

From the Author

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Presented by Dr. Acland

CAUSE OF THE COMMENCEMENT

OF

PARTURITION.

BY

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P R E F A C E .

THE subject of the following pages, which was lately discussed before the Aberdeen Medico-Chirurgical Society, has been special matter of careful observation for several years, and the conclusions verified by the most ample experience. In the latter respect, no subject of inquiry can be more advantageously situated, since the facts of the case are not away in remote or difficultly-accessible quarters, but present themselves as the most ordinary occurrences of medical practice. On this account, it might be thought the nature of the phenomenon in question ought long ago to have been fully understood; but it must be remembered that it is very often just those events that are of daily occurrence which frequently fail to attract our consideration. Such, at least, is the case in the present instance; for there is nowhere to be found in medical literature any indication that the process of gestation, as regards the uterus, has ever hitherto been recognised in its real character as an active state, in the same train with the expulsive movements of parturition.

The consideration of the practical consequences of this fact—it being my object to call attention simply to the fact itself—is not entered on here; but it will be readily understood that an organ known to be engaged in the execution of constantly-increasing movements, gives a very different view of the situation from the notion that, until parturition, the uterus serves only as a simple receptacle.

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It is remarkable that the progress of enlightened opinion has been less manifest in all that relates to the genesis of human beings than in any other department of Natural Science. The conception of all its phenomena as the result of causes whose operation is determined by natural and invariable laws, has not yet been so readily entertained, nor become so familiar, as might have been anticipated from the position of homogenesis as a science. For, though the positive basis of fact upon which many of its doctrines are founded is undoubtedly narrow and imperfect, in view of the older and more elementary sciences, yet clearly as much is known for certain of the origin and development of the human ovum, as not merely to raise—apart from either general or special analogy—a presumption in favour of the certainty of the natural causality of the entire phenomena, but to put the matter beyond all doubt. The process from first to last evinces the regularity and constancy of phenomena due to the agency of definite, and therefore definable, causes. The statement, indeed, may appear unnecessary, but only to those unacquainted with the history and present position of this science. As the sequel will show, the belief in strictly natural causation, the most fundamental axiom of positive knowledge, still needs repetition, if only *memorie causa*, in dealing with questions of the kind to be discussed. For, it will be seen that, in this department of Physiology, much of the mythological or supernatural spirit still prevails, not having finally yielded, as elsewhere, before the successive advances of discovery, but only in so far as its position is no longer tenable. And thus the new and more intelligent

conception of any Science, as a whole, which almost invariably follows a discovery in any of its particulars, is, in a great measure, missed in the case of human development, where a corresponding degree of enlightenment on the general principles of the doctrine does not so readily come to follow the working out and establishment of individual truths. It is a fact that, although Anatomy and Physiology have admirably succeeded in clearing up many of the mysteries that formerly enshrouded this subject, by demonstrating the existence of objects and processes then entirely beyond the reach of human insight, with regard to the obscurities that still remain, the old superstitious prejudices exercise almost unabated authority. Particularly is this the case when the considerations involved have a practical issue. There is seemingly an insurmountable tendency to regard every process as inscrutable, even preternatural, until its true character has been unchallengeably established, thus presenting a striking contrast to the willingness with which the credit of a capacity for solving its own problems is accorded to every other department of Science. Every educated mind unhesitatingly acquiesces in the belief that a satisfactory explanation will yet be arrived at on most, if not on all, the questions of Chemistry and Physics, which are not yet explicable on the general principles of those sciences. And if, as no one will deny, such a persuasion animates to further efforts in the path of discovery, and procures for every new achievement a ready acceptance, its absence, on the other hand, is no less a crushing misfortune. The belief that a phenomenon partakes of the supernatural attribute of inexplicability is a sufficiently thorough dissuasive from any earnest inquiry on the point, and may be even as thorough a disqualification for understanding it when the explanation is forthcoming.

In opening the question of the cause of the commencement of labour, I have introduced the above remarks as a general indication of the position which, in my opinion, it mainly holds at the present time. As the immediately-exciting cause of the phenomenon is not known, it is for the most part consigned to the category of the unknowable. In some of the most recent works on Midwifery and the physiology of gestation, it is but barely mentioned, as a subject of hopeless speculation, and in others it is held up as a striking and salutary memento of our inability to comprehend Nature in her more secret and mysterious processes. An esteemed obstetrician, after enumerating in his lectures many of the fanciful

but frivolous explanations that have been advanced at various times, used to conclude his reference to this subject with the remark that, after all, perhaps, the best and most becoming account of the occurrence was that given by Avicenna, when he said that "At the appointed time labour comes on by the command of God." An impression of a somewhat similar nature must be pretty widely felt, otherwise it is impossible that an event coming so frequently under the observation of inquiring minds should have attracted comparatively so little attention. There is nothing in the phenomenon itself to excite greater wonder than many of the other passages in the life of the ovum, and the development of the uterus, which have already been successfully investigated. Indeed it might rather have been expected that its frequency, and apparent facility of examination, would have created a directly opposite opinion. And as to the practical advantage of the inquiry, it can hardly be supposed that the determination of the causes of phenomena with which every practitioner has so much to do can be otherwise than valuable. Naegele has said that "to a knowledge of the mechanism of labour alone, is owing the existence of a helping-hand in difficult labours, and precisely in consequence of the lack of it, is to be found the chief reason why every branch of obstetrics has remained so remarkably long in the rear of the other departments of the healing-art; and why our art, in spite of the efforts and enthusiasm of the most talented men during the second half of the last century, made none of the advances which we might have reasonably expected."* Until a rational account of the nature and method of the passage of the fœtus through the pelvis had been rendered, the assistance of skilful art, with a view to its facility, was manifestly not to be procured. Whatever might be done independently of this knowledge was undertaken on the strength of sheer hardihood, with the consequent probability of much more evil than good. And it is well-known that at the time when superstition stood back, afraid in any way to interfere in the business, and anxiously waiting for the child to creep out of the womb on its hands and knees, or by some such extravagant deliverance, officious ignorance, on the other hand, intent on expedition, was ready to drag away the contents of the uterus by any means, judging that since through the outlet it must come some

* Naegele, Die Lehre von Mechanismus der Geburt.

way, any way might be the right way, although the speediest could not but be the best. Equally opposed in spirit as well as in aims, to both those extremes, the progress of Midwifery, as anything worthy the name of an art, dates from the time when a knowledge of the mechanism of labour began to be developed—and that time is not removed by any great interval from our own. For, as the writer above quoted remarks :—“ Midwifery, as is well known, has no classical antiquity, like its associated department, Medicine ; it has no Hypocrates, no Galen, of whom the physician may boast with justifiable pride ; no Celsus, like surgery ; no Aristotle, like anatomy to point to—our art, until recent times, was confined, for the most part, to rude and untrustworthy hands—and the prejudices against the practice of it, which prevented the better class of physicians from directing their energies to its improvement, being handed down from generation to generation, had this effect that, even when here and there a famous name does seem to touch upon the historical horizon of Midwifery, it either does not rise with any really invigorating influence, or, if it does, it sets again speedily, and almost without leaving us a trace.”* To proceed to the study of Midwifery, unmindful of this fact, would be to discard its most invaluable interpreter ; since there appear throughout the whole subject leading doctrines and ideas, that might thus be mistaken for final, while they are but incipient tentatives, to be accepted and trusted only as the immediate successors of an absolute vacuity of all rule and principle, or as the indispensable, and perhaps ephemeral, predecessors of others based on a more completely rational and consistent system. Without further evidence than the statement of its historical position, as an object of scientific inquiry, contained in the above passage—a statement unquestionably true—we might justly infer the rudimentary character of its principles. It is not to be expected that three-quarters of a century should bring to maturity any department of human knowledge. There is no reason, however, why we should refer solely to *à priori* arguments derived from its history in estimating the true position of Midwifery. An examination of its general doctrines, and more especially a consideration of the spirit in which many of its yet unsolved problems are viewed, is confirmatory of the foregoing, and quite conclusive as to its immaturity. With regard to the former, it will be found that they are sorely destitute of that

* *Idem*, loc. cit. p. 73.

harmony and consistency which are the acknowledged criteria of scientific development. As an example, where this is particularly conspicuous, the time laid down for the accomplishment of gestation may be referred to, which I hope afterwards to show is, as usually given, essentially erroneous and practically misleading. Meantime, to illustrate what has been already said in reference to the sentiments entertained as to the propriety of investigating such questions as the cause of the natural induction of labour, I shall quote, as one instance out of many of a similar kind, the remarks of a writer on Midwifery whose work deservedly enjoys as great a popularity as any on the subject in England. In criticising the various hypotheses that have been offered in explanation of the preponderance of head presentations over all other kinds, Dr. Ramsbotham remarks : " Dubois has ascribed the general situation to an instinctive impulse implanted in the fœtus, which inclines it to take the most favourable position for its escape, as the needle points mysteriously to the pole. But such a mode of reasoning and illustration cannot be considered either as argumentative or conclusive ; it is, in fact, completely evading the question after attempting to elucidate it : and the method he has taken can only be regarded as a cloak for human ignorance. It would, in my opinion, be much better not to endeavour to explain the secrets of Nature so deeply hidden, but content ourselves with referring this also to a general, although not invariable law—a part of the great system which shows the design, and exemplifies the harmony, that reign throughout the whole works of Providence."

