore-limb or limbs are carried back beneath the abdomen towards the flanks. Here the advantage of a long arm and a strong one will be plainly obvious, for the success of the operation in this,

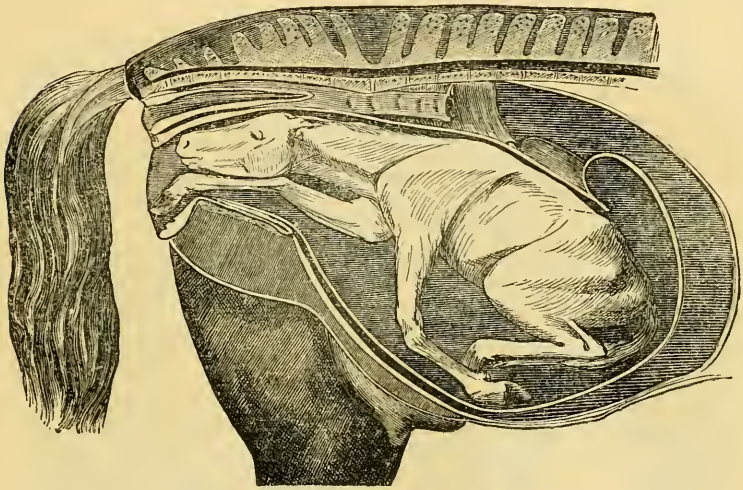

FIG. 7.—Anterior Presentation. Head and One Fore-Limb in Position.

as in the case last referred to, will depend upon the forelegs being secured and brought into position. If the head is in the passage, it must be put back; the hand is then passed along the under part of the neck until the forearm is reached, and brought up as before. Failing to accomplish this, a backward direction may be given to the foal by underpacking the forefeet of the dam with litter, so as to raise the front of the body. When the forearm is secured the hand should be passed downward as far as possible towards the knee; a good hold of the limb is then taken, and while the lower end of the arm is being raised to the pelvic inlet, the upper end will be forced backward. At this time it may be desirable to push the body of the fœtus back into the uterus with a crutch implanted against the breast, so as to make room

for the further upward and forward movement of the leg. As the limb comes towards the pelvis the hand will now seize the shin and proceed to bring the foot into the passage, as described in the last presentation. Should it occur that the arm cannot be grasped, either from its not being sufficiently within reach or from cramp or fatigue on the part of the operator, an attempt should be made to pass a cord round it by means of a suitable instrument, as shown at fig. 20, p. 31. In its absence a small hooked walking-stick, carrying a cord through a hole in the handle, may be used, and while the limb is being acted upon by assistants the operator will engage himself in raising and guiding it into position.

Malposition of the Head.

Downward deviation of the head presents itself in various degrees, from a slight bending upon the neck to that extreme

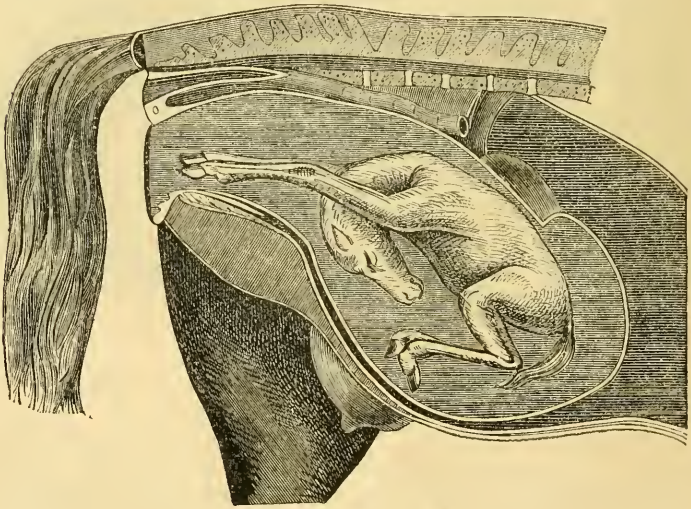

FIG. 8.—Anterior Presentation. Fore-Legs in Position, Neck bent downward on itself.

condition of displacement depicted in fig. 8, where the head is doubled under the body, while the neck is presented to the pelvic inlet and blocks the way to delivery. The difficulty attaching to this and other deviations of the head arises out of the great length of the foal's neck, which allows it to be carried out of reach. In the matter of adjustment, the trouble to be encountered will be in accordance with the degree of backward displacement. This may be no more than to bring the nose

against the brim of the pelvis, but sufficient to interfere with natural delivery. Here it is only required to introduce the hand into the uterus, and on reaching the nose to carry it round the chin, or pass the fingers into the mouth and by a steady pull raise the head into the passage and complete delivery in the usual way. When, however, the head is situated deep down under the brisket, and the poll is firmly fixed against the pelvic brim, or the neck encroaches on the passage, the task becomes both difficult and embarrassing. In this position rectification will be assisted if the hind-quarters of the dam are elevated by under-packing with litter, so as to give the fœtus a downward inclination. Should the neck present itself to the passage, the

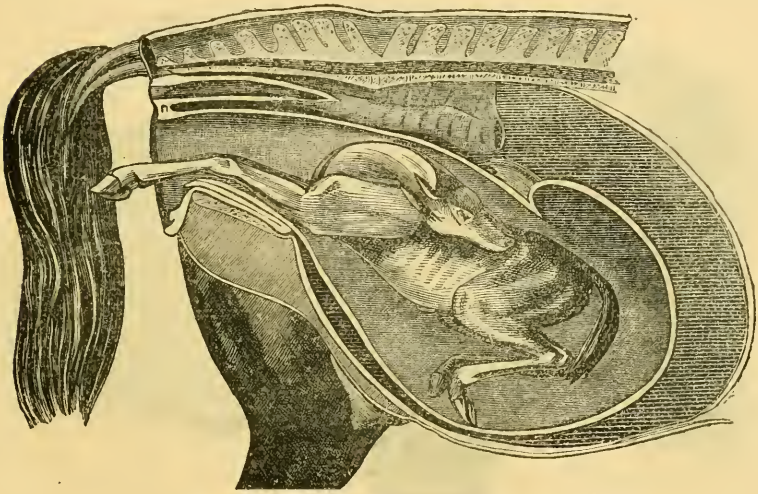

FIG. 9.—Anterior Presentation. Fore-Legs in Position, Head and Neck deflected to the Left.

body will require to be forced backward by means of a powerful arm, or, failing in this, crutches applied to the front of the shoulders in order that room may be provided for the forward movement of the head. To raise the latter, advantage must be taken of such parts as come within reach to which traction may be applied. Thus, the ears will be first accessible, or blunt hooks or crotchets may be anchored on to the orbits, or passed behind the lower jaw, or into the angle of the mouth. If capable of adjustment, a cord round the neck may also afford assistance. It should be borne in mind that in attempting to rectify this form of presentation, the backward force applied to the body should be exercised simultaneously with that acting upon the head. Mechanical ingenuity, tact, anatomical know-

ledge and discernment are all necessary in dealing with this difficult form of presentation.

Lateral displacement of the head (fig. 9) may be either to the right or to the left. The head may be simply bent upon the neck, or the neck may be bent upon itself and the head carried backward to the side of the shoulder or the chest, or descend towards the floor of the uterus. In whatever degree the deviation may exist, the presentation is at all times difficult and often an impossible one to correct. Especially is this the case with the foal, for reasons already stated. Referring to this form of displacement, Dr. Fleming observes: "The principal aim is of course to get hold of the head, adjust it, bring it into a favour-

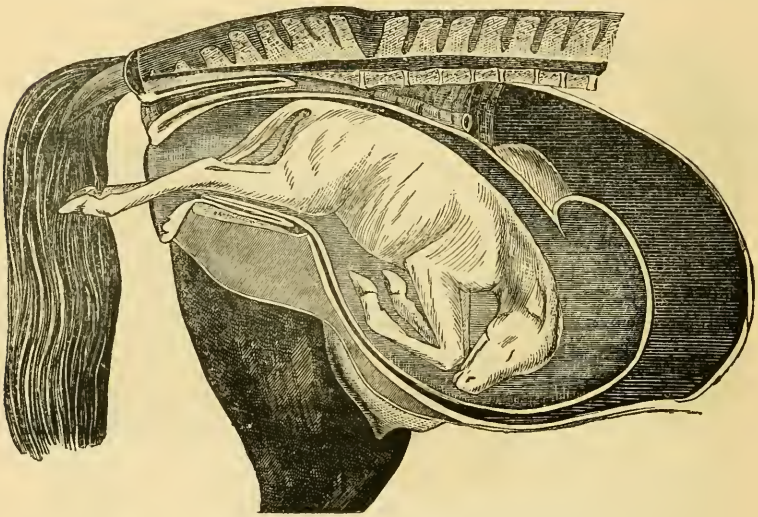

FIG. 10.—Breech Presentation. Legs Fair for Delivery.

able position in the genital canal, and then terminate delivery. But this indication cannot always be carried out, especially when the head is beyond reach. With regard to adjustment, the better plan appears to be as follows. Cord the presenting fore-feet, push the fœtus into the uterus so as to clear it from the inlet, pushing either on the flexed neck or chest, and not directly forward but rather obliquely to the side opposite that to which the head inclines, so as to bring this round to the inlet. If the fore limbs are in the way of the operator they may also be pushed back into the uterus. The head is then to be sought for and twisted in such a way as to bring its under surface uppermost." To effect this latter change requires an

amount of dexterity in manipulation and in the use of mechanical appliances only possessed by the experienced accoucheur, and when professional assistance can be obtained it should not be attempted by the amateur.

Posterior or Breech Presentations.

