Subsequent Management of Abortion.—The frequency with which abortion leads to chronic uterine disease should lead us to attach much more importance to the subsequent management of the patient than has been customary. The usual practice is to confine the patient to bed for two or three days only, and then to allow her to resume her ordinary avocations, on the supposition that a miscarriage requires less subsequent care than a confinement. The contrary of this is, however, most probably the case; for the uterus has been emptied when it is unprepared for involution, and that process is often very imperfectly performed. We should, therefore, insist on at least as much attention being paid to rest as after labor at term.

PART III.

LABOR.

CHAPTER I.

THE PHENOMENA OF LABOR.

Delivery at Term.—In considering delivery at term we have to discuss two distinct classes of events.

One of these is the series of vital actions brought into play in order to effect the expulsion of the child; and the other consists of the movements imparted to the child—the body to be expelled—in other words, the mechanism of delivery.

Causes of Labor.—Before proceeding to the consideration of these important topics, a few words may be said as to the determining causes of labor. This subject has been from the earliest times a *quæstio vexata* among physiologists; and many and various are the theories which have been broached to explain the curious fact that labor spontaneously commences, if not at a fixed epoch, at any rate approximately so. It must be admitted that even yet there is no explanation which can be implicitly accepted.

The explanations which have been given may be divided into two classes—those which attribute the advent of labor to the fœtus, and those which refer it to some change connected with the maternal generative organs.

The former is the opinion which was held by the older accoucheurs, who assigned to the fœtus some active influence in effecting its own expulsion. It need hardly be said that such fanciful views have no kind of physiological basis. Others have supposed that there might be some change in the placental circulation, or in the vascular system of the fœtus, which might solve the mystery.

The majority of obstetricians, however, refer the advent of labor to purely maternal causes. Among the more favorite theories is one, which was originally started in this country [*i. e.*, England] by Dr. Power, and adopted and illustrated by Depaul, Dubois, and other writers. It is based on the assumption that there is a sphincter action of the fibres of the cervix, analogous to that of the sphincters of the bladder and rectum, and that when the cervix is taken up into the general uterine cavity as pregnancy advances, the ovum presses upon it, irritates its nerves, and so sets up reflex action, which ends in the establishment of uterine contraction. This theory was founded on erroneous conceptions of the changes that occurred in the neck of the

uterus; and, as it is certain that obliteration of the cervix does not really take place in the manner that Power believed when his theory was broached, it is obvious that its supposed result cannot follow. A modification of this theory is that held by Stoltz and Bandl. According to this view, when the cervix softens during the last weeks of pregnancy, the painless uterine contractions of gestation act upon the os internum, and open it sufficiently to admit of the ovum pressing on the lower segment of the uterus, and so inducing labor.

Girin[1] contends that the descent and pressure of the fœtal head on the os internum is favored by changes in the density of the liquor amnii. This attains its maximum density in the early months of pregnancy, when it is 1.030, and it diminishes steadily until term, when it is nearly that of water. The specific gravity of the fœtus is at first lower than that of the amniotic fluid, but becomes steadily higher. Eventually the fœtus, sinking on the os internum, excites the uterus to contraction.

Extreme distention of the uterus has been held to be the determining cause of labor, a view lately revived by Dr. King, of Washington,[2] who believes that contractions are induced because the uterus ceases to augment in capacity, while its contents still continue to increase. This hypothesis is sufficiently disproved by a number of clinical facts which show that the uterus may be subject to excessive and even rapid distention—as in cases of hydramnios, multiple pregnancy, and hydatidiform degeneration of the ovum—without the supervention of uterine contractions.

Another inciter of uterine action has been supposed to be the separation of the ovum from its connection to the uterine parietes, in consequence of fatty degeneration of the decidua occurring at the end of pregnancy. The supposed result of this change, which undoubtedly occurs, is that the ovum becomes so detached from its organic adhesions as to be somewhat in the position of a foreign body, and thus incites the nerves so largely distributed over the interior of the uterus. This theory, which has been widely accepted, was originally started by Sir James Simpson, who pointed out that some of the most efficient means of inducing labor (such, for example, as the insertion of a gum-elastic catheter between the ovum and the uterine walls) probably act in the same way, viz., by effecting separation of the membranes and detachment of the ovum.

Barnes instances, in opposition to this idea, the fact that ineffectual attempts at labor come on at the natural term of gestation in cases of extra-uterine pregnancy, when the fœtus is altogether independent of the uterus, and, therefore, he argues, the cause cannot be situated in the uterus itself. A fair answer to this argument would be that although, in such cases, the womb does not contain the ovum, it does contain a decidua, the degeneration and separation of which might suffice to induce the abortive and partial attempts at labor then witnessed.