Apart altogether from the special enquiry here alluded to, it is the manner in which it is sought to be disposed of to which I wish to invite attention. It must be very obvious, on the slightest reflection, that there is a very fundamental difference between the kind of explanation attempted in this instance, both by Dubois and Ramsbotham (for the latter brings in vaguely his general law of Providence as the explanation, although avowedly he declines to give any), and that pursued in relation to scientific subjects generally. The only interpretation of which the words of the latter admit, is that the circumstance in question is determined by a direct fiat on the part of the Deity, into which no further explanation can ever go ; while the account of the former assumes the existence of an entity in the fœtus, created simply and solely for the one purpose of making it stand *per caput in utero*. It is, therefore, plain enough that they are merely examples, one of the postulate that all things

happen by the command of God (a doctrine of theology with which science has nothing to do); the other of the postulate that all things happen, each in consequence of the possession of a special entity existing only for the purpose of producing that one event. Consequently, it will be remarked, there is no place in such an estimation of facts for the most indispensable of all philosophic operations—that, namely, of classification; for how can there be any arrangement of phenomena where, as according to the one view, they are all equally referable to one and the same law; and, according to the other, each potential entity is totally different and distinct from every other. It is easy to see that such an order of ideas, however legitimate and suggestive from a different standpoint, do not advance us one step in the interpretation of Nature, for the purposes either of Science or of Art. There is nothing peculiar, however, in their prevalence in Midwifery, where examples similar to that now quoted, and to the opinion commonly entertained on the subject about to be discussed, are sufficiently numerous, except in the circumstance that very few attempts have been made to eliminate them, and that they are consequently admitted in a vague way by many who, it may be safely affirmed, would not accept such pseudo-explanations on any other subject.

That Midwifery, then, is in its infancy as an Art founded on scientific principles, is proved both by its history, and the general spirit that now dominates over its undeveloped future. Against this spirit of mysticism, which proscribes all free inquiry, it is obvious that every positive doctrine claiming that right will have to contend. But it is to be hoped that the liberal tendencies of the age, being on the side of progress, will powerfully assist in the demolition of such antiquated opposition to improvement, and admit the principle in this department of Science,—so fruitful of happy results in every other,—that there is no phenomenon but may legitimately, and with a prospect of success and advantage, be made an object of inquiry. The recollection of what has been accomplished by the philosophic investigation of the mechanism of parturition, will be a strong incentive to every one who cultivates the subject in a scientific spirit, to adopt the same method in elucidating the obscurities,—and there are many of them,—that still remain. It would surely be great presumption to suggest beforehand as unprofitable, an investigation into circumstances that are mixed up with practical concerns of the highest moment, in so intimate a manner. If no useful information or assistance has been

derived from the examination of the subject hitherto, this must be assigned to the use of wrong methods, or the unskilful use of right ones. And to show the justness of this observation, as well as to indicate briefly what former efforts have been made in this direction, I shall mention a few of the hypotheses adduced in explanation, at different times, of the immediately exciting cause of the commencement of labour.

Next in order to the purely supernatural interpretation already referred to, comes a numerous class of metaphysical or imaginary suggestions, the general character of which is that they are all anti-physiological. Instead of endeavouring to bring the circumstances constituting the event into relation with the recognised and established laws of physiology, it is made to appear as marvellous as possible by assigning it to an extraordinary causation entirely *sui generis*. That some of them could have been proposed by persons who had ever witnessed the occurrence is almost incredible, except when we remember the unbounded influence which superstition has always exercised in distorting facts. With those, too, who could only fittingly express their wonder at the nature of the processes performed by the womb, by calling it the "*miraculum nature*," *par excellence*, the disposition to extravagance might be very justly anticipated, and thus the opinion that labour was induced by the efforts of the child to liberate itself, and consisted simply of a combination of those efforts, might possibly have once been believed in by those whose senses were overpowered by their imagination. The all-potent influence of the planets could hardly have escaped being called in as compelling the day of man's nativity, like all else in his destiny. But it would be hardly worth mentioning ideas which are become so strange and obsolete to us as to suggest the notion of children rather than of men with intelligence worthy of our notice, were it not that they, by way of contrast, teach us, and very pointedly, the important lesson that causes, equally beyond our conception, or operating in ways unknown to us, are, so far as we are concerned, of equal merit and importance. It is only when we are able not only to assign the cause but the law of its operation, that we have really gained anything either for Art or for Science. Thus the notion of the planetary influence as the efficient cause of labour is as useful, and its verisimilitude as great, as the notion of acidity in the liquor amnii being the cause. For supposing that acidity were a strictly definable quality, and that the liquor amnii was possessed of it, the all-important ques-

tion would require to be answered : In what way does the presence of an acrid secretion in the uterus give rise to the observed phenomena ? We are always inclined, by a sort of instinct, to eject from the mouth (which is the real discriminator of acidity) what is acrid ; but the idea of the womb spitting out its contents when they become acrid will be too lively a suggestion for most people. Again, Buffon's conception of its similarity to the dropping of ripe fruit, mistaken by many for an analogy while it is but a pure allegory, must be dismissed for like reasons. If there were a real correspondence between the phenomena, investigation of the separate details in the one process would reveal the nature of those in the other, and thus yield the desired information, viz., the law of the phenomenon ; whereas we have nothing in the suggestion but a fancied resemblance between the final result in both cases. Harvey attributed it to the uterus having attained its maximum of irritability at the exact time that the fetal development is completed. This, of course, is not an explanation, but simply a statement of the fact, rendered in very ambiguous language. An unfortunate circumstance, even if there were no others, for the theory accounting for the phenomenon by means of the pressure of the head upon the os uteri is that labour usually, if not always, begins before the head is brought into this situation. In regard to stretching of the uterine fibres beyond or up to the limit of distention it is a gross misrepresentation of facts as it is physiologically absurd. There is, in the first place, a real development of muscular fibre going on throughout the whole of gestation, in accordance with the enlargement of the organ ; and, in the second place, muscles, so far from being first excited to action when they are stretched or distended to the point of rupture, are then always deprived of all power to contract, as completely as if they were paralyzed. Dr. Taylor Smith's explanation is, that ovarian excitement causes uterine excitement. Precisely the same objections are applicable here. The cause is assumed as well as the mode of its operation : we know nothing, as a matter of fact, of ovarian excitement preceding labour, and if this much were established, the connecting circumstances must be ascertained before the theory can be admitted.

Sir James Simpson refers the induction of labour to the disintegrating process occurring in the decidua, and leading to a separation between it and the uterus. The defect of this view is not like any of the foregoing, for not only is the disintegrating process here referred to an established fact, but it likewise undoubtedly

plays a part in the expulsion of the ovum. But then it is only a part, and we are not to adopt one only of the circumstances necessary to the production of an event to the exclusion of all the others. Like all partial statements of the truth it stops very far short of a consistent explanation; for if the separation of the decidua around the os and cervix were the only circumstances concerned, labour would advance equally as they were accomplished, which, of course, is not the case.

I have not thought it necessary to enter into any very lengthened examination of the theories that have been proposed, because they are all open, with the exception of that last mentioned, to the charge of assuming agents and processes completely at variance with the laws of Physiology. It would seem as if nothing were thought worthy of being made instrumental in the occurrence, except those possessing a certain degree of unusualness or extravagance. An extraordinary event seems to demand an extraordinary cause, and it is still the fashion to attach this quality in an unwonted degree to the action of the uterus at this period; for, "of the reason why the muscles which were up to this time inert, should then combine in *this extraordinary manner*, and with such remarkable energy, Physiology can afford no certain information."*

Whether I succeed in elucidating the point or not, I must leave to the judgment of others; but my object cannot but be in their opinion legitimate, since it is to interpret the phenomenon according to the known laws of Physiology, or to show that it is explicable on those principles of Physiology that are recognised as established. So far as those principles are concerned, I cannot pretend to have added anything; indeed I would be much deceived if they were made to appear in any other light than they are wont to do; but I think I shall be able to establish that there is a process going on during the whole period of gestation that has hitherto been altogether overlooked, or very imperfectly attended to. † It was the discovery of this fact, some years ago, that first attracted my notice to the subject. I was invited to see a case in which there had been almost from the time of conception a strong desire, as the patient expressed herself, for abortion; pains in the back and loins having been experienced at intervals of three or four days, and lasting for some hours, and occasionally every other day. When

* Carpenter, "Principles of Human Physiology," p. 101. London. 1844.

† I have read since this was written the observations of Dr. Braxton Hicks on the intermittent action of the uterus, with much interest.

the womb could be felt, it was manifest that uterine contractions were taking place, just as during parturition. Since that time I have scarcely ever questioned a pregnant woman on the point, who has not signified her consciousness of occasional attacks of a similar occurrence, and always, on examination, uterine contractions are perceptible. I have thence come to the conclusion that active uterine contractions take place throughout the whole period of gestation, in opposition to the dogma, "that the uterus is passive and inert in pregnancy, and simply allows itself to be evolved during its development."