In this form of presentation the more common obstacles to delivery arise out of the position occupied by the hind extremities. Where, as in fig. 10, they are extended in the passage, and the croup of the fœtus is in apposition with the spine of the dam, delivery is most favoured, and although this

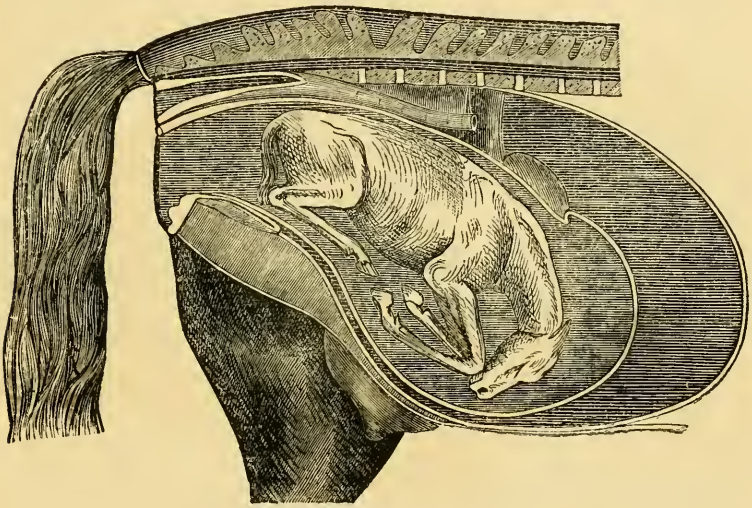

FIG. 11.—Hock Presentation.

may be effected by the natural efforts of the mare, such cases should always receive prompt assistance when the necessity arises. There is nothing here in the matter of position to rectify. All that is necessary is to aid by force, as may be necessary, the expulsive throes of the dam.

Very different is the case of what is known as hock presentation (fig. 11), when, instead of the feet being projected into the genital canal, as in the presentation last referred to, they are carried beneath the belly, while the hocks occupy the passage, or they, together with the breech, are jammed in the pelvic inlet. In the latter condition especially the obstacle is always a formidable one, and in the mare frequently insurmountable. To effect delivery requires that the hind limbs shall

be brought into the genital canal and fully extended. Before this can be done, however, the necessary room must be provided by forcing the buttocks of the foal away from the passage. Here, again, some assistance will be derived from raising the hind-quarters by under-packing with litter or other means. By thus giving the body of the dam a downward inclination from back to front, the foal will more readily respond to pressure from behind. This may be applied either with the hand, or a crutch (fig. 12) brought to bear steadily but persistently upon the buttocks a little below the tail. The intervals between the throes or straining should be chosen for action, when there is no resistance to the forward movement of the fœtus into the uterus. When the passage has been sufficiently cleared an attempt must be made to recover the legs, and bring them one by one into position. To do this the palm of the hand should be planted against the under side of the point of the hock, and the second thigh forcibly pressed in an upward and forward direction. If a cord is now passed round

Fig. 12.—Crutch or Repeller.[1]

the hock, and handed to an assistant, the limb may be steadied in position, while the operator, grasping the shin bone, will, with outside assistance, draw the leg towards the pelvic inlet. As progress in this direction is made the hand is to be moved along the cannon towards the fetlock joint. The foot is then seized and the pastern forcibly flexed, and the leg lifted into the passage and extended. When the buttocks by being forced back towards the passage again interfere with adjustment of the legs, the crutch or repeller must be brought into use, and it may also be desirable to carry the cord down to the pastern when additional force is required.

Still more difficult and dangerous is the presentation given in fig. 13. This position, at all times serious, is rendered even more so by the throes of the mare, which tend to push the presented parts backward into the passage and to force the hind legs forward beyond the reach of the operator. Early recogni-

[1] This form of repeller is used when it is required to bring force to bear on the buttocks, in which case the centre-piece is passed into the anus.

tion, therefore, of this malposition is of the first importance, and the absence of any appearance of the feet in the passage should lead to prompt exploration of the fœtus and the engagement of professional help. The difficulties to be overcome in this form of presentation are very considerable at all times, and often insuperable. With the croup wedged in the pelvic inlet and the hocks beyond reach, the chances of readjustment and delivery are remote. Here, as in the last position referred to, the body of the foal must be forced into the uterus by means of the repeller, and the passage cleared for the upward and backward movement of the legs. An attempt should now be made to get a cord round the hock by means of the curved

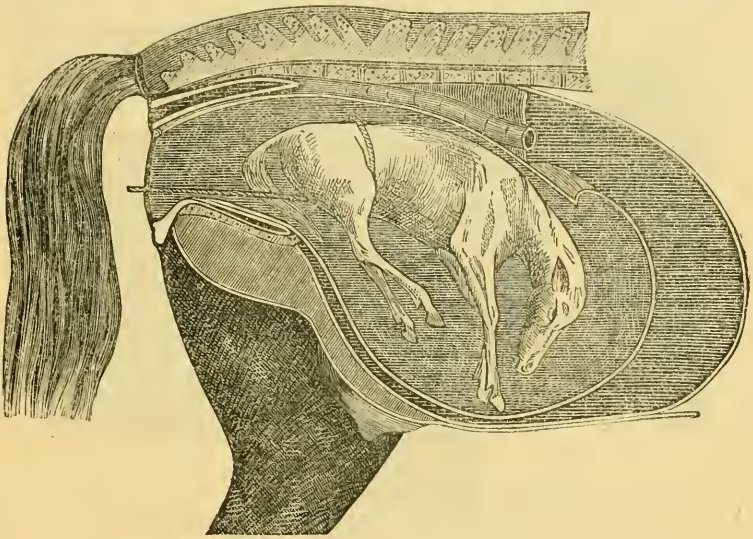

Fig. 13.—Thigh and Croup Presentation.

porte-cord and by forcible traction to draw it towards the pelvis. Where this can be done the further course of action would be such as we have described in dealing with the case last referred to. In some few instances where the hind limbs could not be recovered, delivery has been effected without change of position. This requires either to pass a cord round each of the thighs and draw it up to the flank or to fix one round the body, as shown in fig. 13.

Equally difficult and dangerous are the presentations depicted in figs. 14 and 15. In the former no parts have entered the passage, but the neck is presented to the pelvic inlet, while the head and fore-limbs are carried backward beneath the body,

In the latter the passage is occupied with both the fore and hind limbs, as well as the head. It need hardly be said that the rectification of such formidable malposition should only be attempted by the expert. The various illustrations of malpresentation are from Lehndorff's "Handbuch für Pferdezüchter."

Mechanical Aids to Delivery.

It would hardly be possible, in the space allotted to this article, to consider the many and various devices—mechanical, medical, and surgical—which the veterinary expert employs, in correcting and removing the numerous and varied forms of

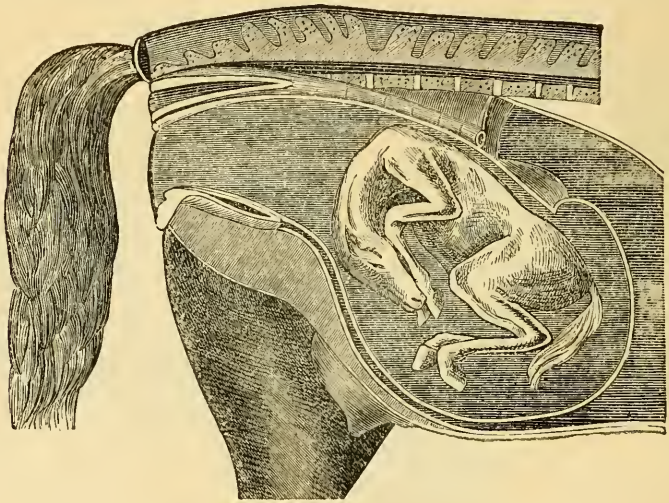

Fig. 14.—Anterior Presentation. Head and Fore Extremities turned back.

obstruction which complicate and oppose delivery. There are, however, certain devices and general principles of action with which all who are in any way concerned with horse-breeding should be acquainted, and which may here be briefly considered.

As we have already seen, the fœtus may present itself to the genital passage in a variety of ways, all tending to render delivery difficult, and often dangerous to both dam and offspring. To bring about a rectification of these malpositions and presentations with reasonable despatch and safety requires not only a knowledge of anatomy and physiology, but a large and varied experience of the technique of obstetrics in which the manipulation of the parts, and the selection, adjustment, and use of instruments and appliances, are of the highest importance.

These are qualifications which cannot be imparted by any written description, but must be acquired by experience and practice.

When the position of the fœtus has been determined and the

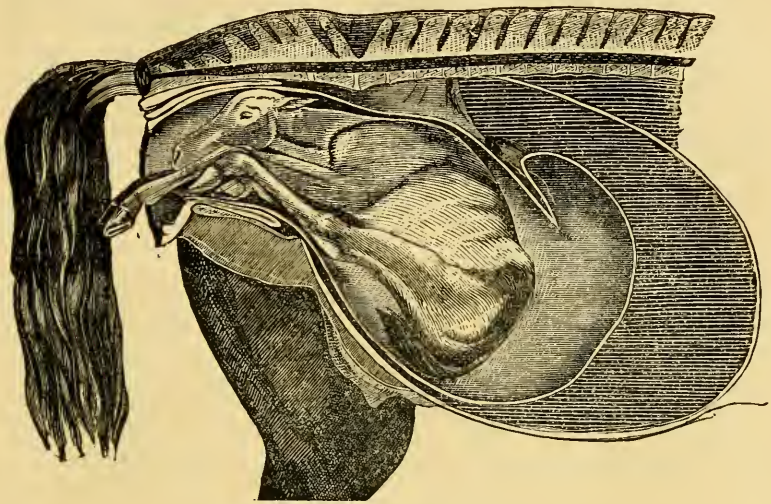

FIG. 15.—Head and all Four Legs Presented.

necessary change in the whole or any part of it has been decided upon, the mode of procedure will require to be considered. In

FIG. 16.—Sharp Crotchet.