Leopold[3] suggests that the advent of labor may be connected with

[1] Arch. de Tocologie, No. 8, 1889.
[2] American Journal of Obstetrics, 1870–71, vol. iii. p. 561.
[3] "Studien über die Schleimhaut," etc. Arch. f. Gyn., 1887, Bd. xi. s. 443.

other changes in the decidua which occur in advanced pregnancy. He points out that then giant cells, containing many nuclei, appear in the serotina which penetrate the uterine sinuses, and cause the formation in them of thrombi. The obstruction in the calibre of a number of these vessels leads to a stasis of the maternal blood returning from the placenta, and to an increase of carbonic acid in it, which may excite the motor centre for uterine contraction, which is known to exist in the medulla oblongata.

Objections to These Theories.—A serious objection to all these theories, which are based on the assumption that some local irritation brings on contraction, is the fact, which has not been generally appreciated, that uterine contractions are always present during pregnancy as a normal occurrence, and that they may be, and often are, readily intensified at any time, so as to result in premature delivery.

It is, indeed, most likely that, at or about the full term, the nervous supply of the uterus is so highly developed, and in so advanced a state of irritability, that it more readily responds to stimuli than at other times. If, by separation of the decidua, or in some other way, stimulation of the excitor nerves is then effected, more frequent and forcible contractions than usual may result, and, as they become stronger and more regular, terminate in labor. But, allowing this, it still remains quite unexplained why this should occur with such regularity at a definite time.

Tyler Smith tried, indeed, to prove that labor came on naturally at what would have been a menstrual epoch, the congestion attending the menstrual nisus acting as the exciter of uterine contraction. He therefore refers the onset of labor to ovarian, rather than to uterine, causes. Although this view is upheld with all its author's great talent, there are several objections to it difficult to overcome. Thus, it assumes that the periodic changes in the ovary continue during pregnancy, of which there is no proof. Indeed, there is good reason to believe that ovulation is suspended during gestation, and with it, of course, the menstrual nisus. Besides, as has been well objected to by Cazeaux, even if this theory were admitted, it would still leave the mystery unsolved, for it would not explain why the menstrual nisus should act in this way at the tenth menstrual epoch, rather than at the ninth or eleventh.

In spite, then, of many theories at our disposal, it is to be feared that we must admit ourselves to be still in entire ignorance of the reason why labor should come on at a fixed epoch.

Mode in which the Expulsion of the Child is Effected.—The expulsion of the child is effected by the contractions of the muscular fibres of the uterus, aided by those of some of the abdominal muscles. These efforts are in the main entirely independent of volition. So far as regards the uterine contractions, this is absolutely true, for the mother has no power of originating, lessening, or increasing the action of the uterus. As regards the abdominal muscles, however, the mother is certainly able to bring them into action, and to increase their power by voluntary efforts; but, as labor advances, and as the head passes into the vagina and irritates the nerves supplying it, the abdominal

muscles are often stimulated to contract, through the influence of reflex action, independently of volition on the part of the mother.

There can be little doubt that the chief agent in the expulsion of the child is the contraction of the uterus itself. This opinion is almost unanimously held by accoucheurs, and the influence of the abdominal muscles is believed to be purely accessory Dr. Haughton,[1] however, maintains a view which is directly contrary to this. From an examination of the force of the uterine contractions, arrived at by measuring the amount of muscular fibre contained in the walls of the uterus, he arrives at the conclusion that the uterine contractions are chiefly influential in rupturing the membranes, and dilating the os uteri, bringing into action, if needful, a force equivalent to 54 pounds; but when this is effected, and the second stage of labor has commenced, he thinks the remainder of the labor is mainly completed by the contractions of the abdominal muscles, to which he attributes enormous powers, equivalent, if needful, to a pressure of 523.65 pounds on the area of the pelvic canal.

These views bear on a topic of primary consequence in the physiology of labor. They have been fully criticised by Duncan, who has devoted much experimental research to the study of the powers brought into action in the expulsion of the child. His conclusions are that, so far from the enormous force being employed that Haughton estimated, in the large majority of cases the effective force brought to bear on the child by the combined action of both the uterine and abdominal muscles is less than 50 pounds—that is, less than the force which Haughton attributed to the uterus alone. In extremely severe labors, when the resistance is excessive, he thinks that extra power may be employed, but he estimates the maximum as not above 80 pounds, including in this total the action of both the uterine and abdominal muscles. Joulin arrived at the conclusion that the uterine contractions were capable of resisting a maximum force of about one hundredweight. Both these estimates, it will be observed, are much under that of Haughton, which Duncan describes as representing "a strain to which the maternal machinery could not be subjected without instantaneous and utter destruction."