I hope that such a seemingly trifling and accidental occurrence as that to which I refer my first suggestion, will not be thought too insignificant to lead to any important doctrine, since it may be remembered that it was in a precisely similar way that Sir Fielding Ould arrived at a knowledge of the facts which led to the foundation for the development of the true doctrine respecting the mechanism of parturition. He himself informs us, it was while present at an accouchement in Paris, which seemed to be progressing favourably until after the membranes ruptured, when the case began to assume a serious aspect, that, on making an examination, it was discovered the head, instead of being placed, as was always formerly believed, antero-posteriorly at the brim, was directed crosswise from the acetabulum to the sacro-iliac synchondrosis. He then concluded that this apparently unnatural position was the cause of the difficulty; but, the child having been safely delivered, he says he began to reflect upon the subject, and in his after experience came to be fully satisfied that this position was the normal or most frequent one, and the only one in which, in the vast majority of cases, the head could be passed. The discovery of this one fact was very far from affording a rational account of the mode of the fetal delivery; and to students of Midwifery in our day it may seem surprising that facts so necessarily obvious when once the key of the position had been found, in the relation between the head of the fetus and the diameters of the maternal passages, should have come so slowly to be reduced to matter of certain knowledge. But it must always be remembered, that it is not the simple recognition of any phenomenon that leads to the most valuable results. Many persons before Sir F. Ould may have recognized the cross position of the head at the brim of the pelvis, but it fell to him, by making it a point of special inquiry, and by his endeavour to co-ordinate the phenomena on rational principles, to lead the way to the ultimate solution of

the question. It did not happen to him, as indeed it rarely happens to any one, to seize the whole of the truth ; for it took both him and his successor Smellie to make out the true position of the fœtus at the commencement of labour. The former thought that the cross position of the head, while the belly of the child faced the spine of the mother, and *vice versa*, necessarily implied that the neck was twisted ; whereas Smellie showed that the whole body occupied a cross position. I do not doubt that much remains to be filled-in, in order to make the account I have to give of the commencement of labour complete ; but I am confident that it is at least a step in the right direction, and I hope to be able to show that the right conception of the doctrine will materially assist us in what are called ordinary cases of Midwifery, and more especially in some important obstetrical operations. The propriety of inducing premature labour in many instances makes it a matter of great importance that the principles directing such an operation should be scientifically established ; and, on the other hand, the equally important object of endeavouring to save the life of the fœtus, when it is threatened, requires that a sound knowledge of those principles should be possessed by all who make the attempt. The uncertainty of the various measures that are recommended in either case is plainly enough indicative of an imperfect insight into the causes in operation, or the true nature of the process. The mistaken opinion as to the relation of the uterus towards the ovum during pregnancy is allied with another and corresponding error respecting the action of the cervix and os during parturition ; for, although the very absurd and obviously erroneous doctrine that, while the fundus of the uterus is contracting, the os uteri is dilating, has disappeared from works on Midwifery, it is still the common belief that an antagonism exists between these two parts of the same hollow muscle—the one directly hindering the operation of the other. That such is not the case, there will not be much difficulty in admitting, if attentive consideration is given to the facts which I shall adduce on this point. But, besides these, there are other opinions equally obstructive and hostile to a correct view of the subject, which, as they meet us on the threshold of the discussion, so to speak, it will be necessary to deal with in the first instance. Most conspicuous among these are the common ideas regarding the *time* and *mode* in which labour begins.

It has been handed down from one generation to another since the subject first occupied attention, that nine calendar months

—forty weeks, or 280 days—from the date of impregnation, is the appointed time for the occurrence of the event. The data upon which this statement is founded are by no means capable of justifying it, even if it were not contradicted by everyday experience. Yet, so strong is the persuasion in its accuracy, that women who trust in it as a law, and have made their calculations according to the prescribed formula—although always, as a rule, out of their reckoning—are not a little distressed with apprehensions of evil, in consequence of the irregularity, which they are irresistibly disposed to attribute to their situation in such circumstances. Having given the question all their attention, and guarded against every possibility of error, they are quite certain something must be wrong when the event does not happen at the time they had anticipated. Of course, the whole doctrine is entirely opposed to physiological principles; but this does not prevent even some medical men from supporting the fallacy. Nothing is more certain than the fact that vital action does not proceed at a uniform rate in all men or women alike—that time is associated with development by no necessary or fixed connection.* In estimating what a given time will accomplish in the way of physical development, just as in mental, it is a *sine quâ non* that the rate of development should in every instance be determined, because it is known to vary with every new case. Now, the evolution through which the embryo passes may, in conformity with the character of the individual organism, or nascent peculiarities of its own, vary in every instance. No two women, perhaps, are alike as to the time they take to digest their dinner, or, *cæteris paribus*, to perform any other bodily function. The wheels of life, so to speak, move at very different velocities in different individuals; and so, as a veritable consequence, the amount of work performed within a prescribed time must always be correspondingly different. Nothing illustrates this general truth better than the wide limits within which normal menstruation occurs; in some it returns every three weeks, in others every four, in others six, in some every fortnight. Now, here we have a function varying by more than two-thirds of the whole time within which it is seen to take place. The same variation is observed also in the time during which this discharge lasts at each period, for its continuation ranges from one to eight or more days. The differences noticeable in regard to digestion, and

* See Experiments of Remach on the hatching of eggs.

any other function which occupies only a very short period, may more easily escape notice, and can never be expected to be so manifest; but it must be obvious to all that a function occupying so large a space of time for its fulfilment as the maturation of the human ovum will necessarily vary within very wide limits. That some women should give birth, therefore, to fully-formed children, so far as full development can be ascertained, at seven or eight months, while others bear their children nine months, and bring them forth unripe for independent existence, is only in harmony with the laws of nature.

Yet what a phalanx of ignorant prejudices, and unjust and ungenerous inferences, have been and still are all-powerful in obscuring the truth of this fact. The poor mother, in certain circumstances, who has the misfortune to bring forth a viable and apparently well-developed child before "the appointed time," is exposed to mischievous obloquy. Because, forsooth, there have been invented certain abstract rules to which Nature has never given any countenance; and because her case is conspicuously intractable, therefore, she is put to rights with the physical laws of the universe, at the sacrifice of what have been made the moral and religious. And not only in this direction, which has caused secret and severe sorrow and shame to many a chaste bosom, but even in a scientific point of view the nine-months dogma has caused no less confusion. It is in this way that we come to have so many of those wonderful exceptions to natural laws which, in order to account for, modern philosophers, as Swift says, "disdaining the old evasive occult causes, whereby the followers of Aristotle endeavoured in vain to disguise their ignorance, have invented that wonderful solution of all difficulties, the *lusus naturæ*, to the unspeakable advancement of human knowledge." A ten months' child, just like a healthy or well-developed eight months' child, is a preternatural occurrence, or a *lusus naturæ*.

Akin to, and illustrative of this, is the doctrine of the chronology of disease, which has caused no less and no fewer mistakes. Thus there are certain fevers, especially, which some men have had the assurance to pretend they have witnessed recurring with as great if not greater a respect for precision of time than the arrival of the mails when the line is clear. They could almost predicate the event to a second, if their timepiece were trustworthy. Such are the strict laws and discipline which artificially precise minds have always aimed at foisting upon Nature as her ordinances, to the in-

finite perplexity of those who have sought to reconcile the phenomena as they really occur with the laws which determine how they ought to occur. The administration of medicine, as a scheme for taking time by the forelock, has led to grave and practical errors. It is another example of this belief that used to induce medical men, when a girl had arrived at a certain age, to administer forcing medicines in order to induce the catamenia. It is the same thing that makes the Factory Act fix upon a certain age as the test for physical capacity for toil—out of charity for the undeveloped; making a circumstance which is no proof, except incidentally, of development, its criterion. As, however, it is not the register of the child's birth, but the condition of its dental apparatus, that is taken to be the test of age, it follows that although it is age and not development that is really sought for, it is development and not age that is certainly arrived at. Hence the discrepancies, and not unnaturally the animosity which arises between the examining surgeon and the parent. The one charges the other with palming a child upon him which he believes they know to be under the age, the other calumniates the surgeon for rejecting a child which they know to be of the required age. If, instead of having to examine the teeth, it were left to the surgeon, independently of age altogether, to take into account its general development, and therefore its ordinary fitness for the occupation, it would be proceeding at least in a rational way. Inasmuch as the order of development of the organs of the body do not take place definitely, nor *pari passu*, although a certain development of particular teeth may indicate, in a rough way, a certain general development of other organs, yet it is very singular why such a method of procedure should be adopted, since it is the fact of general development that determines capacity for work, let the age be what it may. I have entered at so great length into this subject, showing that the same opinion as regards time prevails in other departments of practical Medicine, and with injurious effects here as in Midwifery. The nine-months dogma is seen to be impossible upon the well-known principles of physiology; but it only requires to turn to the examination of the data upon which it is founded, to show that there is not the least shadow of evidence in its favour.

Looking to the duration of pregnancy, therefore, there is discoverable no precise date when it shall terminate in labour; an event which clearly depends, like every other physiological result, on the rate of activity in its relation to time.

Next as to the manner in which the process of parturition sets in, it is important to observe that there is nothing sudden nor convulsive about it. The pains are at first almost imperceptible, and attain their highest action only after a gradual and regular increase, which makes the various stages of labour. It is no more according to the law of nature for a woman to be taken in the severest pains of labour without warning, than for the sun to leap from horizon to meridian at a bound; yet there is so strong an inclination to treat gestation and labour as natural antitheses that the advent of the latter at the close of the former is not unfrequently described in books in terms suggestive of the interposition, at the critical moment, of some Professor, with his magical wand. Until the very eve of parturition the uterus is supposed to suppress its "latent energies," and go through the stages of its development in conformity with the requirements of the ovum, without exhibiting the faintest disposition to call them into action. It then somehow breaks out with all the force inherent in its powerful muscular walls against the foetus hitherto cherished in its bosom, and summarily dislodges it therefrom. "When gestation is completed the uterus—which during the period of its growth was inert, allowing itself to be passively evolved and acquiring a surprising size—begins a new action, which constitutes the function of labour."* With the greatest respect for the author from whose work this extract is taken as embodying the common version of the phenomena in question, it is meant to be affirmed that the distinction thus indicated is simply an illusion and a fallacy. The uterus is not inert during pregnancy—there is no rebound from passivity to activity at its termination—labour is no new function. There is a constant effort on the part of the uterus throughout the entire period of gestation to evict the ovum from its cavity, and this becomes manifest in the gradual access and advance of the process which culminates in delivery. It is with the view of introducing this fundamental fact that I have sought to remind obstetricians of the dilatory process that ushers in the condition whose more effective stages they are called to supervise. Though for the purpose of more sharply defining those two conditions as separate and distinct, writers have, for the most part, overlooked the working of the expulsive agency until it has assumed a palpable and striking aspect, practical observers are well aware that it is in operation long before its

* Ramsbottom.

effects are imposing, some counting its duration beforehand by hours or days ; others even by a week or a fortnight. It is the principal object here, however, to prove that the date of its origin is contemporary with the earliest period of gestation, reaching back to the first arrival of the ovum in the uterus.