FIG. 17.—Blunt Crotchet.

the first place rectification of malposition will be attempted by means of the hands alone, and, failing this, one or more of the various appliances employed in obstetric practice will be resorted

to. In addition to ropes and cords, these comprise sharp and blunt pointed hooks (figs. 16 and 17)—some attached to ropes, and others fixed to handles—crotchet-forceps (figs. 18 and 19), pulleys, and other mechanical aids to delivery. Nor must it be forgotten that considerable assistance may sometimes be derived from placing the body of the mare in certain special positions. In one case, as we have seen, it may be necessary to raise the hind quarters, so as to throw the fœtus forward, while in another the opposite attitude is required to be enforced.

As to the means of effecting these changes of posture, much will depend upon the extent to which they are needed. A con-

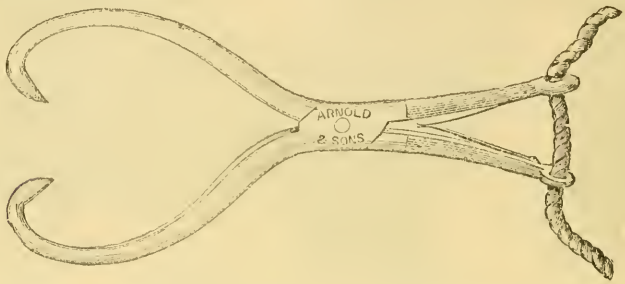

Fig. 18.—Pointed Crotchet Forceps.

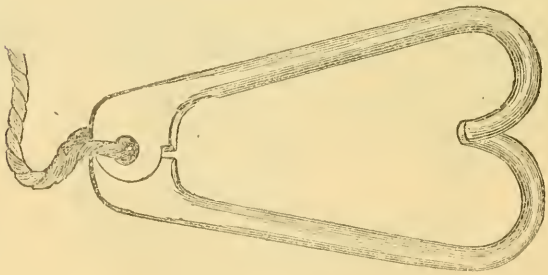

Fig. 19.—Blunt Crotchet Forceps.

siderable inclination either one way or the other can be given to the body by underpacking the fore or hind legs respectively with litter; but where it is required to give the hind quarters a distinct upward tendency—which, by the way, seldom occurs—pulleys acting from a beam will need to be resorted to. In the employment of mechanical appliances for the purposes of delivery, it is of the first importance that the operator should make himself acquainted with the parts that most readily and usefully lend themselves to bring the whole into proper position; and it should be an invariable rule of procedure, where help of this kind is needed, to secure with

ropes or other means all parts, whatever they may be, which first present themselves in the passage. By adopting this course the operator is at liberty, while deciding as to what parts are to come first, to return any one or all of them into the uterus, with the assurance of again recovering them should necessity arise. Moreover, where the head is thrown to one side and nothing but the fore legs present, it may be desirable to put the legs back until the head is brought into position. In such-like cases, the legs, having been secured, may be brought into the passage at any time, whereas if unsecured they may pass out of reach, or be forced during the throes of the dam into some difficult position, in recovering them from which much time would be lost. The body and extremities of the foal offer many points for the adjustment of ropes, cords, and hooks as means of traction. When the head is accessible, a light headstall may be applied to it; or a stop noose may be put round the neck, or a running noose introduced into the mouth and carried over the poll, or a cord may be affixed to the lower jaw, and so on, according to the requirements of the case and the facilities which offer for adjust-

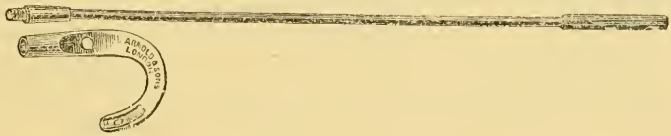

Fig. 20.—Porte-Cord.

ment of the one or the other. It should, however, be observed that while the head forms a most substantial base for the application of force, the lower jaw is likely to be severely damaged, or even broken, unless the amount of traction applied to it is judiciously regulated.

Besides the use of ropes, there are certain parts of the head into which hooks may be fixed, after other and less heroic means have failed to secure a hold. If, for example, the head be turned back, and the angle of the mouth cannot be reached by the finger, a blunt hook mounted on a suitable rope or handle may be pushed forward, and anchored on to the cheek. In difficult cases, when the last-named part cannot be reached, the orbit of the eye will afford a favourable point into which to insert the finger or a blunt hook, or in difficult cases even a pointed one may be employed. Should the latter be adopted, the amount of force used must be carefully graduated, or the instrument will be made to tear out and may seriously damage the uterus. In fixing hooks into the orbit care should be taken not to injure the eye, unless the foal

is dead or the mare in danger, when no consideration of this kind should influence the operator.

When the hind part of the body is presented, and the posterior limbs are advanced beneath the belly of the foal, ropes may be passed between the legs and brought round the thigh, or the bend of the hock, or both in succession, as progress is made in raising the limbs towards the natural outlet. For this purpose various forms of porte-cord are used, of which the one shown in fig. 20 is perhaps the most useful.

Double hooks or crotchet-forceps, blunt or pointed as may be required, may also be brought into use, both in anterior and posterior presentations, when no sufficient hold can be secured by any other means. These instruments may be made to penetrate the tissues and take a firm hold of deep-seated tendons, or be anchored on to bones and ligaments. Equally useful in the rectification of abnormal presentations are the various forms of repeller or crutch (fig. 12, p. 26), by means of which the body of the fœtus as a whole may be pushed back, in order to make room for the advance of misplaced extremities, and to secure them by means of ropes or other appliances.

In connection with mechanical aids to delivery, it remains to be said that in their employment the strictest regard should be paid to cleanliness, and all ropes and appliances used for parturition purposes should be well scalded and disinfected.

The Treatment of Brood Mares.

Early Mating of Mares.

The perennial question as to the age at which mares should commence their stud career is as green to-day as it was thirty years ago, and there are plenty of men of large experience who believe and act upon the dictum that the "dictates of nature" should be promptly complied with, and that at the early age of two the mare should go to service. To this suggestion there can be no objection if the breeder has no desire to enter the race for supremacy, and has no ambition to produce a "horse of the century," or add to the excellence of the general stock. It is urged by those who practise this system of early mating—and who does not?—that it is economical, since at a period when young mares must perforce lead a more or less idle life they may by this means be made to yield some immediate return for the outlay bestowed upon them. This is perfectly true, and it is hardly to be expected that consideration for the higher principles of breeding will be allowed to stand in the way of that narrow but urgent margin of profit obtained by the average breeder.

There can be little doubt that mares born early in the year and well forward in growth at two years old are much less retarded in development at this time, and more likely to produce a good foal, if well done, than others less favourably situated; but the fact remains that the practice is not conducive to the best interest of our horse stock, and the writer has no hesitation in affirming that in respect to size, frame, constitution and bone, it is distinctly prejudicial. It is not contended that mares at this age do not now and again breed horses of the highest class. Instances to the contrary are to be found in every breed.

Among others of the Shire breed, for example, is that grand horse Bury Victor Chief, who was the produce of Bury Daisy at three years old. Among the Hackneys, Garton Duke of Connaught, Langton Duke, Langton Performer, Vigorous, Astonishment, Orange Blossom, and Dorothy Derby II., are all out of three-year-old mares. But these and such other examples as are to be found form a very small proportion of the total of good horses of the respective breeds, and include a still smaller proportion of the best. While recognising, therefore, the possible and occasional success of early breeding, such statistics as our various stud-books afford will, I believe, lend no sort of encouragement to the practice, if they do not actually condemn it.

To say when a mare should not be put to the stud does little to advance the argument, and leaves the question very much where it was. It remains, therefore, to indicate at what age this may be permitted with the greatest prospect of success in the production of the best and the improvement of the whole. In this connection we might point to mares in every variety who have produced high-class horses when stinted at three years old, and still more who have given us produce above the average at the same age; but a full consideration of the question warrants the conclusion that the best results would follow were mares allowed to commence their stud career a year later. At this period growth is drawing near to completion, the organs of reproduction have acquired size and stability, and the physiological energy hitherto engaged in building up the frame may now be more largely devoted to maturing the fœtus. At the present time, when want of size in our working horses is so universally recognised, breeding from babies can hardly be regarded as a commendable practice.

When Foals should Fall.

To so regulate the mating of mares that the foals shall be dropped at a suitable season is a matter of the greatest concern

to the breeder of horses. In these days of horse shows, with their numerous and costly prizes, medals, and challenge cups, great temptation is offered to the breeder of pedigree stock to strive after early produce, and to resort to a system of forcing and pampering which, while productive of a limited and temporary success, cannot be otherwise than disastrous to the general well-being of the horse. As to the particular month of the year when foals should be encouraged to come, a great deal will depend upon the soil, locality, and climate in which they are to be reared, and, naturally, opinions on this question vary with the variations of experience gained under different local conditions. In a climate so uncertain and trying as ours, early foaling is distinctly prejudicial to the life and health of the offspring, and it is not too much to say that a large share of the loss and disappointment that breeders experience under ordinary conditions is due to this cause. Some consider the advantage of an early colt to be a good set-off against the risk entailed, and the latter part of February or the beginning of March is the time arranged for foaling to commence. With the prevailing winds from the east or north-east at this season of the year, cold rains and snowstorms, little sunlight, and a scanty supply of rank herbage, both mare and foal must either be subjected to confinement for several weeks, or face the rigours of the season and attendant risks. Nothing conduces so much to the health and well-being of the dam, and to the growth and stability of the foal in the first period of its life, as an abundance of spring grass and the vivifying influence of the solar rays. These desiderata cannot be hoped for as a settled condition until the month of April has well advanced, and it is from this time onward, through May and June, that the best and strongest foals will be dropped and most successfully reared. The best food that can be procured, and the most perfect stable and management that can be designed, are poor substitutes for the liberty, pure air, and rich, succulent herbage of advanced spring.