There are many facts in the history of parturition which make it certain that the chief factor in the expulsion of the child is the uterus. Among these may be mentioned occasional cases in which the action of the abdominal muscles is materially lessened, if not annulled—as in profound anæsthesia, and in some cases of paraplegia—in which, nevertheless, uterine contractions suffice to effect delivery. The most familiar example of its influence, however, and one that is a matter of everyday observation in practice, is when inertia of the uterus exists. In such cases no effort on the part of the mother, no amount of voluntary action that she can bring to bear on the child, has any appreciable influence on the progress of the labor, which remains in abeyance until the defective uterine action is re-established, or until artificial aid is given.

1 "On the Muscular Forces Employed in Parturition," etc. Dublin Quart. Journ. Med. Sc., 1870, vol. xlxi. p. 459.

Contraction of the uterus, then, being the main agent in delivery, it is important for us to appreciate its mode of action, and its effect on the ovum.

Uterine Contractions at the Commencement of Labor.—We have seen that intermittent and generally painless uterine contractions exist during pregnancy. As the period for delivery approaches, these become more frequent and intense, until labor actually commences, when they begin to be sufficiently developed to effect the opening up of the os uteri, with a view to the passage of the child. They are now accompanied by pain, which increases as labor advances, and is so characteristic that "pains" are universally used as a descriptive term for the contractions themselves. It does not necessarily follow that uterine contractions are painless until they commence to effect dilatation of the os uteri. On the contrary, during the last days or even weeks of pregnancy, women constantly have irregular contractions, accompanied by severe suffering, which, however, pass off without producing any marked effect on the cervix. When labor has actually begun, if the hand is placed on the uterus, when a pain commences, the contraction of its muscular tissue is very apparent, and the whole organ is observed to become tense and hard, the rigidity increasing until the pain has reached its acme, the uterine walls then relaxing, and remaining soft until the next pain comes on. At the commencement of labor these pains are few, separated from each other by a considerable interval, and of short duration. In a perfectly typical labor the interval between the pains becomes shorter and shorter, while, at the same time, the duration of each pain is increased. At first they may occur only once in an hour or more, while eventually there may not be more than a few minutes' interval between them.

If, when the pains are fairly established, a vaginal examination be made, the os uteri may be found to be thinned and dilated in proportion to the progress of the labor. During the contraction the bag of membranes will be felt to bulge, to become tense from the downward pressure of the liquor amnii within it, and to protrude through the os if it be sufficiently open. The membranes, with the contained liquor amnii, thus form a fluid wedge, which has a most important influence in dilating the os uteri (see Frontispiece). This does not, however, form the sole mechanism by which the os uteri is dilated, for it is also acted upon by the contractions of the muscular fibres of the uterus, which tend to pull it open. It is probable that the muscular dilatation of the os is effected chiefly by the longitudinal fibres, which, as they shorten, act upon the os uteri, the part where there is least resistance.

Partly then by muscular contraction, partly by mechanical pressure, the cervical canal is dilated, and as it opens up it becomes thinner and thinner, until it is entirely taken up into the uterine cavity.

There is no longer any obstacle to the passage of the presenting part of the child into the cavity of the pelvis, and the force of the pains now generally effects the rupture of the membranes, and the escape of the liquor amnii. There is often observed, at this time, a temporary relaxation in the frequency of the pains, which had been steadily

increasing; but they soon recommence with increased vigor. If the abdomen be now examined, it will be observed to be much diminished in size, partly in consequence of the escape of the liquor amnii, partly from the descent of the fœtus into the pelvic cavity.

The character of the pains soon changes. They become stronger, longer in duration, separated by a shorter interval, and accompanied by a distinct forcing effort, being generally described as "the bearing down" pains. Now is the time at which the accessory muscles of parturition come into operation. The patient brings them into play in the manner which will be subsequently described, and the combined action of the uterine and abdominal muscles continues until the expulsion of the child is effected.

The precise mode of uterine contraction is still somewhat a matter of dispute. It is generally described as commencing in the cervix, passing gradually upward by peristaltic action, the wave then returning downward toward the os uteri. This view was maintained by Wigand, and has been indorsed by Rigby, Tyler Smith, and many other writers. In support of it they instance the fact that, on the accession of a pain, the presenting part first recedes, the bag of membranes then becomes tense and protrudes through the os, and it is not until some time that the presenting part of the child itself is pushed down. It is very doubtful if this view is correct; and a careful examination of the course of the pains would rather lead to the belief that the contractions commence at the fundus, where the muscular tissue is most largely developed, and gradually proceed downward to the cervix, the waves of contraction being, however, so rapid that the whole organ seems to harden *en masse*. The apparent recession of the presenting part, and the bulging of the bag of membranes, are certainly no proof that the contractions begin at the cervix; for the commencing contraction would necessarily push down the fluid in front of the head, and cause the membranes to bulge, and the os to become tense, before its force was brought to bear on the fœtus itself. Indeed, did the contraction commence at the lower part of the uterus, we should expect the opposite of what takes place to occur, and the waters to be pushed upward, and away from the cervix. The fundal origin of the contraction is further illustrated by what is observed when the hand of the accoucheur is placed in the uterine cavity, as often happens in certain cases of hemorrhage or turning; for if a pain then comes on, it will be felt to start at the fundus, and gradually compress the hand from above downward.