It will be well, however, in the first place briefly to consider why the conduct of the uterus towards the ovum has been so commonly represented as totally different during the contrasted states of gestation and labour. At first sight, the very striking contrast implied appears not unreal, as it seems to answer to an actual contrast affecting the nature of the well-known phenomena of the states in question. On the one hand, it is true that, throughout the whole period of gestation, when life can flow to the human fœtus through one channel only, the womb affords the necessary medium, while at the same time it serves the purpose of an asylum against external injury or exposure : it is also true, on the other hand, that the advent of labour reverses this provisional arrangement, for there then comes into play a process destined to banish the young from any further participation in such advantages, and to intercept the certain supply of maternal succour. Now, if, instead of being a simple statement of final results, this were an explicit account of their evolution, it would be impossible to deny a complete revolution on the part of the uterus, the antithesis obtaining between these two sets of phenomena being so manifest. There is clearly a reversion in the position of affairs, so far as the final results are concerned, when labour occurs. The ovum, instead of being nourished and guarded, is forcibly ejected and broken up. But, then, how is this change in the fortune of the ovum brought about ? Certainly not by any change in the policy of the uterus towards it. The event is explicable in a way that does not depend upon the improbable supposition that that organ is then invested with a new power specially adapted for the occasion. Such an exceptional proceeding is at variance with the general principles that govern the operations of Nature, and in the present instance is disproved by the actual facts of the case. The misconception arises in consequence of taking the gross result as the product of a simple agency. During pregnancy the uterus retains the ovum, its capacity is retentive ; in labour it expels the ovum, its capacity is expulsive. If, however, we analyse the function of utero-gestation we shall find that, through the whole series of phenomena coming within its sphere, the uterus adheres without deviation to one unvaried line of action. When two forces, equal and opposite in direction, are

acting in the same plane, equilibrium is the result : but the least inequality is followed by a movement in the direction of the greater force. In like manner while the retaining forces of the uterus balance the expelling their effect is neutralised, but when the latter are augmented while the former decrease, expulsion follows as a matter of course. Such I believe to be a definite statement of the relation of affairs in this interesting physiological condition. And first let us examine the part played by the uterus.

The teaching of comparative anatomy and physiology, and of all the circumstances, normal and abnormal, connected with the life of the uterus, goes to show that its fundamental function is the expulsion of the ovum. This point is displayed when the organ is considered in the light of its analogy and homology as a portion of the mammalian oviduct or egg-discharging canal : it is displayed in the events of menstruation, of pregnancy, and of labour, and its consequences, as well as in the many phenomena of uterine pathology ; so that, whether regarded in its theoretical relations as assigned by the principles of biology, or in the actual exercise of its functions, the uterus manifestly belongs to the apparatus provided for the extrusion of the ovum from the body of the parent. Each of these points requires to be brought forward separately.

The biological doctrine in reference to all animals with special organs of reproduction is that these consist in each case of a gland and its duct ; in the case of the female, an ovary and an oviduct. The ovary yields the ovum ; the oviduct discharges it externally. But, as in the majority of cases, when the ovary, instead of producing the fully completed ovum, furnishes only the rudiments of one, it falls to the oviduct to supply the deficiency while the ovum is traversing its cavity. In the order of biological arrangements this supplementary function imposed upon the oviduct, however great may be its significance in other respects, must be held to be secondary to its fundamental one of expulsion. Yet as we rise in the animal scale, the subordinate and adventitious duty assumes such magnitude that the oviduct undergoes modifications of a kind that nearly efface its primary purpose. Particularly is this the case in mammalian animals, and of these most of all in the human female. The ovum leaves the ovary in a condition so rudimentary and imperfect, that the whole onus, so to speak, of its development is thrown upon the oviduct ; consequently the simple excretory tube of the lowly constructed animal becomes, in view of this object, differentiated into a highly complex organ. But notwithstanding the remarkable transformation of parts thus accomplished,

and the highly involved purposes which they subserve, the fundamental facts, both as to structure and function, so clearly established in those lower forms, remain still the same. Thus, although greatly differing in appearance from the simple duct, the uterus, whether pregnant or not pregnant, has its primary function as a duct indicated by its anatomical relations with surrounding parts and by its own peculiar structure. Lying in the line of transit from the ovary to the exterior of the body, and furnished with a muscular coat of greater or less dimensions according to circumstances, it is to all intents and purposes the portion of the oviduct intermediate between the fallopian tubes and the vagina. There can be no objection to this view on the score of its peculiar shape any more than to the view that the oviduct in birds is continuous, although at certain parts it presents ampulæ and other modifications of form. Its anatomy, therefore, declares the uterus to be simply a highly differentiated portion of the oviduct. Then, as to its physiology, the rôle which it occupies is strictly in accordance with its anatomical character as a duct. The chief care committed to it is to discharge the ovum into the outer world, and this it aims at from the moment that body enters its cavity, and never ceases to attempt, as we have many facts to prove, until it has succeeded; although, in conformity with the secondary purpose to which the oviduct is made subservient, this success is not arrived at in ordinary circumstances until after an indefinite period of from eight to ten months. During that period its efforts at expulsion being productive of no manifest result—being so little anticipated at a time when actual expulsion would in effect defeat the entire scheme of generation—they have been noticed only, so far as I am aware, by one obstetrician. Since I became aware of the contractions that take place regularly in the uterus during that part of pregnancy amenable to such observations, I have not met with any indication that their existence has been suspected except by the obstetrician referred to, who has described them as normal phenomena under the name of intermittent action of the uterus during pregnancy. In the proper place I will describe their special character, as I have in numberless instances observed them, as well as bring forward several facts that indirectly establish their existence on *à priori* grounds. It is sufficient here to have mentioned that the fundamental function of the uterus as an expelling organ is a palpable fact, and it matters not that those efforts in this direction are for a time wonderfully and beautifully diverted from threatening the existence of the fœtus, as unchecked or unadapted they would

do, into an agency instrumental to its life and development, for in itself it is the same force which finally brings forth into the world the fully-developed ovum. When this activity, therefore, on the part of the uterus, is recognised, and its constant tendency to rid itself of the ovum, the period of pregnancy is seen just to correspond in mammalia to the period the egg in oviparous animals requires to descend the oviduct, and the circumstance of the constant movements of that body is manifestly the same in both cases, although in the one it is progressive, in the other rotatory. It is absolutely necessary, from the imperfect state in which the impregnated ovum enters the oviduct, that somewhere, as it is moved on in its outward passage, its course should be arrested, in order that it may have the opportunity of gathering from the parent organism the subsidiary equipment essential to its maintaining an independent existence. In this respect, however—as has been already noticed—the human ovum is nowise differently circumstanced from the ova of other animals, which, after leaving the ovary, receive the different elements of their outfit as they travel along their excretory duct. It will bear to be repeated that all but the simplest oviduct has two functions, and the most complicated has no more—one, namely, of expulsion, and another of *habilitation*.* In birds, reptiles, and certain fishes, although both of these functions are very prominently exhibited, they proceed simultaneously, and the operation of the one never obscures that of the other, and consequently the oviduct in them never loses the character of an expelling organ. While the egg is getting inrolled in its various investments, it is at the same time being rolled along the efferent channel. Hence a unity of purpose so obviously attaching to the whole apparatus permits it to be designated by a common name. Now, although a similar congruity of function is as unmistakeably demonstrable in the human oviduct, the long delay of the fœtus in the uterus does, in no small degree, disguise the true relation of that organ to the other parts entering into the composition of the duct. The fallopian tubes and the vagina appear more in the light of a simple passage for the exit of the ovum; yet we know that it is during the transference of the ovum from the ovary to the uterus that the chorion is developed; and there cannot be a question of the utility, to the head of the fœtus at least, of that sometimes difficult and perilous journey through the inlet and outlet of the pelvis. Thus, while traversing one passage, one of its most indispensable additions is

* "Habilitation" = clothing, *habiller* (French), "to clothe."

made to the ovum ; and as it travels along the other, if no actual addition is made to any part of it, the parts already in existence—especially the head—are considerably modified by the conformation of the surrounding structures. In both cases, the double function of the organs concerned is noticeable, and may be viewed as proceeding simultaneously ; the ovum being in motion while the respective changes in its condition are taking place. A similar twofold process engages the uterus during the entire development of the ovum within it, although in this case the result of the action exerted upon the ovum is not motion *in progressu*, but only a tendency to such motion.