Foals dropped late in the summer are at an equal disadvantage with those that appear too early. The grass at this time is losing its goodness, and the milk of the dam is indifferent both in quantity and quality. Besides, the nights are getting cold and damp, and, worse than everything, the youngster will be shedding its coat at a time when it should possess its winter suit. All this tends to lower the vitality of the individual, to check growth, and enfeeble development. If foals are to grow, and shape, and make good horses, they must bask in the sunshine of summer and receive an abundant supply of the rich milk and ripe herbage it affords. Moreover, growth, to be

attended with substantial development, must be continuous, and uninterrupted by the poverty and inclemency of both spring and autumn.

Management of In-Foal Mares.

Not the least important branch of stud management is that which deals with the care and protection of mares during the period of pregnancy, and it is not too much to say that a considerable percentage of the sickness and mortality ordinarily prevailing in our breeding-studs results from causes of a common and preventable character. Of these some are especially conspicuous, and perhaps none more so than the prevailing and rapidly extending system of undue feeding, fattening, and pampering which mares of the heavy breeds especially are subjected to in the course of their show career. This is an evil so obvious to everyone concerned in horse-breeding, and so universally admitted by all, that neither evidence nor argument is called for here. Were it otherwise, ample testimony would be found in the stud-books of our heavy breeds. Here it is clearly shown that the productiveness and breeding merit of our great champion mares stand at an almost irreducible minimum, and the limited number of successful produce among their offspring is such as to leave no doubt as to the pernicious effects of the "getting up," and "letting down' to which they are subjected in the course of their show career' The obesity in which the great bulk of our show mares are found during the exhibition season is a state altogether inconsistent with the exercise of the full measure of their productive powers. With every organ in the body encumbered with fat and impeded in function to the verge of disease, it would be strange indeed if the fœtus did not suffer in point of size and constitution. Nor does the mischief of this injurious practice end here, for the danger to both dam and foal where any impediment to parturition arises is multiplied many fold, —firstly, by diminishing the room naturally available for the passage of the fœtus; and secondly, by lowering the vitality and strength of the dam, and adding to the difficulty of delivery. It is not only in its immediate effects that this practice proves hurtful but, long after it has been discontinued, sterility, or a disposition to abort—one or the other—is often left behind, while the capacity to reproduce, in the offspring, that vigour of growth and frame which characterises the parent is frequently weakened beyond recovery.

Good general health is unquestionably the bodily condition most conducive to productiveness in the dam and growth in

the young, and this state can only be acquired and maintained in its fullest measure by a judicious system of liberal feeding and apportionment of suitable work. It must, however, be recognised that while the former may, and should, be within the reach of all who aspire to horse-breeding, the latter is for obvious reasons impossible of universal adoption. Mares kept exclusively for breeding purposes lead a life of idleness—in what is usually, but erroneously, regarded as a natural state. As to pasturing brood mares much might be said, but it will be sufficient to note the chief points in which it may fail of success. Not the least important of these is the nature of the country. Steep hills and rough ground should certainly be avoided, and especially so where the mares are big and roomy, and in all cases when pregnancy is far advanced. Very naturally, to any suggestion of this kind may be opposed the condition of mountain ponies. Mountain ponies, however, are neither big nor roomy, nor are they highly bred, or highly fed, or highly domesticated. Their susceptibility to outside impressions cannot be compared with that resulting from the long years of cultivation and artificial treatment of our improved breeds. Besides, there is no evidence to show that even these denizens of the mountains do not suffer as breeding animals from the physical conformation of the country they inhabit.

Of still greater importance to the well-being of the brood mare is the nature of the soil from which she draws her sustenance. That best adapted to stud purposes is such as will neither fatten nor starve, but supply a steady growth of herbage of a sound and nutritive character throughout the greater portion of the year. Low-lying, damp situations, where the grass comes sour and rank, where the soil is wet, and dense fogs prevail in the cold nights of spring and autumn, are alike conducive to abortion and prejudicial to health. At all times the winter grazing of pregnant mares needs considerable care and attention on the part of the manager, and the resort to dry, nourishing diet should not be too long delayed. As to when it should be commenced will depend upon the nature and quality of the herbage, the size of the pasture, the number of stock upon it, the state of the season, but above all upon the condition of the mares. The last-named should never be allowed to get low. Poverty on grass is the worst form of poverty, not only because it is usually attended with exposure, but also because of the tendency which the cold, indifferent herbage of the autumn and winter possesses of lowering the temperature of the body. This kind of treatment not only predisposes to abortion, but at the same time retards the development of the fœtus, and tends to impair its vitality and render

the foal an easy prey to any disease that may overtake it at the period of birth.

Working and Breeding.

The view may not be universal, but it is very generally held that nothing conduces so much to the production of strong, healthy offspring as a reasonable amount of work under judicious management of the mare. A certain element of risk, it is true, always attends the active employment of pregnant animals, and especially those engaged in farm work, but with common care these are far outweighed by the benefits conferred on the dam and produce. With well apportioned work and a liberal supply of good food, foals are not only dropped bigger and stronger, but they resist exposure to adverse influences, and thrive and grow much better than those from idle, ill-conditioned mares.

As to the stage of pregnancy when mares should cease to work, different people entertain different ideas, but the question is surely far more one of management than one of opinion. It is common enough for mares to work right up to the time of parturition, and especially among little men who depend for their livelihood on the labour of their mares. But in these cases self-interest lends its force to management and largely determines the success of the enterprise. As a general system, such a course would be fraught with the greatest danger, but there can be no doubt where common care is observed in the selection and appointment of work, together with good general management, pregnant mares are all the better for use up to within three or four weeks of the time of foaling; when work is discontinued, daily exercise should be substituted, or, if available, some brief, light employment. The late Mr. James Martin—a rare authority, by the way, on blood and breeding—once observed to the writer: "I have foaled down eighteen mares this season. All have worked nearly up to the time of foaling, and without a mishap to either mare or foal." Such a result is not likely to be of common attainment, but it is most assured under the influence of reasonable, well-regulated work, and generous but careful treatment. In-foal mares should, however, be guarded against severe exertion, such as drawing heavy loads in deep ground or on hilly roads, or backing, or trotting at fast pace; nor should they be made to undergo long fasts or suffer fatigue. As pregnancy advances, and the calls of the growing fœtus on the nutritive resources of the dam become more and more considerable, so should the amount of work demanded of her be diminished, and the food ration undergo suitable adjustment. To assert that the

observance of such details should be among the commonplaces of every stud is only to suggest a state of things that, to say the least of it, is far from universal, technical education notwithstanding.

In the stable pregnant mares should be provided with plenty of room to permit them to lie down and extend themselves over a good bed of soft litter. The floor of the stable should not slant too much in a backward direction. When separated only by bails their companions should be quiet and free from vice. Breeding mares, however, never perhaps do better than when turned into the crew yard at night with a dry shed for protection from the weather and plenty of dry litter, provided they are on good terms with each other. Our cold and changeable climate has often been urged against this exposure of working animals, but experience teaches that with an adequate food supply the open yard is far more conducive to health than the atmosphere of the average stable, which is usually made filthy by the studious exclusion of outside air, and the deliberate confinement of that which is within. Moreover, the denizens of the open yard know nothing of those extremes of temperature the sudden alternations of which are so fruitful of disease, and while being at all times fitter for their work, they are also much less susceptible to sickness than those who spend their nights in the stuffy filth-laden air of a stable deprived of all means of ventilation.

When the weather permits, this kind of management allows the mare's being turned to grass for a few hours each day during the later weeks of pregnancy, without the risk attaching to animals more closely stabled. A bite of spring grass before parturition prepares for the more complete change of food which is shortly to take place, and protects the foal from those often fatal attacks of diarrhœa which result when mares are suddenly transferred from hard corn to pasture—from the close stable to the open field.

Food and Water.

Whatever may be the surroundings of the brood mare, she should receive an ample supply of good wholesome food, which should be regularly given. Long fasts, especially when associated with excessive work and fatigue, are distinctly inimical to fœtal life, and are often accountable for premature birth and sporadic acts of abortion. As an ingredient of the winter food, working mares should receive a liberal supply of pulped roots, and an occasional ration of bran, but on no account should the former be given to excess, or when in a state of decay. The pregnant animal is specially liable to digestive trouble, and for this

reason every care is demanded in her regimen. In some parts of the country potatoes are given as a substitute for roots, and in small quantities nothing can be said against them; but without careful supervision they may become a source of dire mischief, seeing that in certain conditions of decay they are capable of developing a poison as deadly as arsenic. Coarse, indigestible fodder, mouldy and mowburnt hay, are not the least harmful of degraded aliment, and should be altogether withheld from the breeding mare.

It is hardly necessary to insist that the supply of water be wholesome, if not pure, and it is not less important that it be regularly given. Long spells of work without water lead to drinking to excess, which in itself is a common source of trouble, but still more hurtful when the water which is consumed is cold and hard, as commonly supplied from the chalk. The familiar practice of allowing mares to "drink their fill" at the trough when returning from work heated and tired is much to be deprecated; the more so as pregnancy advances. A small quantity with the "chill off," to be followed by a full allowance after a brief rest and a little food, is more consistent with good management and security.

Brood mares should never be allowed to drink from ponds or ditches when low in droughty weather. In this condition the water they consume is not only saturated with the products of decomposition, but also with large quantities of decomposing organic matter. Moreover, it is in this state, when the beds of ponds and ditches become worked up with the feet, that the ova and larvæ of the most deadly of equine parasites gain access to the body. The writer is repeatedly being called upon to investigate losses resulting from this cause, and too often has witnessed the wreck of most valuable studs. In seasons of drought ponds and streams in the condition indicated should be fenced off, and the water carted from a clean source, or lifted into tubs without disturbing the underlying mud. Moreover, it should not be forgotten that the periodical cleansing of water courses and receptacles would do much to secure our breeding mares and their progeny against this fruitful source of sickness. This does not apply only to ponds and ditches, but to troughs and tanks, which often abound in filth. In advising the cleansing of the former, it should be understood that the common practice of dressing pasture land with the matter removed is full of danger to brood mares and their offspring, and indeed to horse stock generally, since any parasites or their ova that may exist in it are rendered immediately accessible to them while grazing.

