Hoffman (Jos.)

THE AXIS-TRACTION FORCEPS:

ITS PLACE IN OBSTETRICS.

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THE AXIS-TRACTION FORCEPS: ITS PLACE IN OBSTETRICS.

By JOSEPH HOFFMAN, M.D.,
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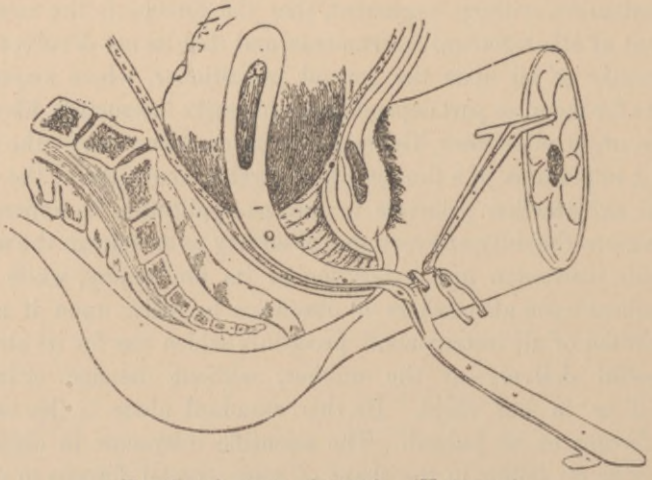
Assuming, without argument, that the forceps is the most important of all obstetrical instruments, and that its use devolves most frequently of all upon the general practitioner, whose success or failure for the most part depends upon his early instruction, his experience, or, in some cases, his strength—force, without art—the paramount importance of a thoroughly general appreciation of the value of the axis-traction principle in forceps application is imperative. It becomes the duty of every special society to encourage the widest possible discussion and exposition of its philosophy, while it is incumbent upon all teachers of obstetrics to insist upon it as the foundation of all instrumental procedure which has for its aim the successful delivery of the mother, without damage either to herself or to her child. By this standard alone is the use of the forceps to be judged. The scientific instructor in obstetrics must ride no hobby in the shape of some special forceps to which he has applied a new curve, which is most likely an old one, unless underlying the placing of this or that modification of the already too-numerous instruments, there is a real idea which, added to the sum of obstetric experience, will increase its value. Students of our various schools are too apt to go out from them, pinning their faith upon the instrument which the traditions of their own special institution have sanctified. Each, according to his instruction, will expect to subdue the world of obstetrics with a Hodge or a Wallace, a Simpson or a Davis. The fact stands out that in this as in too many other questions, we have been taught to deal with names instead of principles. Considering the instruments designated above, each one of them, which, unfortunately, cannot be affirmed

of all others, took its origin on an obstetric principle, and was not propagated as a curiosity. The point here to be insisted upon is that, added to the special features of any ordinary instrument, of which the above may be taken as a type, the principle of axis-traction completes it; without this the instrument is crude, the skill of the obstetrician being the only factor to modify and determine the degree of its imperfection.

The necessity of obviating a direct pull against the maternal tissues, outside of the axis of the pelvis, was apparently appreciated by Hodge[1] when he wrote: "During the descent of the head into

Fig. 1.



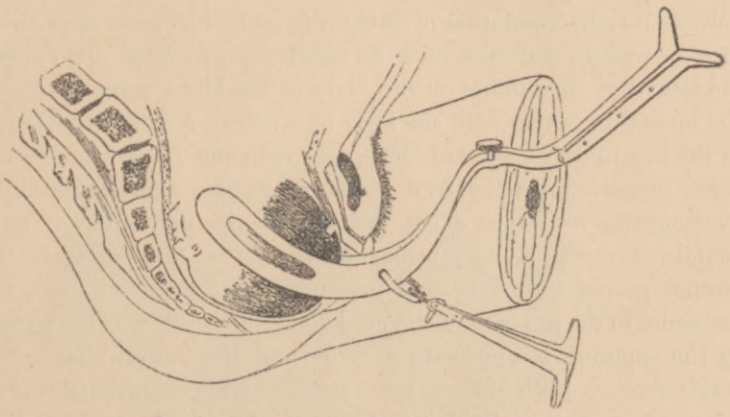
Traction above superior strait. (Hermann.)