Value of the Intermittent Character of the Pains.—The intermittent character of the contractions is of great practical importance. Were they continuous, not only would the muscular powers of the patient be rapidly exhausted, but by the obliteration of the vessels produced by the muscular contraction, the circulation through the placenta would be interfered with, and the life of the child imperilled. Hence one of the chief dangers of protracted labor, especially after the escape of the liquor amnii, is that the uterine fibres may enter into a state of tonic rigidity, a condition that cannot be long continued without serious risks both to the mother and child.

The fact that the uterine contractions are altogether involuntary

proves them to be excited—as indeed we would *a priori* infer from our knowledge of the anatomical arrangement of the nerves of the uterus—solely by the sympathetic system. Still it is a fact of everyday observation that they can be largely influenced by emotions. Various stimuli applied to the spinal system of nerves (as, for example, when the mammæ are irritated) have also a marked effect in inducing uterine contraction. The precise mode in which such influence is conveyed to the uterus, in spite of the numerous experiments which have been made for the purpose of determining how far labor is affected by destruction of the spinal cord, is still a matter of doubt. After the fœtus has passed through the cervix, the spinal nerves distributed to the vagina and perineum are excited by the pressure of the presenting part, and through them the accessory powers of parturition are chiefly brought into play. The contraction of the muscles of the vagina itself is supposed to have some influence in favoring the expulsion of the fœtus after the birth of part of the body, and also in promoting the expulsion of the placenta. In the lower animals the vagina has a very marked contractile property, and is, in some of them, the main agent by which the young are expelled. In the human subject this influence is certainly of very secondary importance.

Character and Sources of Pains During Labor.—The amount of suffering experienced during labor varies much in different cases, and is in direct proportion to the nervous susceptibility of the patient. There are some women who go through labor with little or no pain at all. This is proved by the cases (of which there are numerous authentic instances recorded) in which labor has commenced during sleep, and the child has been actually born without the mother awakening. I am acquainted with a lady, who has had a large family, who assures me that, though labor is accompanied by a sense of pressure and discomfort, she experiences nothing which can be called actual pain. Such a happy state of affairs is, however, extremely exceptional, and, in the vast majority of cases, parturition is accompanied by intense suffering during its whole course, in some cases amounting to anguish which has probably no parallel under any other condition.

The precise cause of the pain has been much discussed, and is, no doubt, complex.

In the early stage of labor, and before the dilatation of the os, it is chiefly seated in the back, from whence it shoots around the loins and down the thighs. It is then probably produced, partly by pressure on the nerve-filaments caused by contraction of the muscular fibres to which they are distributed, and partly by stretching and dilatation of the muscular tissue of the cervix. M. Beau believes that in this stage the pain is not produced, strictly speaking, in the uterus itself, but is rather a neuralgia of the lumbo-abdominal nerves. The pains at this time are generally described as "acute" and "grinding," terms which sufficiently well express their nature. In highly nervous women these pains are often much less well borne than those of a later stage, and the suffering they undergo is indicated by their extreme restlessness and loud cries as each contraction supervenes. As the os dilates, and the labor advances into the expulsive stage, other sources of suffering are added.

The presenting part now passes into the vagina and presses on the vaginal nerves, as well as on the large nervous plexuses lying in the pelvis. As it descends lower it stretches the perineum and vulva, and presses on the bladder and rectum. Hence cramps are produced in the muscles supplied by the nerve plexuses, as well as an intolerable sense of tearing and stretching in the vulva and perineum, and often a distressing feeling of tenesmus in the bowels. By this time the accessory muscles of parturition are brought into action, and they, as well as the uterine muscles, are thrown into frequent and violent contractions, which, independently of the other causes mentioned, are sufficient of themselves to produce great pain, likened to that of colic, produced by involuntary and repeated contraction of the muscles of the intestines.

Taking all these causes into consideration, there is no lack of sufficient explanation of the intolerable suffering which is so constant an accompaniment of childbirth.

Effect of the Pains on the Mother and Fœtus.—The effect of the pains on the mother's circulation is well marked. The rapidity of the pulse increases distinctly with each contraction, and, as the pain passes off, it again declines to its former state. A similar observation has been made with regard to the sounds of the fœtal heart, especially after the expulsion of the liquor amnii. Hicks has pointed out that during a pain the muscular vibrations give rise to a sound which often resembles that of the fœtal heart, and which completely disappears when the muscular tissue relaxes. The effect of the pain in intensifying the uterine souffle has been already mentioned. The strong muscular efforts would naturally lead us to expect a marked elevation of temperature during labor. Further observations on this point are required; but Squire asserts that there is generally only a very slight increase in temperature during delivery, rapidly passing off as soon as labor is over.