Effect of Railway Travelling on Brood Mares.

The prevailing desire on the part of many to mate their mares with the best sires has been much encouraged in recent years by the more favourable terms and facilities offered for their conveyance and return over our various lines of railway. On the whole this may be regarded as a distinct benefit, especially to those who necessarily desire to keep down expenses, but it cannot be considered altogether an unmixed good. Long journeys inflicted on nervous, fretful young mares not infrequently cause them to refuse service or to prematurely part with the fruits of conception. Moreover, nursing-mares of excitable temperament, when long absent from their foals, are liable to return with the udder charged with unwholesome milk. Unless, therefore, the spirit of economy be tempered with discretion, not only may money be thrown away, but the life of the foal imperilled or sacrificed. Consequently, when mares are required to travel long distances to service, the udder should be emptied previous to leaving, and again on returning, before the foal is allowed to suck. Neglect of these precautions is sometimes followed by a troublesome and even fatal diarrhœa in the offspring. On reaching home a feed of scalded bran with which is mixed half a teaspoonful of carbonate of soda will prove serviceable in guarding against this untoward result.

Management of the Mare after Foaling.

Where large numbers of mares have to "foal down," comprising old and young, healthy and strong, to say nothing of varied temperament, habits, and vices, management after foaling demands a considerable amount of care and watchfulness on the part of the responsible head.

Mares which have been at the stud for some time generally know how to discharge the duties of their office, and if all has gone well in foaling, there is little to trouble about. With young mares, however, fresh to the business, certain special precautions require to be observed. Fretful and irritable animals should be waited upon only by their common attendant until they have become reconciled to their new condition and the excitement resulting from parturition has passed away.

While the foal is "getting its legs," the permeability of the teats should be tested, as it sometimes occurs that one or both have no outlet for the milk, and the defect usually remains to be discovered when the foal has been reduced to the verge of starvation. At the same time attention will be given to the

state of the gland and the quantity and quality of the milk it promises to afford. This precaution is specially called for in the case of mares foaling before their time is up. In such cases there is often a scarcity of milk for a day or two, and the necessity of drawing it from another source will require to be considered. Surplus milk from another mare will be found useful here when it is procurable.

If the afterbirth has come away it should be promptly removed from the box, and buried sufficiently deep that dogs may not exhume it. In too many instances it finds its way into the crew yard, whence it is hurried off by dogs into the "home field," where possibly other in-foal mares are pastured, and provoked to excitement and, it may be, premature parturition.

In the matter of food, a little warm oatmeal gruel is perhaps the best restorative, to be followed by a small feed of well-scalded bran, a little malt-meal and two or three tablespoonfuls of linseed oil. Mares advanced in years and those in low condition are materially benefited by a pint of good beer or an ounce or two of whisky where foaling has been protracted and difficult. So soon as the foal can stand, the box should undergo a thorough cleansing. All the litter fouled by the discharges of the mare should be removed, and after the floor has been freely dressed with some disinfecting powder, a fresh supply of clean litter is to be given. The danger of decomposing organic matter in the foaling box is too little appreciated, and so long as it is permitted so long must the breeder count on the diseases incidental to filth and putrescence. The risk attaching to uterine discharges is not limited to that which falls to the ground, but equally serious consequences may result from that other portion which, by trickling down between the thighs, or first soiling the tail, ultimately finds its way on to the udder and teats, and finally into the stomach of the foal. This and other descriptions of putrid matter adhering to the teats are productive of the worst and most destructive forms of diarrhœa. Many of those mysterious attacks of this ailment attributed to all sorts of possible and impossible causes arise out of the ingestion of putrid filth taken in the act of sucking. Not only may this poisonous stuff find its way on to the udder by trickling down the perinæum, but it may also be transferred from the filth-laden tail, or be gathered from the sodden litter on which the mare may lie.

This leads us to suggest the desirability of safeguarding the foal by repeated sponging of the udder during the few days the uterine discharges continue, and further to thoroughly wash and cleanse the tail of the dam after parturition. These precautions,

always desirable, are rendered especially needful where difficulty has been experienced by the mare in foaling.

For several days, or it may be weeks, depending upon the season and state of the weather, the mare and foal will be kept in confinement. During this time the former should receive a liberal ration of crushed oats, bran and hay chaff, to which may be added a little malt-flour and salt.

For the first two days after foaling the mare should be carefully protected from exposure and draughts, but since she is soon to go to grass, over-heating of the stable requires to be strictly guarded against by free but duly regulated ventilation. Through neglect of this precaution both mare and foal are sometimes exposed to dangerous extremes of temperature, not rarely resulting in fatal pneumonia. To keep a foaling stable too cool is pardonable, to overheat it is culpable. At the earliest opportunity consistent with safety both should be turned to grass. Midday, when the sun is up, the ground fairly dry, and the air not too fresh, is the most suitable time for the initial turn-out. The first impulse of a foal when liberated from confinement is to gallop and gambol until overheated and fatigued, and many a fatal attack of pneumonia has followed the subsequent rest on wet ground and exposure to cold, biting winds. A paddock with shelter from the north and east is much to be desired. Early spring is a period when the weather is given to rapid and extreme changes. Sudden clouding, cold winds and driving rains quickly succeed to bright warm sunlight, necessitating a return to shelter and protection. In a few days, however, with suitable cover at night, foals will adapt themselves to a complete outdoor life. Where in the case of early foals a turn-out is not permissible for some time, both mare and foal should have daily exercise. If the weather does not admit of its being taken out of doors, then a barn, covered yard, or shed may be used. A little movement causes foals to "straighten up" much more quickly than they otherwise would do, and to put them fairly on their legs.

As to how far grass will require to be supplemented with manger food when the turn-out is made will depend upon a variety of circumstances, the more important of which are the weather and the quality and stage of growth of the pasture. When the one is cold and the other backward a liberal daily ration of dry food should be provided, and, in any case, young mares that enter on their breeding career at two and three years old—as is now too much the practice—should receive a generous allowance of dry food until grass comes to its best and the season is well advanced; and the same may be said for old

mares who enter on their maternal duties late in life, and whose yield of milk is often very limited in amount and not always of the best quality.

In all cases, but more especially in those referred to above, not only should the mares be liberally fed, but the foals should also be encouraged to share in the manger food of the dam, so that any deficiency of milk supply occurring as the season advances may be promptly compensated by an addition to the corn ration. Loss of flesh and stunted growth in the offspring of the young and immature, as also in those of old and worn-out mares, are common consequences of neglect of this simple precaution. It may here be noted that continuous stocking of pastures with horses from year to year is a practice that never fails to bring trouble to the breeder sooner or later, whatever may be said of it on the ground of expediency. Besides fouling the soil and exciting abortion it tends to the scattering and accumulation of parasitic life in favoured spots, and the ultimate development of verminous disease, especially in the young. The danger becomes considerably increased where the enclosures are small, and more so if in addition they are wet and retentive of moisture. Mares, and foals too, are benefited by a good range of open ground, and a periodical change of pasture. Over-stocking and confinement in small enclosures are much to be deprecated. By the one the herbage is rendered rank and foul, while the other deprives the mare and foal of those short spells of exercise which conduce so much to health, condition and action. Pastures grazed with bullocks alternate years, or thinly stocked with horses and bullocks at the same time, are the most suited to the requirements of the brood mare.

The Treatment of Foals.

Attention to the Foal after Birth.

As a rule, the umbilical cord or "navel string" is broken from the afterbirth in the act of foaling. Occasionally, however, the foal is born enclosed in its membranes, with which it continues to be connected. In the latter case no time is to be lost in removing the youngster from its enclosure lest by excluding air from it too long suffocation ensue. The next step will be to divide the cord and free the one from the other. Before doing this some light string soaked in carbolised oil should be procured, and the hands of the operator, as well as the knife he employs, should both be thoroughly washed and well carbolised. This having been done, a carbolised ligature is now tied tightly round

the cord about an inch from the belly to prevent escape of blood. The cord is then cut through with a knife below the string, after which the navel should be freely dressed with carbolised oil or some equally efficient antiseptic. After protracted labour, or when the foal has been unduly confined in its membranes, it is sometimes found either exhausted to the point of extinction or threatened with suffocation. In these conditions any mucus or watery matter contained in the nostrils should be promptly removed, the legs and body should be briskly rubbed with wisps of hay, and artificial respiration is to be resorted to where the breathing becomes feeble and disposed to arrest. Restoration of the respiratory function in these cases may sometimes be facilitated by applying to the nostrils a bottle containing smelling salts, or, failing this, the fumes of tobacco may be used in the same way. As breathing becomes re-established, warm flannel wraps will prove a useful restorative, and a teaspoonful of brandy given in a little of the mare's milk will assist in the same direction.

After the lapse of half an hour the foal when free from such mishaps is ready with a little help to get on its legs, and when the dam has licked it over it may be conducted to the teat. A little milk drawn from the mare and rubbed over the gland will attract the foal by its odour, and sometimes save a good deal of trouble in starting it on its "milky way." Ill-nourished, weakly foals may be some time ere they rise to the teat, in which case careful supervision becomes necessary to avoid accident, and a little milk drawn from the dam and fed to it by hand will assist in helping it to its feet. These sickly youngsters often present a very misshapen appearance, with their bent knees and hocks, arched back, and depending head, but if the dam is a generous milker and supplied with good living, they soon begin to "straighten up." When these conditions are not fulfilled growth becomes impaired, the body stunted, and the limbs more or less permanently deformed.

Foals Prematurely Born.

It sometimes occurs that the foal, for some reason or other, that may or may not be apparent, is born before its time. As to what should be done with such creatures will depend upon their lineage and prospective value, as also upon the stage of gestation when they quit the dam and the strength and vigour they exhibit at the time. If birth is four or five weeks premature there is little hope of any good being done with them, and others less forward are always a source of considerable trouble.