the cavity of the pelvis, it may often be advantageous to place the fingers of the left hand in front on the shanks or joint of the forceps, so as to make direct pressure downward, and thus determine the blades more directly in the axis of the pelvis. By this manœuvre the head will be directed firmly against the coccyx and perineum, and not be drawn against the pubis." In giving this advice, so far as I have been able to discover, he stands alone among American and English authorities up to his time. So far as the application of the principle, which he strove to inculcate was

[1] System of Obstetrics, p. 255.

concerned, he was antedated mechanically by Hermann, of Berne, nearly twenty years. Dr. A. H. Smith, lately deceased, of this city, after a careful investigation of the bibliography of the manœuvre suggested by Hodge, decided that in this he was also preceded by

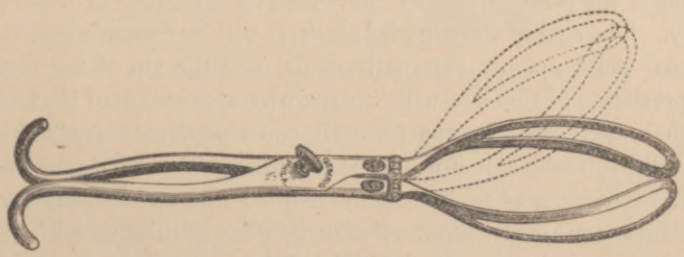
Fig. 2.



Traction below the superior strait. (Hermann.)

Osiander, of Göttingen, many years. I call attention to these facts simply to emphasize the position here assumed, that the ordinary obstetrical forceps is a defective instrument, no matter what name it bears, and that this deficiency has been long appreciated and never

Fig. 3.



McFerran's forceps.

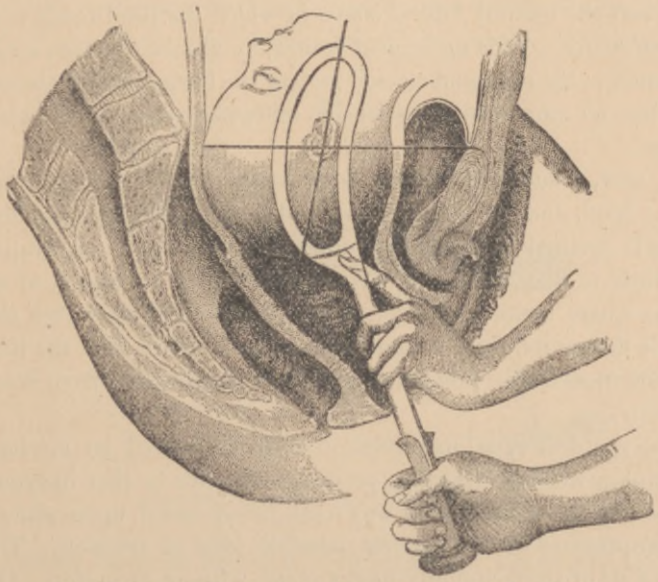
obviated, though measurably modified in skilful hands by the manipulation advocated by Osiander and Hodge. It is worthy of comment in this connection that, although the need of axis-traction was felt so long ago in this country, still, with all its boasted

mechanical ingenuity, there was no invention of an axis-traction forceps, nor is there yet one of American design, those of Cleemann and McFerran, the latter of which is represented, being simply devices to overcome the difficulties of high pelvic application.