There is nothing, therefore, in the nature of this organ to distinguish it from the rest of the oviduct, except the *protracted continuance of its function*. Even that feature is not peculiar to the uterus, as it is well known that gestation may take place in the fallopian tubes ; and, from all that appears, there does not seem to be any reason, other than the anatomical relation of the parts, why it should not take place in the vagina. It is convenience, more than any special aptitude or requirement, that seems to determine the particular part of the oviduct where the process of maturation shall be accomplished by the ovum. The womb is so situated that the fetus enjoys in it the greatest facility for expansion attainable within the body of the parent. Provision is therefore made for preventing this organ, when the impregnated fruit of the ovary is committed to it, from continuing its immediate transference to the passage beyond. This, however, is not done by paralysing its motor energies—which, in the form above alluded to, are manifestly always at work, and directed to this end—but by the interposition of opposing or controlling agencies. In this view of the subject, therefore, the cause of the commencement of labour is not to be sought in the immediate antecedents of that phenomenon, but is to be traced in the gradual withdrawal or reduction of the conditions that, during gestation, prevent the activity of the uterus from taking effect. Before passing from this part of the subject, it is desirable to enumerate a few of the signs which the uterus presents of its activity during the pregnant state, as well as more exactly to describe those contractions which are the direct and palpable exponents of it. Of those, we may notice :—

I. The great muscular development of the uterus. It is against all analogy to assume that the growth of a powerful muscular organ takes place while that organ remains in a state of abso-

lute torpor. The same law presides over the development of both voluntary and involuntary muscular fibre, viz. : action favours and promotes it, inaction retards and arrests it. Now, one of the most marked alterations that occur to the uterus during pregnancy is the remarkable increase of the muscular element in its walls. In the unimpregnated condition, the muscular fibres are so rudimentary as to be hardly appreciable under the microscope ; and, accordingly, their existence was for a time a disputed point amongst microscopists. But when the impregnated ovum makes its appearance they then begin to multiply and enlarge in such a manner that towards the end of gestation they come to form the most conspicuous constituent of the uterine walls. This change implies that the uterus becomes the seat of active contractions from the very dawn of pregnancy. It may be that the peculiar sensations that convey to the mind an impression of the occurrence of conception have their origin in those movements : but, be this as it may, to suppose the growth of muscle proceeding without movement is contrary to all our experience of muscle in other parts of the body, and of this same muscle at a later period of its development. Whatever objections may be urged in consideration of the hazard that the ovum may appear to be subjected to from such early and constant activity on the part of the uterus, the point contended for remains unaffected, since in no other way can we, consistently with physiological principles, account for the change occurring in the organ. It may not appear that the nascent fœtus,—unfit as yet for any existence but in the womb of Nature,—has any need of an impulse directed to drive it thence into the world where it cannot live ; but if no such impelling force were at hand when the time comes when it must be delivered, what would remain for it but to die unborn ? And how is this force to be produced when the crisis demands it ? Not, I presume, by any convulsion of Nature like the exercise of some supernatural agency, but by a gradual and steady accumulation from the impotence of the elementary fibre, to the irresistible energy of the fully formed muscle. Whoever attends to the process cannot fail to discover this truth. The power that is brought to bear at last is generated slowly, and is always perceptibly on the increase until, in the happy arrangements of Nature, it reaches its climax when its greatest effects are wanted.

It must not be supposed, however, that all the utility of the habitual contractions of the uterus is merely in reserve. It would not indeed be labour misspent even were the uterus to be regularly

exercised for nine or ten months for no other purpose than to be able efficiently to discharge the function which at the end of that time must devolve upon it. But there is an ever-present need for the contractions of the uterus, quite independent of this prospective use, and failing which the development of the fœtus could not proceed. It is not only that the activity of the organ commands an increased supply of blood for the enlargement and perfection of all its own structures, but that activity determines a constant flow into the channels by which the fœtus is nourished. The great dimension of the bloodvessels in the uterine walls results, primarily, from the law that the stream of blood in any part of the body is augmented in proportion to the degree of exercise engaged in. Unquestionably in this way the nutrient fluid is first attracted into the vicinity of the fœtus, and, most probably by the same agency, is assisted on through the placenta into the umbilical vessels. It is well understood that the movements of our limbs, and of the muscles of the whole system, come in aid of the heart's action in the circulation of the blood; and as regards the uterus, if there be any need for an auxiliary to the heart of the mother in maintaining the circulation through the placenta, there lies in it a force utilisable for this purpose. But whether it plays the part of a supplementary heart or not in forcing, by regular and repeated contractions, the stream determined towards the neighbourhood of the ovum, there can be little doubt that the abundant supply of blood in that neighbourhood is created and maintained by its activity. It is impossible that the fœtus should exert any influence in attracting its own nourishment for some time, as it necessarily must remain a passive body during the greater part of its existence *in utero*. If the uterus were in like manner passive, such dormant vitality would never establish or advance the nutritive changes that occur in and around that organ in a state of ingravidation. Inertia in every other known instance results in muscular atrophy—here we have hypertrophy: in degeneration of all organic structures—here we have the highest perfection of the parts concerned: in shrinking of the bloodvessels—here we have enlargement: in general loss of power—here we have multiplied increase of power. Looking at these facts nothing appears more opposed to the rational physiology of the process than the dogma that the uterus is inert during pregnancy.

II. The next proof afforded of the activity of the uterus during pregnancy to which I will allude is the phenomenon of abortion or

premature labour. It has been said that "the womb has the habit of aborting;" that is, experience shows that the uterus, any time during gestation, may expel the fœtus. The power of expulsion is always at hand, and ready to effect its end when an opportunity presents. Upon this fact depends not only the occurrence of miscarriage, but the possibility of inducing premature labour. The original disposition of the uterus not being to make nor to hold captive as generally supposed, but, on the contrary, to discharge and cast forth so soon as the ovum relaxes, so to speak, or is made to relax the persisting tenacity which in general preserves it in the face of threatened expulsion, its doom is sealed. Between abortion and labour there is no essential difference as regards the process of delivery; the difference is mainly confined to the result. Since, then, labour may come on, or be brought on, at any time during pregnancy, the uterus must always be in a condition of activity, as it cannot be supposed that that property springs up like a will-o'-the-wisp, in a moment, without precedent or antecedent.

III.—In the third place, I have no doubt that the sensations referred to the quickening of the child are due mainly, if not wholly, to the movements of the uterus. It is said that—"the period of quickening is that at which the mother becomes for the first time conscious of the movements of the fœtus within her womb." The time, however, at which this event takes place, is by no means well defined; for, according to all writers on Midwifery, the time varies within a very wide range,—the most recent writer on this subject, in this country, giving it as "varying from the end of the second to the eighth month."* Now, in the first place, it is certain that, at the early period of two months, when quickening may take place, the fœtus is almost destitute of every attribute of motion, having neither bones nor muscles. About the eighth week after conception, when this sensation may arise, the first points of ossification in the clavicle, lower jaw, &c., are just beginning to make their appearance, and as for true muscular fibres, they are a tissue quite unknown in any part of its economy. Certainly the sensation in question cannot be referred to this source, as a creature devoid of the means of movement cannot be capable of stirring up such a fluttering as this experience is said to be. It is quite intelligible, however, that as the uterus enlarges, and more especially when it begins gradually to rise out of the pelvis, its

* Leishman's "System of Midwifery," p. 172.

movements should disturb the surrounding parts, and give rise to unusual feelings. But, besides all this, there is a cogent psychological objection to attributing this consciousness of movement to the motion of the fœtus as the exciting cause. As it is a sensation of movement which the pregnant woman becomes conscious of, that itself may be taken as proof that it cannot, at this period, be the movements of the fœtus which she feels, for the power of appreciating the movements of bodies is a capacity with which the viscera of the human body are not endowed. It is true they yield a sensation of their own movement, but that is a very different thing from conveying an impression to the mind of the movement of bodies moving near or along their surface. The most movable material within the system is the blood; but, although a concentration of the attention thereon may in any case reveal the pulsations of the heart, the most intense subject-object consciousness will not elicit the faintest trace of the blood's course through the arteries. The food, in passing along the alimentary canal, gives no intimation of its whereabouts by communicating to the bowel an impression of movement, and the presence of intestinal worms is never discovered from a perception of their actual locomotion. In the one case we have simply pain and irritation, without any speciality to indicate whether it proceeds from a body in motion or at rest; and, in the other case, if there be any sense of movement present at all it arises from the motion of the intestines themselves, and not from that of their contents. And so, through the force of analogy, we are constrained to believe of the uterus. Very unwillingly will we admit the existence of exceptional powers or properties to signalise this organ as peculiar or more mysterious in its nature than other organs of the body, and all the more so when the phenomena to be explained neither requires nor warrants any such fictitious endowments. There is a sensation of movement at quickening, and, in order that the fœtus may be the primary cause of it, we have, in the first place, to suppose, in some cases at least, a creature destitute of any apparatus of locomotion originating spontaneous movements; and, in the next place, we have to provide tactile sensibility for the interior of the uterus to take cognisance of the same (for what possible purpose has never been even hinted), although we know of no such provision in the interior of any other organ of the body, and this all the while that we know from other sources that the organ itself executes movements, and in being sensible of them would only resemble all its