They are necessarily small, ill-developed and feeble, and require the greatest care and attention. For some time they are unable to stand, and cannot therefore feed themselves. They exhibit a constant desire for sleep, and, as a matter of management, everything should be done in this respect to satisfy the requirements of nature. The breathing is always more or less hurried in these immature youngsters, sometimes so much so as to give the idea of some grave lung disease, but under favourable conditions the respiratory function gradually approaches the normal standard.

Where it is decided to rear a foal of this kind it should be removed from the mare so soon as she has thoroughly cleansed it, and placed in a warm, dry apartment; if the latter is capable of being artificially heated so much the better. The body should then be covered with a couple of warm blankets and kept perfectly quiet, so that sleep may not be interrupted. So much milk as the mare affords is to be taken from her every half hour and given to the foal directly out of a clean vessel previously warmed. A feeding-bottle for this purpose may be easily extemporised with a quill, a little worsted, a perforated cork, and a pint bottle, or the milk may be sucked from the finger. Whichever system is adopted cleanliness is of the first importance as a means of guarding against diarrhœa, which, when once established in these fragile things, is very difficult to arrest. It must be understood that this periodical feeding will require to be carried on during the night until the foal acquires sufficient strength to return to the mare and help itself, but the intervals between meals may be gradually lengthened out a little after the first twenty-four hours.

If, as sometimes occurs, the mare does not "come to her milk" at once, cow's milk must be substituted under conditions prescribed below for "Hand-rearing Foals." An enema of milk-warm water with a little glycerin may be given to empty the posterior bowel if no fæces are discharged during the first four hours, and, if necessary, a second injection should be administered later on. At this period of the foal's existence purgatives should be as far as possible withheld, lest the sensitive bowels be unduly excited and fatal diarrhœa induced.

Hand-rearing Foals.

Notwithstanding the most scrupulous care in stud management, disease will now and again assert itself, and, either by hopelessly damaging the udder or destroying the mare, leave the produce dependent for its food supply on some extraneous source. As to whether hand-rearing is a desirable course to

pursue will very much depend on the age, character, and breeding of the offspring. The more youthful it is when deprived of its parent, the greater the amount of trouble it will give, whether its other properties be good, bad, or indifferent; and those who undertake the task of ministering to the wants of these unfortunate youngsters must be prepared for no inconsiderable sacrifice of time, to say nothing of comfort, as well as for inconvenience and expense.

To procure a foster-mother is always a difficult task, and sometimes a most costly one. It does, however, now and again occur that a mare will lose her foal, and a foal will lose its mother, about the same time in the same district, and in such cases it is a mutual, if unequal, advantage to the persons concerned to bring the survivors together. When this can be done all the trouble contemplated above is removed; although it must be admitted that the transference of a newly born foal to a strange mare is not unlikely to be attended with digestive disorder and diarrhœa at first, and especially if the former has not received the first laxative milk of its dam, and the latter should have foaled several days prior to entering upon her fostering duties.

Failing a substitute, the next best source of food supply is the cow. Here again some consideration must be given to selection of the most suitable subject whence to obtain the milk; for, if the task of hand rearing is to be undertaken, it must be entered upon and pursued in such a way as to safeguard success at all points.

Although, as will be seen from the figures given below, the same constituents are found in the milk of the cow as enter into that of the mare, the actual and relative proportions of these constituents differ to a considerable extent in the two cases. In order, therefore, to approximate the composition of the one to that of the other, and to render it more suitable to the requirements of the foal, water must be added to reduce the proportions of casein and fat; and at the same time the deficiency of sugar must be made up by the addition of a suitable quantity of the domestic article. 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. The following figures are percentages:—

	Cow's Milk	Mare's Milk
Water	87·0	88·0
Fat	4·6	1·0
Casein	4·0	1·6
Sugar	3·8	8·9
Salts	0·6	0·5

Thus it will be seen that while the fat and casein of the cow's milk is largely in excess of that of the mare's, the sugar of the mare's milk far exceeds that of the cow's.

Next in importance to a judicious selection of milk is the desirability of its being transferred immediately from the cow to the foal while still warm. To maintain the natural temperature (100° F.) it should be drawn from the cow into a vessel previously warmed, and afterwards diluted with water raised to 100° F. Cold, stale milk at this tender age is sure to provoke diarrhœa, and not unlikely to bring about a fatal result. Cleanliness in the vessels used and the handling of the milk should be strictly observed; and, above all, its administration must be frequent, and regular both as regards quantity and time. At first half a pint should be given every half-hour, and gradually increased as time goes on, while the intervals between each meal may be extended accordingly; but it must be remembered that, to be successful, the indications of Nature must be closely observed and acted upon. Neglect in this matter can have but one result—viz., failure.

In commencing this system of rearing from birth attention should be directed to the state of the bowels at the outset. Should the foal not have received the first milk of its dam, constipation is more than likely to exist, and should be corrected by the administration of a small dose of castor oil and an enema of glycerin and water. Where the milk of a newly calved cow can be procured, its purgative properties may be sufficient in itself to unload the bowels, in which case further interference becomes unnecessary. Once having commenced with the milk of a particular animal, it is most desirable that no change be made, if possible to guard against it; and the milk of a young cow freshly calved is much to be preferred to that of a stale old one.

Weaning Foals.

To wean a foal is not a very difficult matter, but to effect its severance from the mare with the least possible amount of trouble and loss requires a little consideration and some care. Few allow their mares to wean their own foals, and all are not agreed as to how and when the separation should be effected. There can be no doubt that the longer a foal can have the benefit of its mother's milk the better it will thrive and grow—all other things of course being favourable—but it has to be remembered that stud mares are usually performing the double duty of breeding and suckling at one and the same time, building up a new organism within, and ministering to the wants of a more

perfected one without, and to this is not unfrequently added a certain amount of daily work. Within proper limits these services may be carried on simultaneously, with but little interference with the economy of the dam or the growth of the fœtus she carries, but as the latter attains to higher development, and its demands upon the nutritive resources of the former become greater, the drain upon the system entailed by suckling is not only detrimental to the mare but also to the young she bears. Protracted nursing therefore in the interest of the born can only be carried on at the expense of the unborn. For all practical purposes it may be said that *under proper management* foals are ready to leave the mare when about five months old. In some instances where—from constitutional weakness, or from debility resulting from disease—they are weak and backward in growth, it may be desirable to continue them with the dam for a few weeks longer, but whenever the necessity for such a course arises the food supply of the mare should be increased accordingly, and all demands upon her for work should cease. Moreover, mares which have continued to nurse their foals into the autumn must have special consideration in their winter management, and, in addition to good food and plenty of it, require to be protected from severe weather. Such animals should be wintered in a warm yard and not turned out until spring.

To the foal the loss of the easily assimilable mother's milk is of considerable moment, and the change so soon noticeable in its coat and condition after being withdrawn from the dam is a good index of the fact. To guard against loss of condition the foal should early be taught to feed from the manger, and should be supplied with an extra quantity of corn, bran, and chaff, for a fortnight or three weeks before the separation takes place. In this way its desire for milk will be less keenly felt and its loss of it more readily overcome when the separation takes place. As to whether this separation should be effected completely and at once, or by allowing the foal to return to the mare at increasing intervals during the lapse of a few days, is a question upon which there is no complete agreement; and although in the hands of some the former system appears to be attended with a fair amount of success, we consider the latter to be the more rational and the best calculated to safeguard the health of dam and offspring. Whether the one system or the other be adopted, the mare will benefit by being placed on a spare diet for a short time in order to check the secretion of milk and bring the gland to a passive state. Any difficulty in this respect must be met by drawing the udder now and again as may be required, and putting the mare to gentle work.

Some Common Ailments of Foals.

The first fortnight or three weeks after birth is the most critical period in the life of a foal. At this tender age, when least capable of offering resistance, he is specially liable to be overtaken with accident and disease. As regards disease, derangements of the digestive system are, perhaps, the more common ailments, but the mortality from respiratory disorders as the result of cold, and blood-poisoning as the result of exposure to filth, are very much in evidence, even in some of our best and most fashionable studs. That the prevalence of these affections can be largely curtailed by judicious management and foresight is best realised by a knowledge of the sickness rate and death rate in different establishments under different systems of management.

Constipation.

This affection is not unfrequently found to exist at the time of birth, for although no solid food has entered the mouth of the foal during utero-gestation, the intestines always contain more or less of a yellowish-brown or greenish-brown substance known as "meconium," and which the foal usually discharges soon after birth. This is the solid residue of the secretions formed by the intestines and the liver, and which has accumulated in the bowels during fœtal development. It is a common practice with some to anticipate constipation by administering a dose of castor oil to all foals soon after birth; but, in face of some disagreeable experiences of the custom, it is not, in the writer's opinion, a desirable course to recommend, for just as there are cases disposed to constipation at birth, so are there others in which the bowels are too seriously relaxed to endure the further irritation entailed by a dose of oil. Indeed, we have known several valuable foals lost by converting into an acute and fatal diarrhœa what was originally a simple relaxed state of the bowels. Constipation at birth is more especially noticed in early foals, when the dam has lived in confinement on hard food with little or no succulent aliment.

If the bowels are normally active the foal will empty himself in the course of the first two hours after birth. Where this does not take place, an enema of milk-warm water, with a little soap and glycerin dissolved in it, should be given, and repeated half-an-hour later. Any sign of restlessness, whisking the tail, straining without a motion, or looking towards the flank, should be promptly followed by a dose of castor oil, which will usually

afford speedy relief. Should the bowels not respond, no time should be lost in seeking professional advice.

Diarrhœa.

This is one of the most common of foal ailments; and, in addition to a heavy mortality, many promising youngsters who live through it are every year hopelessly dwarfed by its abiding effects on the digestive canal. Of the many and various causes that conduce to it some have reference to the mare herself, and others are of an extraneous character. In connection with the former we have already noticed the baneful effects of the uterine discharges when permitted to foul the udder. There can be no doubt, too, that under certain conditions the milk of the dam is liable to acquire properties which irritate and inflame the delicate membrane which lines the alimentary canal.