Division of Labor into Stages.—Such being the physiological facts in connection with the labor pains, we may now describe the ordinary progress of a natural labor—that is, one terminated by the natural powers, and with a head presenting.

For facility of description obstetricians have long been in the habit of dividing the course of labor into *stages*, which correspond pretty accurately with the natural sequence of events. For this purpose we generally talk of three stages: viz. (1) from the commencement of regular pains until the complete dilatation of the cervix (*stage of effacement and dilatation*); (2) from the complete dilatation of the cervix until the expulsion of the child (*stage of expulsion*); (3) the concluding stage, comprising the permanent contraction of the uterus, and the separation and expulsion of the placenta (*stage of the after-birth*). To these we may conveniently add a preparatory stage, antecedent to the regular commencement of the labor.

Preparatory Stage.—For a short time before delivery, varying from a few days to a week or two, certain premonitory symptoms generally exist, which indicate the approaching advent of labor. Sometimes they are well marked, and cannot be mistaken; at others they

are so slight as to escape observation. Amongst the most common is a sinking of the uterus into the pelvic cavity, resulting from the relaxation of the soft parts preceeding delivery. The result is that the upper edge of the uterine tumor is less high than before, and in consequence the pressure on the respiratory organs is diminished, and the woman often feels lighter and altogether less unwieldy than in the previous weeks. If a vaginal examination be made at this time, the lower segment of the uterus will be found to have sunk lower into the pelvic cavity; and the consequence of this is that, while the respiration is less embarrassed and the patient feels less bulky, other accompaniments of pregnancy, such as hemorrhoids, irritability of the bladder and bowels, and œdema of the limbs, become aggravated. The increased pressure on the bowels often induces a sort of temporary diarrhœa, which is so far advantageous that it empties the bowels of feces which may have collected within them. As has already been pointed out, the contractions which have been going on at intervals during the latter months of pregnancy now get more and more marked, and they have the effect of producing a real shortening of the cervix, which is of great value preparatory to its dilatation. More marked mucous discharge from the cavity of the cervix also generally occurs a short time before labor, and it is not infrequently tinged with blood from the laceration of minute capillary vessels. The discharge, popularly known as the "*shows*," is a pretty sure sign that labor is not far off. It may, however, be entirely absent, even until the birth of the child. When copious, it serves to lubricate the passages, and is generally coincident with rapid dilatation of the parts and a speedy labor.

During this time (*premonitory stage*) painful uterine contractions are often present, which, however, have no effect in dilating the cervix. In some cases they are frequent and severe, and are very apt to be mistaken for the commencement of real labor. Such "*false pains*," as they are termed, are often excited and kept up by local irritations, such as a loaded or disordered state of the intestinal canal; and they frequently give rise to considerable distress, and much inconvenience both to the patient and practitioner. They are, it should be remembered, only the normal contractions of the uterus intensified and accompanied with pain.

First Stage, or Dilatation.—As labor actually commences, the uterine contractions become stronger, and the fact that they are "*true*" pains can be ascertained by their effect on the cervix. If a vaginal examination be made during one of these, the membranes will be felt to become tense and bulging during the pain, and the os uteri will be found partially dilated, and thinned at its edges. As labor advances this effect on the os becomes more and more marked. At first the dilatation is very slight, perhaps not more than enough to admit the tip of the examining finger, and both the upper and lower orifices of the cervix can be made out. As the pains get stronger and more frequent, dilatation proceeds in the way already described, and the cervix gets more thin and tense, until we can feel a thin circular ring (which is lax between the pains, but becomes rigid and tense during the

contraction when the bag of waters bulges through it), without any distinction between the upper and lower orifices. During this time the patient, although she may be suffering acutely, is generally able to sit up and walk about. The amount of pain experienced varies much according to the character of the patient. In emotional women of highly developed nervous susceptibilities it is generally very great. They are restless, irritable, and desponding, and when the pain comes on cry out loudly. The character of the cry is peculiar and well marked during the first stage, and has constantly been described by obstetric writers as characteristic. It is acute and high, and is certainly very different from the deep groans of the second stage, when the breath is involuntarily retained to assist the parturient effort. When dilatation is nearly completed various reflex nervous phenomena often show themselves. One of these is nausea and vomiting, another is uncontrollable shivering, which is not accompanied by a sense of coldness, the patient being often hot and perspiring. Both these symptoms indicate that the propulsive stage will shortly commence; and they may be regarded as favorable rather than otherwise, although they are apt to alarm the patient and her friends. By this time the os is fully dilated, the membranes generally rupture spontaneously, and a considerable portion of the liquor amnii flows away. The head, if presenting, often acts as a sort of ball-valve, and, falling down on the aperture of the cervix, prevents the complete evacuation of the liquor amnii, which escapes by degrees during the rest of the labor, or may be retained in considerable quantity until the birth of the child.