confreres in like circumstances. There is no doubt at a later period, when the fœtus has acquired enough strength in its limbs to wrestle and kick, as at times it seems disposed, that through the muscles of the abdomen and the skin an impression of its movements may be conveyed to the mind of the patient ; but, even then, no small part of the movement undoubtedly is caused by the contractions of the uterus, which must be set up by this internal stimulus. Obstetricians have, happily, been long aware of the potent influence that irritation applied to the interior of the uterus, after labour, has in causing it to contract, and it is surprising that this should have never been thought of as taking place before labour at a period when, by the movements of the fœtus, it is being subjected to almost continual irritation. As far as determining the cause or origin of any feeling of movement in this situation, the patient is in no better position than her medical attendant, except that she has more abundant opportunity of observing it. Where she is conscious of such a thing, it is owing to the muscular and tactile sense present in the walls of the abdomen, just as, when the obstetrician detects it, it is through the muscular and tactile sense wherewith his hand is endowed. I have been led to introduce the above remarks from a conviction that the attention both of the mother and the practitioner has hitherto been absorbed by the movements of the fœtus, to the entire neglect of the contractions of the uterus, notwithstanding the fact that these contractions are the main cause of the sense of movement experienced during pregnancy. There is an involuntary and regular process of contraction and expansion—not an action, dormant for hours, breaking out all at once, and again suddenly subsiding ; but going on regularly for hours, day and night, and, in fact, to a more or less perceptible extent, is present whenever attention is directed to it. If attention is directed, not to the body of the fœtus (when it can be felt), but to the wall of the uterus, that substance will be found gradually to get tighter and firmer under the hand, and then, in the course of a very short time, to relax again. These contractions, when faint or imperceptible, may be intensified, just as the actions of the heart can be, by the sudden application of cold to the surface of the skin in the region of the organ. It is astonishing, however, that that proceeding should have been recommended as a test for eliciting the vitality or presence of a living fœtus, as being a most efficient method of awakening it to active exertions. It hardly comes within the range of possibility that the temperature of the

hand should reach the fœtus in the manner supposed. To communicate an impression of temperature across a stratum of fluid requires, of course, that the whole stratum should be changed to the temperature to be communicated. It is altogether impossible that the cold hand should be able to effect this in the liquor amnii, and therefore it is impossible that it should have anything to do with exciting the fœtus into a state of activity. As to the idea of a shock being thus indirectly conveyed to the fœtus through the nervous system of the mother, it will be time enough to discuss that view when the existence of a nervous communication between them has been established. But that the application, and especially the sudden application, of cold to the abdomen is capable of producing and intensifying uterine contractions, is a fact which every obstetrician is, very fortunately, aware of; and there can be no doubt it is invariably the uterus—in combination, of course, with the muscular walls of the abdomen—which answers to the stimulus.

To sum up this argument, therefore, for the activity of the uterus, during pregnancy—since movements are felt at a time when the fœtus cannot move, and since, at a later period the movements of the uterus can be made the subject of direct investigation—it may be inferred that the activity of the uterus is constant throughout pregnancy.

IV. The last circumstance I will notice, as showing the active condition of the uterus throughout pregnancy, is the gradual approach of the actual process of parturition or expulsion. The contractions that are known in obstetrical language as the “false pains,” as a general rule, are recognised as being in process for days or weeks before the positive symptoms of labour commence. They are not felt regularly every so many minutes, as the true pains, but only occasionally—always, however, becoming more severe and more regular as time advances. The explanation of this new feature, viz., acute pain accompanying the contractions of the uterus, will lead us to the consideration of the means instrumental in retaining the fœtus; for it is at the final breakdown of these that this symptom most prominently presents itself. Not that there is an entire absence of pain or *malaise* during the nine or ten months antecedent to this occurrence (as need hardly be noticed); but the discomfort of those movements of the uterus, for that time, is a very different thing from the sharp and cutting pains of labour; and the explanation of this circumstance brings us to the conditions on which the safety of the ovum depends.

We have not yet, however, touched upon the other evidences discoverable in the history of the uterus which demonstrate its function as fundamentally an expelling organ. The consequences of parturition, as regards the uterus, show us that that organ is never at rest, so to speak, while there remains anything in its cavity which can be expelled. As soon as the child is delivered, it closes upon the placenta, and, after it is discharged by regular and repeated contractions, it clears out every fragment of membrane and every clot of blood. If, by mischance, any remnant of the ovum or coagulum gets a hold within, the consequence is that the patient is disturbed, and, it may be, to such an extent as to endanger her life by the fruitless efforts of the uterus to expel it. It is only when its cavity has been entirely evacuated that the uterus rests from its labours.

In like manner menstruation exhibits the primary intent of the uterus as an expelling organ. This phenomenon is the result of the periodic congestion of the internal genital organs—the ovary, the fallopian tubes, the uterus, and the vagina—and manifests the physiology of the sexual gland and duct in its simplest use. The gland supplies the ovum, the duct discharges it, along with its own adventitious products. It is a miniature labour so far as the maternal organism is concerned, and simulates with great precision, and sometimes on no inconsiderable scale, both the objective and subjective symptoms of the greater event. Thus there is the double transition in the discharge, first from the whitish tinged to the deep red, and back again from the deep red to the whitish, as at the commencement and termination of the phenomena of parturition. The pain experienced in both cases is remarkably of the same character, although differing in degree; some women are used to say that their monthly periods remind them of their lying-in-bed in the resemblance and amount of suffering. Beginning usually in the back the course of the pain follows the direction of the duct round the loins, and down to the lower part of the belly. The analogy between the symptoms of menstruation and labour has not, so far as I am aware, been previously alluded to in this light, yet the connection is obvious and suggests practical considerations of interest.

I shall not at present allude to all that Pathology teaches on this subject of the fundamental function of the uterus, but shall simply produce on this head the well-known facts that those tumours which are really intra-uterine or pendant from the wall of the

uterus give rise to movements that the patient finds impossible sometimes to distinguish from fetal, and that the natural course of cure tends to expel them from the system by the active efforts of the uterus in that direction. For this reason it is a matter of great difficulty, sometimes, to determine whether a formation within this organ is a pathological growth or a fetus, inasmuch as the patient's testimony is inconclusive, and the other signs may not be unequivocal. The best obstetricians have met with singular puzzles in these circumstances, and have not always proved themselves too clever not to be taken in. The action of the uterus is relied upon in case of operation just as it is in the delivery of the child, and without its concurrence in this way recovery is hopeless.

On these several grounds, then, it is maintained that the fundamental function of the uterus is the expulsion of the ovum, and the full meaning of the term fundamental in this connection is to be regarded as merited. Just as it is the main purpose of the ovary to furnish the rudiment of the ovum, so it is the main purpose of the uterus, as of the oviduct generally, to discharge the ovum externally. Its other duties are secondary or incidental, and are imposed on it, so to speak, by the ovum itself, which in virtue of its endowments as a living body resists the uterus, and adheres to it with the tenacity of a parasite, which in reality it is. The relationship between the womb and the fœtus is thus of a somewhat different nature from what it has usually been represented to be. There may not be so much poetry, but I am convinced there is more natural history and physiological truth, in this than in the orthodox opinion. The uterus is no passive viscus yielding always in conformity with its contents; it is no peacefully-disposed recess in the depths of the economy charged in its shelter with the tender keeping of the young, and in the manner of its instinctive guardianship—its very listlessness—reflecting the voluntary assiduity of the mother for whose bosom only at the appointed time it relinquishes its well-kept *protégé*. There is war in the uterus—a struggle between opposite forces—as elsewhere throughout Nature. But in this no more than elsewhere is there anything adverse to the elevating conception that the arrangements of Nature are in the main always good and beneficent, as the final result remains the same. If any operation is to be analysed it must be done without prejudice or feeling as to what the separate elements should be. In the preservation and development of the embryo, as elsewhere in the fulfilment of its purposes, Nature does not confide in a single and

isolated agent, acting like an intelligent being for one end in a variety of ways according to time and circumstances, but in a combination of agents each faithful to its own cue, and conjointly attaining the desired result. In maintaining, therefore, that the womb does not stand in the same relation to the fetus that the mother does to the child, we are dismantling it of its time-honoured *prestige* only to point out how it comes to pass that, impressed with a contrary disposition, the beneficial purposes of Nature are yet accomplished.

I shall now, therefore, endeavour to show how the ovum retains its position, during pregnancy, in the uterus. It was the opinion of Boudeloque that an antagonism existed between the fundus and the neck of the womb, and that while the one tended to displace the ovum, the other served to retain it. A similar view is expressed by M. Desormais:—"The fundus and body of the uterus are the first to become distended, in order to form the cavity destined to retain the fetus. The cavity of the cervix does not participate until the later period in the increase of the uterus, and the resistance which its orifice opposes to the escape of the ovum diminishes in proportion as pregnancy advances to its termination. At this period, the fibres of the cervix no longer possess resistance sufficient to prevent the antagonistic effect of the action of the fibres of the fundus; these last contract and the fetus is expelled." And Miller also remarks:—"To the body it belongs to make preparation for the reception, growth, or accommodation of the ovum; to the neck to make provision for its retention and safe keeping."* Now, according to our opinion, there is truth in this doctrine, but it is incorrectly expressed; for the uterus being a single hollow muscle, and not a combination of muscles, it is very difficult to understand how one portion could possibly pull one way, and the other portion the directly opposite way, and all inquiries into the action of the uterus show that the cervix and the fundus always contract together. It is necessary for a proper conception of this point to know, in the first place—since there can be no doubt as to the fundus—what the action of the cervix really is. Actual observation during labour shows that while the fundus is forcing down the body of the child, the cervix is pulling upon the vagina so as to slip it, as it were, over the presenting part and body of the child. The one directs the fetus outwards; the other directs the maternal passages inwards. The

* "Principles of Midwifery," page 69.