This is specially noticeable in sudden and complete changes from one description of diet to another, in the use of unwholesome food and filth-laden water, and not less so where excessive work is imposed upon the dam, associated as it usually is with excitement and long absence from the foal. Moreover, the milk of mares "in use" frequently relaxes the bowels, and may provoke an acute attack of diarrhœa. An undue proportion of fat in the lacteal fluid has also been known to give rise to the same result. The fact should not be overlooked that a short supply of milk from the dam, or milk when yielded of an inferior character, may drive the foal to take manger food to excess before the puny stomach is capable of digesting it.

Many outbreaks of diarrhœa in foals may be traced to this cause, especially in the offspring of old mares who have been put to the stud late in life. Indigestion in the mare is not infrequently the precursor of this disease in the offspring. Foals confined in close stuffy boxes, deep in fermenting manure, are specially liable to diarrhœa under the influence of slight inducing causes.

To identify and remove the cause is in this, as in all other diseases, of the first importance. Food and water will naturally claim attention with the object of removing anything that may seem objectionable from the one or the other, or, if needs be, effecting a complete change in both.

In the early period of the attack, while the bowels are still free from inflammatory action, a dose of castor oil may be of service by causing the removal of any objectionable matter they may contain. A mixture of bicarbonate of potash, precipitated chalk, aromatic spirit of ammonia, and oil of peppermint, given

every three or four hours, is a useful corrective. When the foal gives evidence of pain, a little tincture of opium may be added to the prescription. A teaspoonful of bicarbonate of potash given to the mare night and morning, or oftener, and a feed or two of barley while the foal continues sick, are useful adjuncts to treatment. It should, however, be remembered that while it is most desirable to have such means of relief available for the moment, it is equally important that no time be lost in seeking professional help. Changes in these sickly youngsters are frequently rapid and severe, and all the skill and foresight of the expert is sometimes required to guard against fatal complications. If the foal refuses the teat, the mare should be milked out from time to time, so that when appetite returns the secretion may be fresh and wholesome.

Cold and Pneumonia.

Foals born in the early season, when weather changes are rapid and severe, are often the victims of cold, resulting in inflammation of the lungs. This is notably so when they are turned out of hot, badly ventilated stables into the open pasture, and, after taking the customary gallop, extend themselves while heated on the damp, cold ground. Pneumonia is usually preceded by catarrh, or common cold, when the foal is heard to cough, and appears dull and listless; the coat stares, a discharge issues from the nose, and although a desire for food still remains, the teat is taken without relish. In pneumonia these symptoms are supplemented by quick breathing, a high temperature of the body, cold extremities, congested membranes, and prostration.

Whenever symptoms of cold appear at this tender age, the foal should be promptly transferred to a warm box, free from draught, and well supplied with clean dry litter and pure air. If the bowels are constipated an enema of milk-warm water, in which a little soap and glycerin has been dissolved, may be administered, and repeated once or oftener, as the case may require. When the cough is troublesome, a weak mustard plaster should be applied to the throat and along the windpipe, or, if the breathing be embarrassed, to the sides of the chest. Foals do not readily tolerate clothing, but where no resistance is made a light rug may be thrown over the body, but in no case should the foal be excited or worried into submission. As to medical treatment this is a matter requiring special knowledge and discrimination, and should be left entirely to the veterinary expert. Good nursing may well take the place of empirical physicing, which at this tender age is fraught with the greatest danger.

Joint Ill (Pyæmic Arthritis).

This might be very fairly described as a disease that mostly kills and always maims, if it does not completely disable, its victim. Although commonly described as "joint ill," it is not to be regarded as a mere local affection. The disease of the joints so commonly identified with it is like the eruption in small-pox—a mere local expression of a general derangement of the system arising out of the introduction of infective matter into the blood stream—or, in simple terms, it is a form of blood-poisoning manifesting itself by a febrile state of the body and the development of abscesses in and about the joints, and also in one or several of the internal organs. It usually occurs between the age of one and four weeks. Sometimes it runs a rapid course and kills in a few days, or it may assume a less acute form and extend over several weeks. Whether it be the one or the other matters but little—the result is commonly death or irreparable damage.

Until a few years ago the origin of "joint ill" was altogether unknown. Since, however, the more intimate study of pathology, a rational explanation has been rendered possible, and it is now believed that the wound resulting from the tearing away of the umbilical cord or navel string from the body of the foal is the door by which organisms of a destructive character gain entrance to the broken blood-vessels, and thence find their way into the blood-stream and become distributed over the system. After settling down in the tissues of the joints—or it may be the liver, lungs, and other organs—they undergo rapid multiplication, resulting in the development of abscesses and destruction of the invaded parts.

The onset of the disease is marked by dulness, fever, and stiffness in one or more of the limbs. This is soon followed by a hot and painful swelling of the joints, intense lameness, and great suffering and prostration. Abscesses sooner or later form and break, and the affected joints are seriously damaged, or altogether disorganised. When the lungs are involved, the breathing becomes quick and embarrassed, and the disease runs a rapid and fatal course.

Treatment in this affection is rarely found to be of much avail, but the best results may be expected from measures of prevention when thoroughly carried out. To intercept and destroy the invading organisms until the "navel-wound" has completely healed is the real object to be accomplished. In this connection, therefore, it is of the first importance that those lessons of cleanliness which we have insisted upon elsewhere in

respect to the foaling box be strictly observed. Where, as is sometimes the case, the umbilical cord requires to be ligatured, it should first be freely dressed with antiseptic solution, and nothing in the shape of dirt in its widest sense should be allowed to come into contact with it. The string employed for tying it to prevent bleeding should have been previously steeped in carbolised oil, and not, as is usually the case, taken from any dirty source accessible at the time. Not only so, but the hands must be clean and well disinfected before the operation is undertaken.

Whether the cord requires to be tied or not, the "navel" wound should be dressed five or six times a day with carbolised oil until completely healed. It cannot be too forcibly insisted on that as this is a disease identified with filth, its prevention can only be assured where the rules of cleanliness are strictly carried out.

Umbilical Hernia.

This consists in an escape of some portion of the intestine through the umbilicus, or navel opening. It is usually spoken of as "rupture," but in a large majority of cases it is the result of imperfect closure of the navel orifice, in consequence of which the bowel is allowed to pass through the walls of the belly, and to rest in a pouch formed outwardly by the skin and inwardly by a protruded portion of the lining membrane of the abdomen. In some instances it is the consequence of rupture taking place before or after the opening has become firmly healed over.

In whichever way it may occur it is recognised as a soft, round, fluctuating swelling. Sometimes it is small and soon disappears altogether without interference. At others it becomes progressively larger as time goes on, and, in weakly foals especially, may reach a considerable size. There is no constitutional disturbance or suffering attendant upon this defect, unless, as now and again happens, the extruded bowel becomes strangulated.

Whenever hernia appears, and shows a disposition to enlarge, it should receive prompt attention. A pad of tow or cotton-wool attached to a roller should be applied to the swelling and secured in position by a crupper, collar band, and side tapes. While this is being done the little patient should be kept in the stable as quiet as possible. Should it fail to be effective, a repetition of blisters over the part may have the desired result, or it may be necessary to ligature or clamp the pouch of skin after returning the bowel into the abdominal cavity; but these latter methods will require to be carried out under professional

advice. Early treatment in this disorder is most essential, as it is while the opening in the belly is small that the greatest prospect of a speedy cure is offered.

Sires and their Work.

To render the services of a sire productive in the fullest measure requires, among other things, that the laws of life and health shall be strictly observed, and his sexual work adjusted and regulated to his peculiar capacity. Experience teaches that the reproductive powers of horses, as of other animals, differ, not only in different individuals, but at different periods in the life of the same animal; and it is of the first importance to the success of the breeding stud that something like a reasonable estimate of the average sexual capacity of a sire should be understood, so that abuse may be avoided, his services prolonged, and the number and value of his produce enhanced.

That a horse well-grown and healthy should enter on his stud career at two years old is pretty generally conceded, but the great disparity of opinion and practice existing among breeders and owners as to the number of mares he should receive clearly shows the necessity of some common understanding on the subject. The number of mares sometimes allowed to horses at this age is almost incredible, and the view seems to find favour with many that what a colt can do should be the measure of what he should do, and it is no rare occurrence for forty, fifty, and sixty mares to receive service from these baby sires during their first season. That they may be fairly fruitful under such a strain there are examples to show; but the general result of such a practice is not only to check growth and physical development, but to lay the foundation for sexual weakness and disappointment in the following season, and it may be to produce an abiding weakness of the reproductive function or even permanent incapacity to get stock. Moreover, the offspring of horses so over-taxed are at the best but doubtful blessings to the breeder, and many a farmer can tell how his money and the stud services of a good mare have been thrown away by the incautious use of these overworked youngsters.

Having regard to health interests, to quality of produce, and endurance at the stud, a horse at the age in question should not be allowed more than ten to fifteen mares, and it would be much to his advantage, as it would to that of all young sires, if the season were allowed to get well advanced before commencing service. At this time grass will be plentiful and good, mares will "come keen" to the horse, the chance of returning will be materially

diminished, and the horse's services correspondingly lightened. As to older stallions, the same discrepancy of practice obtains with them as with the more juvenile section, and many a good horse is prematurely used up or falls a victim to disease as the outcome of unbridled abuse. The number of mares a horse should receive from three years old upwards allows of no fixed rule being laid down. Very much will depend upon growth and development, and even more on natural vigour of constitution and sexual capacity, which latter can only be known by experience. Some horses almost complete their upward growth at two years, while others at that age have made but little progress.

This is a matter of the first importance, and should receive the fullest consideration in assessing the work of young sires. It should ever be borne in mind that at the time when growth is most active the reproductive function is least capable of being sustained in any undue demand that may be made upon it.