It not infrequently happens, if the membranes are somewhat tougher than usual and the pains frequent and strong, that the fœtus is pushed through the pelvis, and even expelled surrounded by the membranes. When this occurs the child is said to be born with a "*caul*," and this event would doubtless happen more frequently than it does were it not the custom of the accoucheur to rupture the membranes artificially as soon as the os is completely opened up, after which time their integrity is no longer of any value.

Second Stage, or Propulsion.—The os is now entirely retracted over the presenting part, and is no longer to be felt, the vagina and the uterine cavity forming a single canal. Now the mucous discharge is generally abundant, so that the examining finger brings away long strings of glairy, transparent mucus tinged with blood. The pains, after a short interval of rest, become entirely altered in character. The uterus contracts tightly round the fœtus, the presenting part descends into the pelvis, and the true propulsive pains commence. The accessory muscles of parturition now come into play. With each pain the patient takes a deep inspiration, and thus fills the chest so as to give a *point d'appui* to the abdominal muscles. For the same reason she involuntarily seizes hold of some point of support, as the hand of a bystander or a towel tied to the bed, and, at the same time, pushes with her feet against the end of the bed, and so is able to bear down to advantage. The cries are no longer sharp and loud, but consist of a series of deep suppressed groans, which correspond to a

succession of short expirations made during the straining effort. In this way the abdominal muscles contract forcibly on the uterus, which they further stimulate to action by pressing upon it. It is to be observed that these straining efforts are, to a considerable extent, under the control of the patient. By encouraging her to hold her breath and bear down they can be intensified; while if we wish to lessen them we can advise her to call out, and when she does so the abdominal muscles have no longer a fixed point of action. Although the patient may thus lessen the effect of these accessory muscles, it is entirely out of her power to stop their action altogether. As labor advances the head descends lower and lower, receding somewhat in the intervals between the pains, until eventually it comes down on the perineum, which it soon distends.

The pains now get stronger and more frequent, often with scarcely a perceptible interval between them, until the perineum gets stretched by the advancing head. In the interval between the pains the elasticity of the perineal structures pushes the head upward, so as to diminish the tension to which the perineum is subjected, the next pain again putting it on the stretch and protruding the head a little further than before. By this alternate advance and recession the gradual yielding of the structures is favored and risk of laceration greatly diminished. During this time the pressure of the head mechanically empties the bowel of its contents. During the last pains, when the perineum is stretched to the utmost, the anal aperture is dilated, sometimes to the size of a [silver dollar]; and in this way the perineum is relaxed, just as the distention, and consequent risk of laceration, are at their maximum. The apex of the head now protrudes more and more through the vulva, surrounded by the orifice of the vagina, and eventually it glides over the perineum and is expelled. The intensity of the suffering at this moment generally causes the patient to call out loudly. The force of the abdominal muscles is thus lessened at the last moment, and this, in combination with the relaxation of the sphincter ani, forms an admirable contrivance for lessening the risk of perineal injury. The rest of the body is generally expelled immediately by a single pain, and with it are discharged the remains of the liquor amnii, and some blood-clots from separation of the placenta; and so the second stage of labor terminates.

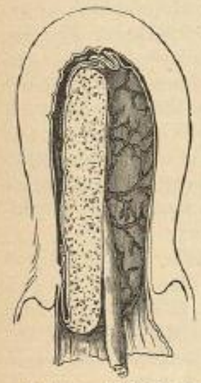
The Third Stage.—The third stage commences after the expulsion of the child. It is of paramount importance to the safety of the mother that it should be conducted in a natural and efficient manner; for it is now that the uterine sinuses are closed, and the frail barrier by which nature effects this may be very readily interfered with, and serious and even fatal loss of blood ensue. Unfortunately, it is too often the case that the practitioner's entire attention is fixed on the expulsion of the child, so that the natural history of the rest of delivery is very generally imperfectly studied and understood.

As soon as the child is expelled, the uterine fibres contract in all directions, and the hand, following the uterus down, will find that it forms a firm rounded mass lying in the lower part of the abdominal cavity. By retraction of its internal surface the placental attachments,

which probably remain undisturbed until the expulsion of the child, are generally separated, and the after-birth remains in the cavity of the uterus as a foreign body.