combined action is similar to the method by which a glove is drawn over the fingers. The finger is pressed on into the glove, while at the same time, by the movement of the other hand, the glove is drawn on over the finger. The forces, although really acting in opposite directions, accelerate the same result, viz., the induction of the hand into the glove. And so the action of the fundus and of the cervix are in opposite directions, but there is so little antagonism between them that they directly coincide in their efforts to expel the fetus. It must be manifest, on the slightest consideration, that were it not for this upward force, which, in a manner, brings the outlet to the head of the fetus, the fundus would have a great deal more to do. And it must be equally manifest that, were it not for this power of shortening or straightening the passage, the only operative part of the uterus would be the part behind the fetus, that is, only about a-third of the organ. Besides being instrumental in the expulsion of the fetus, this pulling inward of the vagina prevents its being forced down before the descending head. In this sense, then, an antagonism may be said to exist between the fundus, or rather between the upper and lower parts of the uterus, for there is really no nice division between them; but it is an antagonism not retarding but expediting the delivery of the child. The dilatation of the os uteri is in consequence of the muscular action here described, as the more those fibres that pass from the cervix to the vagina get to act upon the wall of the vagina, the more nearly is the latter brought into a straight line with the cavity of the uterus, and therefore the more is the separation between them obliterated, until finally they become one passage. When the os uteri is just beginning to give way, it will be seen that many of the fibres acting upon the vagina do so at a mechanical disadvantage; but their power is increased just as the operation of the opening of the os uteri advances. Now there can be little doubt that it is in this way that the external passages are dilated or prepared for the exit of the fetus. And this is a process that does not begin with parturition, it is in progress throughout the period of gestation. Most accurate observers are aware that the vagina undergoes an enlargement in its diameter during this state. I believe this is due to the action of the uterus, or that part of it which ultimately accomplishes the process.

The most recent account of the disposition of the muscular fibres in the fundus and cervix fairly bear out the interpretation here offered, as may be seen by referring to the account given by Henle

of the muscular structure of the uterus, where the fibres that pass from the cervix to the wall of the vagina are clearly indicated.

The conclusion from these observations is, therefore, that no real antagonism, as regards the expulsion of the ovum, exists between the fundus and cervix. Therefore it is not to the action of the cervix that the ovum owes anything for its existence in the uterus. No doubt there is a kind of resistance offered by the cervix to the passage of the ovum, but it is of a similar kind to the resistance offered all along the oviduct, from the fimbriated extremity of the fallopian tubes to the os vaginae, and arises simply from the walls of the passage being in contact, there being only a potential and not an actual cavity. The ovum, having, however, through its own inherent vitality, secured itself to the uterus on its first arrival in that cavity, at a time when it could have easily passed through the cervical passage, by its subsequent growth, causes the cervix to play a part in hindering its expulsion. This is accomplished by the continuance for a time of the close and rigid condition of the cervix uteri, the gradual withdrawal of which is manifested as pregnancy advances, by the change in shape of the os from the transverse slit to a more circular form; also the progressive advance of the softening process which the cervix undergoes, and lastly its final obliteration.

The real safeguards and protection, then, of the ovum threatened with expulsion during maturation are in itself, although in the first instance they are derived from the provision made for its nutrition by the oviduct. It will not be necessary to enter on any lengthened discussion on this head, as it must have been recognised as soon as the subject was made a matter of investigation, that the membranes which establish the connection between the foetus and the womb serve at the same time to retain it *in situ*. The chief point of importance here is to show that those provisions which are made for the safety of the ovum are alone capable of securing this end, and that, too, during a season of ceaseless agitation for eviction.

Let it be observed then, in the first place, that when the impregnated ovum enters the uterus, it is caught by the decidua lining this cavity; and is soon entirely enveloped in this structure, and attached to the internal surface of the uterus. At the period when extrusion would be most easy, as far as the fallopian ovum is concerned, the attachment to the uterus is made the most secure. Without detaching the entire deciduous membrane, there is no pos-

sibility of casting out the ovum. While, however, the attachment of the membranes becomes more and more localized, the strength of the uterus is proportionally increasing; so that in this arrangement there is a gradual transference of power from the retaining to the expelling apparatus. The disintegrating process, which ultimately separates the placenta from the uterus, is what terminates the connection, and leaves the foetus to be expelled. Although, therefore, the last step in a series of changes progressively advancing towards the commencement of labour, it cannot in itself be regarded as the primary cause, and must be taken in connection with the other events which precede and accompany it.

Now the most important of the other conditions which prevent the expelling force from taking effect, and whose gradual withdrawal ushers in the advent of parturition, is the presence of the liquor amnii. This fluid, being contained in a perfectly closed cavity, it is manifest that, according to hydrostatic principles, any pressure brought to bear on one part will be met by pressure equal and opposite in direction; or, what is the same thing, the pressure brought to bear on it will be equally distributed in all directions. The effect of such pressure upon a body immersed in a fluid such as the foetus will be to cause oscillation, but not movement in any one direction. Such is the history of the motions of the foetus, so long as its body is wholly surrounded by this medium. In this simple contrivance Nature finds a check sufficient to control the most active energies of the uterus; so that, although at all times menaced with expulsion, the foetus never comes within its grasp until the protecting fluid is removed by absorption or discharge. The process of its normal removal resembles precisely the localisation of the attachment and final separation of the membranes in gradually yielding up, so to speak, power to the expelling forces. For throughout pregnancy, although absolutely the quantity of the liquor amnii increases, relatively to the size of the foetus it is constantly diminishing, and when labour actually commences it no longer entirely surrounds the foetus, and the first indication of the more active stages of labour is the bursting of the membranes and the escape of the entire fluid. The whole body of the foetus is then exposed to the action of the uterus, and this, co-operating with other changes, finally effects its expulsion.

This reasoning is not simply a deduction from hydrostatics, but is verified by observation. No fact is better established than the gradual diminution of the liquor amnii as labour approaches, and

the increase of the expelling force when it is finally discharged. Among the causes which retard parturition the presence of too great a quantity of this fluid has always been recognised. On the other hand, there is no surer method of inducing abortion than the evacuation of the liquor amnii. The connection, therefore, between the withdrawal of the liquor amnii and the induction of labour, is logically established both by the method of agreement and difference. Another fact, equally significant to those who believe in the power of ergot in stimulating the uterus to contract, is the rule almost universally agreed to, that ergot itself is powerless in bringing on labour; but when labour is once fairly begun, it is efficient in expediting it. The explanation, according to the view here presented, would simply be that no mere increase of the power of the uterus to contract avails anything, until the removal of those conditions which have hitherto insured the safety of the fœtus; the contractions, however powerful, are simply neutralised; but when these conditions are withdrawn any additional force assists in the expulsion of the fœtus.

There can be no doubt that the absence of acute pain—for it is not correct to say there is entire absence of it (the pregnant state being one of much uneasiness, sometimes of much endurance from this as well as from other causes)—is due to the presence of the liquor amnii, which prevents any pressure of the nerves in the uterine walls. It is only when they come into contact with a solid substance, viz., the head or body of the child, that, as a rule, severe pain results from the uterine contractions. But it is well known that only part of the pain of labour is due to the uterine contractions, and that it is the stretching of surrounding parts, as when the head descends into the vagina, that the actual suffering commences.

Such, then, is the explanation offered of the cause of the commencement of labour. It is an attempt to reconcile the facts of the case with the ordinary principles of Physiology and the laws of Nature. It may no doubt leave some of the phenomena unexplained, but I know of no other theory with which a greater number of observed facts are in harmony. It does not do violence, so far as I am aware, either to our general conceptions of the arrangements of Nature, or to our ideas of the operations of physiological instruments, while in itself it is perfectly consistent and logical.

To sum up in conclusion. It is manifest that the great muscular

development of the uterus ; the occurrence of abortion at every stage of pregnancy, of what is called premature labour ; their regularity in point of time when the fully-formed foetus is delivered ; the possibility of inducing labour at any time ; the movements of the uterus felt during gestation ; and, lastly, the gradual approach of natural labour ;—are all facts from which it may justly be inferred that the uterus is active during the whole period of the pregnant state. On the other hand, it is equally evident that the manner of attachment of the ovum to the uterus, the condition of the cervix, and the relation of the liquor amnii to the body of the foetus, are circumstances opposing the casting out of the foetus, and that it is the change in the disposition of these circumstances that gives opportunity for the play of the expulsive power of the uterus and the occurrence of parturition. The existence, therefore, of the foetus *in utero* is a struggle maintained by the antagonism of opposite forces.

THE INDUCTION OF SLEEP

AND

INSENSIBILITY TO PAIN,

BY

JOHN M. CROMBIE, M.A., M.D.

“DR. CROMBIE'S CHLOROFORM APPARATUS (*manufactured by S. Maw, Son and Thompson*).—This instrument, of which we append a woodcut, is a very ingenious and useful invention. The object of the inventor has been to make it possible for persons suffering from intense pain or insomnia to avail themselves of the benefits of those smaller doses (‘stimulant’ doses, we should call them) of chloroform, which will produce sleep without producing coma. It is notorious that an immense number of sick persons are in the habit of using chloroform with this intention, but that they usually take it by means of a simple handkerchief or lint, which, at any rate for self-administration, is a most dangerous method, and is already known to have caused several deaths, and suspected to have caused many others. In Dr. Crombie's instrument there is no danger of any untoward accident. The patient, lying comfortably on a sofa, or in bed, places the vessel containing the chloroform (the cap well screwed on) beside him, and puts the conical facepiece over his nose and mouth. He then proceeds to work the hand-ball with regular rhythm. This projects an exceedingly small quantity of chloroform at each jet, on the blotting-paper in the case. Very soon a feeling of drowsiness comes over the patient, which renders it impossible for him to keep up the pumping movement, and he quickly drops off to sleep without the possibility of giving himself an overdose. We understand that this inhaler has been largely used for cancer patients, and other sufferers from painful incurable diseases, with great benefit. It certainly affords the only means we know of by which chloroform can safely be administered to themselves by patients.”—From *The Practitioner*, April, 1873.