The difference in the capacity of horses for stud work is remarkable. We have known some in the heyday of their life and throughout their stud career to display the most feeble desire for service, although in no way failing in fruitfulness, while others have combined with an extraordinary capacity for service an equally remarkable productiveness and endurance. Many stallions, and some of great celebrity, have been known to serve from 200 to 260 mares in one season, and to leave a fair proportion of foals. Not less remarkable is the large number of mares that some horses will serve and "stop" in a short space of time. Thus it is said of a well-known Shire stallion that, on completing a heavy season in Lancashire, he was let to a syndicate of farmers in the South, and on reaching his destination at three o'clock in the day, there awaited him twenty-three mares, nineteen of which were in season. The whole of the latter received service between three and twelve o'clock at night, and thirteen proved to be in foal. Equally remarkable examples of sexual vigour and fertility might be instanced, but they only serve to emphasise the fact indicated above, with which most owners of stallions are more or less familiar. For reasons already given it is difficult to fix a numerical standard of stud-work applicable to all horses. But for the average sire some such formula as the following may be accepted as fairly consistent with the best interests of the horse, his produce, and the owner :—

Age	Number of mares
2 years old	10 to 15
3 „ „	25 „ 30
4 „ „	45 „ 60
5 „ „ and upwards . . .	70 „ 100

With judicious management and reasonable limitation of stud services, in accordance with condition and constitution, a horse may continue to get valuable stock to a late period of life. Much confirmatory evidence of this truth might be adduced alike from Thoroughbreds, Hackneys, Shires, and others. Among the former (Thoroughbreds) I find that Birdcatcher was twenty-three years old when he got Oxford, the sire of that good horse Sterling, from whom sprang Isonomy. Touchstone was twenty when he got Lord of the Isles, the sire of Scottish Chief. King Tom was twenty when he got Princess, the dam of Royal Hampton. Harkaway was sixteen when he got King Tom, and the granddam of Princess fell to Bay Middleton when he was twenty-two. Vedette got Galopin when he was seventeen, Melbourne got Young Melbourne at twenty, Voltair got Voltigeur at the same age. Blair Athol fell to Stockwell at eleven, Newminster got Hermit when sixteen, and Touchstone got Newminster at the same age, and Rosa Bonheur at twenty-two. These are but a few of many horses of the highest repute which have been got late in life from Thoroughbred sires, and many horses of equal merit in their respective varieties—Hackneys, Shires, and others—might be found to have descended from sires not less advanced in years.

Condition in the Sire.

Whether a stallion be young or old, it is of the first importance that he be submitted to a thorough preparation for the season before him. Condition, if in a less degree, is as much a necessity of the sire as of the hunter or the race-horse, and without it it is hopeless to expect to realise the full benefit of his sexual powers. This conclusion would hardly seem warranted in view of the helpless state of obesity in which many of our horses start out on their season's work, but it is amply justified by everyday experience.

Want of condition not only renders reproduction uncertain, but lays the individual open to attack from all sorts of diseases and accidents of a crippling or even destructive nature, and to none more than that bane of stallions, laminitis. Eighty per cent. of the cases of this disease occur at the beginning of the season, when every organ in the body is overburdened with fat, and the muscles devoid of that healthy tone by which the feet are relieved from undue impact of superimposed weight.

Walking exercise, and plenty of it, during six weeks or two months prior to commencing stud work, with substantial fare, good stabling and careful management, are indispensable to

continuous good service. In regard to exercise, it must be said that men entrusted with this duty should be young and active, and have no excuse for loitering or wasting time on the road.

When a horse commences his season fat and wanting condition, his stud work is greatly multiplied, especially if at the outset he has a large influx of mares. In this state his early services are often abortive, and require to be repeated again and again, so that the vigour and condition with which he should have started is never attained. Young horses especially are made to suffer by neglect of this first principle of stud management.

On more than one occasion we have known valuable sires disposed of, on account of their inability to get foals, which have yet become sure foal getters in the hands of their new owners. A little physic, plenty of exercise, and good hard keep was the only assignable reason for the change from sterility to fertility. With judicious management horses "on the road" will uphold their condition as the season goes on, and far exceed in fruitfulness those that "stand" at home. How much the vitality and strength of the offspring depend upon the vigour of the sire at the time of copulation is an unknown quantity, but no one will fail to realise the importance of their physiological relations. It is distinctly to the advantage of stud horses that they be regularly fed, and that ample time be allowed for digestion to advance before going to service. Neglect of this precaution is accountable for many of those attacks of indigestion, twisted bowels and ruptured stomach, from which stallions so frequently suffer. Nor is it less important that, as far as practicable, horses on the road should do their work in the early morning and cool of the evening, so that the depressing effects of midday heat may be avoided.

Teasers.—Temperament in stallions is a very varying quality, not only as between one horse and another, but in the same horse at different periods of life. While some horses approach their mares with comparative coolness, others are thrown into a state of ungovernable excitement whenever they are brought in sight of them, and the ordeal of "trying" mares by horses of the latter description is sometimes carried on with the greatest difficulty, and not without danger to both horse and attendant. In these cases the animal is mad to get to his mare, and rears and plunges, and breaks out into profuse perspiration, not unfrequently with the result that the service is abortive. In such circumstances the preliminary "trying" should be done by an old horse, or "teaser," so that the one selected for service may come to his work fresh and fruitful, and be spared the

undue excitement to which he is otherwise exposed. Moreover, quite apart from temperament, the constant excitement of "teasing," where horses are called upon to serve large numbers of mares, is in itself prejudicial alike to health and sexual vigour. Valuable sires are best considered, and their services rendered most enduring and effective, when this office is relegated to another. Where horses are slow to come to their mares, a few minutes' walk in the service-yard before they are brought into contact will in some cases be desirable.

Drugging.—It is satisfactory to know that the old practice of drugging horses, so generally adopted twenty years ago, is fast dying out. This is no doubt due to that higher intelligence in regard to animal life and health which is now possessed by the average horseman, and the higher appreciation on the part of horse owners themselves of the serious consequences resulting from it. Old customs, however, die hard, and there are still some who believe that the sexual function may be quickened and upheld by the administration of drugs. It is only necessary to say that whatever effect they may have in provoking sexual desire, they are not likely to materially influence the propagation of the race, but by artificial stimulation to prove hurtful, and add to the functional debility that called them into use. Rest from stud work, generous living, and exercise constitute the only rational response to sexual fatigue.

J. Wortley Axe.

1A Lower Sloane Street, London, S.W.

PAMPHLETS AND LEAFLETS

ON

VETERINARY SUBJECTS

ISSUED BY

THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

PAMPHLETS.

Obtainable at the Society's House, 13 *Hanover Square, London, W.; or of the Publisher,* Mr. JOHN MURRAY, 50A *Albemarle Street, London, W.*

THE ANIMALS OF THE FARM IN HEALTH AND DISEASE. By Sir GEORGE BROWN, C.B. 72 pp. With 52 Illustrations. Third Edition: 1895. Price One Shilling.

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS. By Sir GEORGE BROWN, C.B. 64 pp. With 60 Illustrations. Fourth Edition: 1895. Price One Shilling.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHOEING. By Sir GEORGE BROWN, C.B. 20 pp. With 12 Plates. Third Edition: 1892. Price Sixpence.

THE MARE AND FOAL. By Professor J. WORTLEY AXE, M.R.C.V.S. 58 pp. With 20 Illustrations. 1898. Price One Shilling.

CONTAGIOUS FOOT-ROT IN SHEEP. By Sir GEORGE BROWN, C.B. 16 pp. With 8 Illustrations. 1892. Price Sixpence.

THE LAMBING PEN. By HAROLD LEENEY. 38 pp. With 9 Illustrations. Third Edition: 1897. Price Sixpence.

ABORTION IN CATTLE. Report of the Special Committee on Abortion in Cattle appointed by the Council of the Society, together with the Complete Minutes of Evidence of the Witnesses examined, and Appendices. 88 pp. 1894. Price One Shilling.

LEAFLETS, &c.

Copies sent gratis on application to the Secretary at the Society's House, 13 *Hanover Square, London, W.*

PREVENTION OF EPIZOOTIC ABORTION IN COWS. Details of Professor Nocard's Antiseptic Treatment against Abortion in Cows, and Precautions Necessary for Destruction of the Aborted Fœtus. March, 1897.

NOTES ON ANTHRAX. Facts collated from the Article on Anthrax by Professors BROWN and MCFADYEAN in Vol. V., Part II., of the Journal for 1894, and Directions for the proper disposal of Anthrax Carcasses. August, 1894.

CUBIC AIR SPACE IN DAIRIES AND COWSHEDS. Note by Sir ERNEST CLARKE, Secretary of the Society, with appended Letter from the Local Government Board, dated December 28, 1897.

THE LAMBING PEN.

BY

HAROLD LEENEY.

SUMMARY OF CONTENTS.

CONDITION OF EWES WHEN PUT TO THE TUP.

THE SITUATION AND CONSTRUCTION OF THE LAMBING PEN.

DISINFECTANTS AND APPLIANCES.

THE COMMON KINDS OF PRESENTATION.

DISEASES AFTER LAMBING:

Straining; Eversion of the Uterus; Navel Ill; Infectious Navel Ill; Garget or Mammitis; Contagious Mammitis.

DISEASES OF LAMBS:

Aptha; Malignant Aptha; Constipation; Scour or Diarrhœa; Parasitic Diarrhœa; Colic; Hove, Hoven or Blast; Nephritis, or Inflammation of the Kidneys; Wool-balls.

THE MANAGEMENT OF THE FLOCK FROM LAMBING UNTIL WEANING.

Castration; Docking; Dipping; Branding.

CONCLUSION.

WITH NINE ILLUSTRATIONS.

Price 6d. per copy; 4s. per dozen; 30s. per 100.

Special Quotations for Larger Quantities.

Orders should be addressed, and remittances sent, to

THE SECRETARY,
ROYAL AGRICULTURAL SOCIETY OF ENGLAND,
13 HANOVER SQUARE, LONDON, W.