The escape of blood from the open mouths of the uterine sinuses is now prevented in two ways, viz.: (1) by the contractions of the uterine walls, and the more firm, persistent, and tonic this is, the more certain is the immunity from hemorrhage; (2) by the formation of coagula in the mouths of the vessels. Any undue haste in promoting the expulsion of the placenta tends to prevent the latter of these two hæmostatic safeguards, and is apt to be followed by loss of blood. After a certain time, averaging from a quarter to half an hour, the uterus will be felt to harden, and, if the case be solely left to Nature, what has been aptly called a miniature labor occurs. Pains come on, and the placenta is spontaneously expelled from the uterus, either into the canal of the vagina or even externally. In most obstetric works it is stated that the after-birth may be separated either from its centre or edge, and that it is very generally expelled through the os in an inverted form, with its fœtal surface downward, and folded transversely on itself. That this is the mode in which the placenta is often expelled, when traction on the cord is practised, is a matter of certainty. It then passes through the os very much in the shape of an inverted umbrella. It is certain, however, that this is not the natural mechanism of its delivery. The subject has been well studied by Berry Hart,[1] who has shown that during the contractions of the third stage of labor the placenta is "thrown into heights and hollows," and, if the case be left entirely to Nature, it descends with its edge or a point near its edge first, its uterine and detached surface gliding along the inner surface of the uterus, the foldings of its structure being parallel to the long diameter of the uterine cavity (Fig. 100). In this way it is expelled into the vagina, and during the process little or no hemorrhage occurs. When the placenta is drawn out in the way too generally practised, it obstructs the aperture of the os, and, acting like the piston of a pump, tends to promote hemorrhage. The corollaries as to treatment drawn from these facts will be subsequently considered. I am anxious, however, here to direct attention to Nature's mechanism, because I believe there is no part of labor about the management of which erroneous views are more prevalent than that of this stage, and none in which they are more apt to lead to serious consequences; and unless the mode in which Nature effects the expulsion of the placenta and prevents hemorrhage is thoroughly understood, we shall certainly fail in assisting her in a proper manner. In the large proportion of cases, when left entirely to themselves, the placenta would be retained, if not in the uterus at any rate in the vagina, for a considerable time—possibly for several hours; and such delay would very unnecessarily tire the patience of the practitioner and be prejudicial to the patient. It is, therefore, our duty in the majority of cases to promote the expulsion of the after-birth; and when this is properly and scientifically done, we increase rather than diminish the patient's safety and comfort. But in order to do this we must assist Nature, and not act in opposition to her method, as is so often the case.

FIG. 100.



Mode in which the placenta is naturally expelled. (After DUNCAN.)

[1] Berry Hart: "Sectional Anatomy of Labor." Edin. Med. Journ., November, 1887.

After-pains.—When once the placenta is expelled the uterus contracts still more firmly, and in a typical case is felt just within the pelvic brim, hard and firm, and about the size of a cricket-ball. Generally for several hours, or even for one or two days, it occasionally relaxes and contracts, and these contractions gives rise to the "*after-pains*" from which women often suffer much. The object of these pains is no doubt to expel any coagula that may remain in the uterus, and, therefore, however unpleasant they may be to the patient, they must be considered, unless very excessive, to be salutary rather than otherwise.

Duration of Labor.—The length of labor varies extremely in different cases, and it is quite impossible to lay down any definite rules with regard to it. Subject to exceptions, labor is longer in primiparæ than in multiparæ, on account of the greater resistance of the soft parts to the former, especially of the structures about the vagina and vulva. It is also generally stated that the difficulty of labor increases with the age of the patient, and that in elderly primiparæ it is likely to be unusually tedious, from rigidity of the soft parts. It is very doubtful if this opinion has any real basis, and in such cases the practitioner often finds himself agreeably disappointed in the result. Mr. Roper,[1] indeed, argues that the wasting of the tissues which occurs after forty years of age diminishes their resistance, and that first labors after that age are easier, as a rule, than in early life. The habits and mode of life of patients have no doubt a considerable influence on the duration of labor, but we are not in possession of any very reliable facts with regard to this subject. It is reasonable to suppose that the tissues of large, muscular, strongly-developed women will offer more resistance than those of slighter build. On the other hand, women of the latter class, especially in the upper ranks of life, more often develop nervous susceptibilities, which may be expected to influence the length of their labors. The average duration of labor, calculated from a large number of cases, is from eight to ten hours; even in primiparæ, however, it is constantly terminated in one or two hours from its commencement, and may be extended to twenty-four hours without any symptoms of urgency arising. In multiparæ it is frequently over in even a shorter time. Indications calling for interference may arise at any time during the progress of labor, independently of its length. The proportion between the length of the first and second stages also varies considerably. The first stage is generally the longest, and it is stated by

[1] Obst. Trans., 1886, vol. vii. p. 51.