“Chloroform has indeed, but more clumsily and less safely, been adopted by practitioners since its introduction for this purpose; but it has always most properly been placed in patients' hands with dread and misgiving, and the results have been in several cases disastrous; and no doubt the full therapeutic value of many anaesthetics for the relief of pain has not been taken advantage of for this reason. Dr. Crombie's clever mechanical contrivance recommends itself for fair trial under the surveillance of the medical practitioner.”—*The London Medical Record*, May 28, 1873.

“Dr. Crombie's Apparatus appears to be a good one, and to offer increased

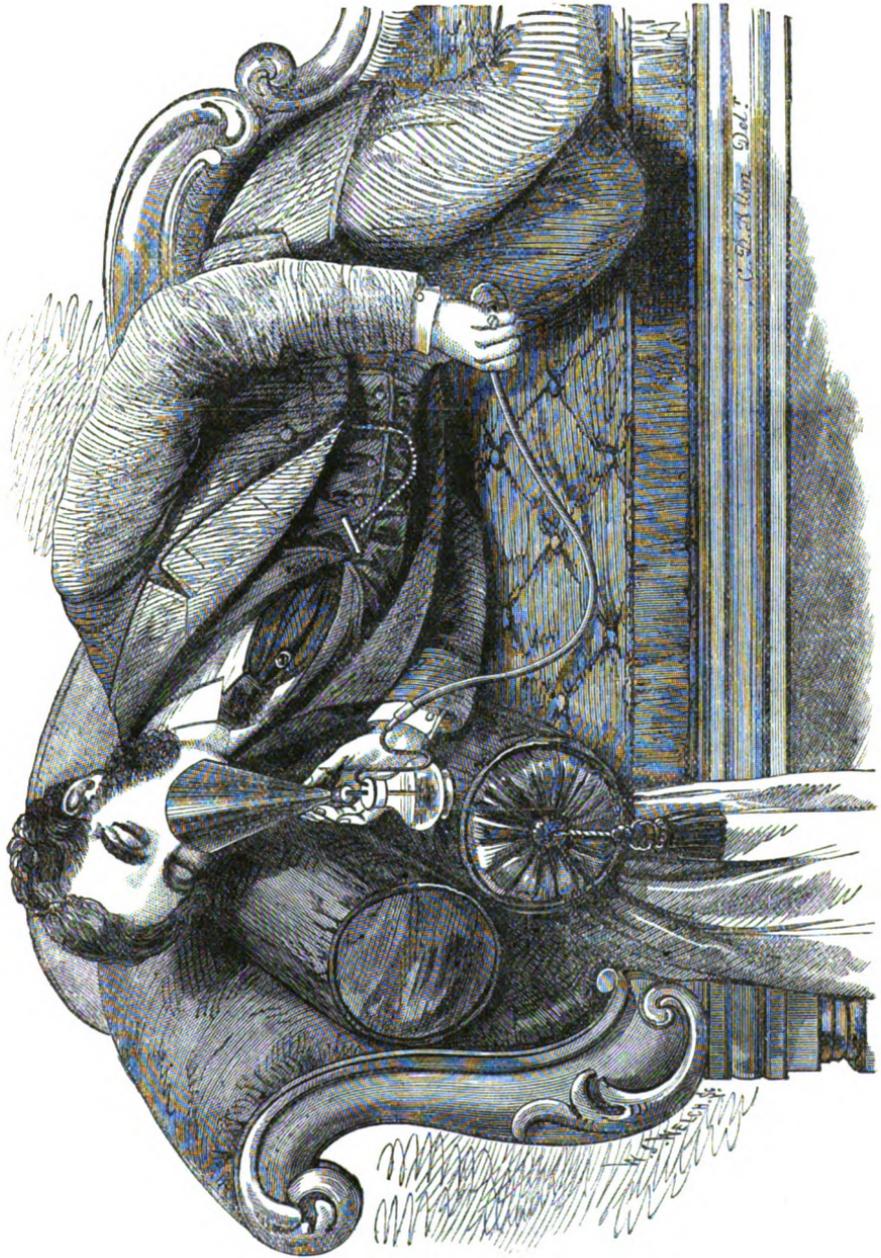
facilities for the safe application of slight anæsthesia for the relief of pain. We have employed it in suitable cases, and it has acted well."—*British Medical Journal*, June 14, 1873.

"Dr. Crombie's ingenious little instrument for the production of sleep and insensibility to pain—such as neuralgia, and the like—by the inhalation of anæsthetics, is now well known. The great value which he claims for it is, that by its means the use of the anæsthetic may safely be left in the hands of sufferers themselves. . . . Dr. Crombie's pamphlet contains some general remarks on anæsthetics which are good in themselves, and which are expressed in accurate and elegant English."—*Westminster Review*, October, 1873.

"Dr. Crombie remarks that when all the conditions favouring sleep are observed—that is, when the patient is in a bed, comfortably warm, and excluded from noise and too much light, and wearily longing for sleep, even although suffering great pain—an incredibly small quantity of chloroform is sufficient to produce it. The accidents which have occurred through the administration of chloroform seem to have been due to the administration of the drug in excess, and attempting to produce total unconsciousness—an unnecessary proceeding, as it is not needful to reduce the vitality so low in order to induce insensibility to pain. The following passage, which is also of much general interest, gives the result of Dr. Crombie's observations on this point," &c.—*Iron*, March 21, 1874.

"Everyone who has had the misfortune to suffer from the want of sleep will, we are certain, fully appreciate the information which this able and interesting essay contains. The subject which the author, Dr. Crombie, has endeavoured to elucidate and render intelligible to the plainest capacity is one of great importance, and it is, moreover, one wherein the rich as well as the poor, the young as well as the old, are equally concerned, since all of us are liable at any time to be attacked by illness or exposed to personal injuries, whether of a serious or modified character. . . . There are many other points which we should have wished to bring under the notice of our readers; but they must be content for the present with what they have already got—strongly recommending them, however, to study the essay carefully for themselves. They will find much to recommend the judicious administration of chloroform in all cases where insensibility to pain is required."—*The Reporter*, July 11, 1874.

"The method of administration and the degree of anæsthesia produced is provided for by an ingeniously-constructed apparatus, devised by Dr. Crombie, which is, so to speak, automatic in its action. . . . In view of the growing consumption of chloral-hydrate, and the rather numerous accidents from its use, it would be well if more attention were paid by the public to the arguments of Dr. Crombie."—*World of Science*, December 4th, 1874.



INSTRUCTIONS AND RULES

FOR THE USE OF

THE ADMINISTRATOR.

Unconsciousness to the extent of *sleep*, as distinguished from *coma*, is all that can be produced by this method for the self-administration of anæsthetics.* This is all that is necessary for relief from pain, however severe; it is all that can be reached and sustained with safety. The sleep thus induced, just as sleep when it occurs spontaneously, does not imply the total suspension of all susceptibility to impressions, but is that degree of unconsciousness in which the susceptibility is so diminished that, what otherwise would be acute suffering or violent pain, can at most be felt only as a feeble or momentary experience, and consequently does not awaken the sleeper at the time, nor recur to his recollection afterwards. *Coma*, on the other hand, is an entire suspension of all susceptibility to impressions—a condition immediately bordering on death.

It is possible to attain *sleep*, and impossible to produce *coma* by this method, for the following reason:—*the inhalation of the vapour ceases whenever the patient begins to sleep*, and this because it is dependent on certain movements of the hand, which are arrested by the approach of sleep.

The anæsthetic sleep is dangerous, like natural sleep, in advanced diseases of the heart, lungs, or brain. Persons suffering from such diseases are always in danger, when asleep, of sleep passing into coma and death, and if they had recourse to anæsthetics, would increase that tendency. But, with those exceptions, sleep induced by chloroform or ether is not attended with danger.

The bottle is to be half-filled with the anæsthetic, the stopper screwed tightly down, and the point of the delivery tube fixed in the inhaler.† A piece of blotting-paper or a small quantity of cotton-wool in front of the delivery tube inside the inhaler prevents the anæsthetic from reaching the patient directly. The inhaler is placed over the mouth and nostrils, about two or three inches distant from them, and at each compression of the ball three or four minims are ejected into it. Two or three compressions per minute suffice to maintain the air inhaled, especially with chloroform, sufficiently charged; but the rate of compression is to be guided by the capacity of the patient for respiring the vapour, always taking care that the mouth and nostrils are so placed as to inspire what is being pumped into the inhaler, and, conversely, that none of the anæsthetics is to be pumped out while the mouth and nostrils are turned from the inhaler.

Perfect quietness must be enjoined on attendants, if any, and patients should compose themselves as in preparing for sleep ordinarily, so as to assist the action of the anæsthetic, and must not be interfered with during the process.

When sleep supervenes, the ball of the instrument is let go, just as the plaything drops from the hand of the sleeping child.

The safety of the instrument for use as directed depends entirely on the accuracy of the mechanical adjustments, and therefore none will be sold but those examined and approved by the inventor.

Messrs. S. MAW, SON & THOMPSON are the sole authorised manufacturers.

JOHN M. CROMBIE, M.A., M.D.

Brompton, March, 1873.

* Chloroform, Ether, Bichloride of Methylene.

† When the small opening in the air-tube is covered by the slide, the maximum quantity of anæsthetic is ejected; when it is left free, the minimum.