Cazeaux to be normally about twice the length of the second. This is probably under the mark, and I believe Joulin to be nearer the truth in stating that the first stage should be to the second as four or five to one, rather than as two to one. Often when the first stage has been very prolonged, the second is terminated rapidly.

The practitioner is constantly asked as to the probable length of labor, and the uncertainty of this should always lead him to give a most guarded opinion. Even when labor is progressing apparently in the most satisfactory manner the pains frequently die away, and delivery may be delayed for many hours. In the first stage a cervix that is apparently rigid and unyielding may rapidly and unexpectedly dilate, and delivery soon follow. In either case, if the practitioner has committed himself to a positive opinion he is apt to incur blame, and it is far better always to be extremely cautious in our predictions on this point.

Period of the Day at which Labor Occurs.—A somewhat larger proportion of deliveries occur in the early hours of the morning than at other times. Thus West[1] found that out of 2019 deliveries, 780 took place from 11 P.M. to 7 A.M., 662 from 7 A.M. to 3 P.M., and 577 from 3 P.M. to 11 P.M.

CHAPTER II.

MECHANISM OF DELIVERY IN HEAD PRESENTATIONS.

Importance of the Subject.—It is quite impossible to over-estimate the importance of thoroughly understanding the mechanism of the passage of the fœtus through the pelvis. This dominates the whole scientific practice of midwifery, and the practitioner cannot acquire more than a merely empirical knowledge, such as may be possessed by any uneducated midwife, or conduct the more difficult cases requiring operative interference, with safety to the patient or satisfaction to himself, unless he thoroughly masters the subject.

In treating of the physiological phenomena of labor it was assumed that we had to do with an ordinary case of head presentation, the description being applicable, with slight variations, to presentations of other parts of the fœtus. So in discussing the mechanical phenomena of delivery, I shall describe more in detail the mechanism of head presentations, reserving any account of the mechanism of other presentations until they are separately studied. Head presentation is so much more frequent than that of any other part—amounting to 95 per cent. of all cases—that this mode of studying the subject is fully justified; and, when once the student has mastered the phenomena of delivery

[1] Amer. Med. Journ., 1854.

in head presentations, he will have little difficulty in understanding the mechanism of labor when other parts of the fœtus present, based, as it always is, on the same general plan.

Mode of Recognizing the Position of the Head by its Sutures and Fontanelles.—In entering on this study we come to appreciate the importance of the sutures and fontanelles in enabling us to detect the position of the fœtal head, and to watch its progress through the pelvis; and unless the *tactus eruditus* by which these can be distinguished from each other has been acquired, the practitioner will be unable to satisfy himself of the exact progress of the labor. Nor is this always easy. Indeed, it requires considerable experience and practice before it is possible to make out the position of the head with absolute certainty; but this knowledge should always be aimed at, and the student will never regret the time and trouble he spends in acquiring it.

At the commencement of labor the long diameter of the head lies in almost any diameter of the pelvic brim, except in the antero-posterior, where there is not space for it. In the large majority of cases, however, it enters the pelvis in one or other of the oblique diameters, or in one between the oblique and transverse; but until it has fairly passed through the brim, it more frequently lies directly in the transverse diameter than has been generally supposed. Hence obstetricians are in the habit of describing the head as lying in four positions according to the parts of the pelvis to which the occiput points; the first and third positions being those in which the long diameter of the head occupies the right oblique diameter of the pelvis, the second and fourth those in which it lies in the left oblique. Many subdivisions of these positions have been made, which only complicate the subject, and render it more difficult to understand.

Four Positions Described.—The positions, then, of the fœtal head after it has entered the brim, which it is of importance to be able to distinguish in practice, are:

First (*left occipito-anterior*, *occipito-læva anterior*, O.L.A.). The occiput points to the left foramen ovale, the sinciput to the right sacro-iliac synchondrosis, and the long diameter of the head lies in the right oblique diameter of the pelvis.

Second (*right occipito-anterior*, *occipito-dextra anterior*, O.D.A.). The occiput points to the right foramen ovale, the forehead to the left sacro-iliac synchondrosis, and the long diameter of the head lies in the left oblique diameter of the pelvis.

Third (*right occipito-posterior*, *occipito-dextra posterior*, O.D.P.). The occiput points to the right sacro-iliac synchondrosis, the forehead to the left foramen ovale, and the long diameter of the head lies in the right oblique diameter of the pelvis. The position is the reverse of the first.

Fourth (*left occipito-posterior*, *occipito-læva posterior*, O.L.P.). The occiput points to the left sacro-iliac synchondrosis, the forehead to the right foramen ovale, and the long diameter of the head lies in the left oblique diameter of the pelvis. The position is the reverse of the second.

The relative frequency of these positions has long been, and still is, a matter of discussion among obstetricians. According to Naegele, to