The problem to be solved in every forceps delivery is complex, involving the application of a force along the curved axis of the pelvis, and the resolution of that force, so that as little as possible may be wasted, and none of it be harmfully expended upon either the tissues of the mother or the body of the child, necessitating at the same time, along with the force of traction, a lateral deviation in the line of the least resistance, and reducing concomitantly the direct pressure upon the fetal head to a degree alone sufficient to overcome the resistance along the axis of the pelvis, or any accidental or necessary increment thereto. It is plain that in the normal pelvis, with a normal presentation of the fetal head, the resistance to the progress of the head along the pelvic axis is afforded by the opposing soft structures below and the bony walls of the pelvis above. Both of these are overcome by the expulsive power of the uterus. Artificial aid, intended to replace or supplement failing or absent uterine contractions in order to be entirely effective at the superior strait, must act at right angles to it. The farther the deviation from a right angle the less effective will be the force, and the greater will be the compression force required in order to prevent slipping of the instrument, hence the violence done the fetal head and the maternal structures is in direct ratio with the inefficiency of the power applied to produce axial progression of the fetal body. The axis of the superior strait, it will be remembered, in the normal pelvis, passes externally at or near the tip of the coccyx. Appreciation of this fact will explain why application of the forceps at the superior strait was formerly considered an unjustifiable or doubtful procedure, just as it also explains the pelvic curve in the obstetric forceps, as well as all the manual and mechanical devices to obtain true axis-traction. So far the effect of misapplied traction upon a normal head and pelvis has only been considered. If, now, there is a disproportion between these parts, or a pelvic deformity alone, the aggregate of injury, arising from misdirected traction-force, will be greater by an increment varying as the deformity. This increment is an additional factor of injury, both to the mother and the child. In the high operation the leverage effect of the

long forceps, by which efforts at rotation must be made, often results in serious injuries to the fetal head, even when the manipulation suggested by Hodge is resorted to, as is well understood from the mechanical construction of this instrument. Now, when it is remembered that the axis of the superior strait meets that of the inferior at an angle of 50 degrees,[1] the inefficiency of simple traction, which, by a direct pull, tends to deliver at the coccyx the fetal head, which must have its egress in the axis of the inferior strait, passing

FIG. 4.



Osiander's method of applying forceps, as advocated by Smith.

beneath the pubis, is apparent. Again, when it is considered that, in addition to the movement along the antero-posterior curvature of the pelvic axis, there must also be a lateral variation, through which the head rotates as it passes downward upon the perineum, it becomes evident that simple downward traction, even though effectively made along the real curved axis of the pelvis, must be made partially inefficient, in that it prevents the lateral movements of rotation. We have now reached the point at which we may

[1] Or, measuring the obtuse angle, 130 degrees.

discuss the efficacy of the manœuvres suggested by Osiander, Hodge, Naegele, etc., and advocated strenuously up to a very late day by those who believed, as Dr. Albert H. Smith, that simple manual dexterity rendered a mechanical axis-traction superfluous —a opinion still held by Pajot. It is interesting to note that the earlier advocates of the non-mechanical axis-traction advocated at the same time the so-called "pendulum" movement of the forceps, thus striving to compensate for the loss of the natural lateral rotation above referred to. It is evident, however, that such movement is simply tentative or experimental, and that it cannot in any way approach the natural lateral curve in which the head tends toward the perineum. This movement is now, by almost common consent, relegated to the past, and classed among the barbarities of obstetrics, and has no more place in scientific midwifery than the crowbar or wedge.

If, now, a lateral curvature is necessary to the normal rotation of the head, and it cannot be obtained by the Hodge, Osiander, or Naegele method of producing downward traction by a strap over the lock of the forceps, it becomes necessary to resort to other means where artificial delivery is required. The very fact that a simple *downward* force is applied, renders it plain that the head is thereby measurably prevented or altogether hindered from rotating laterally.

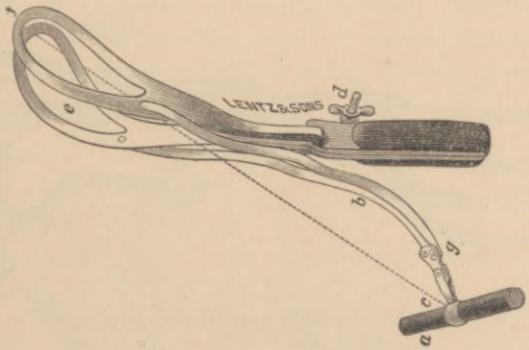
The problem of all axis-traction is to be solved on mechanical principles, without regard to preference for this or that instrument, whose original construction was most likely based upon some idea of compression or the crudest possible idea of traction. This is true of all of the commonly-used forceps, without exception. Given the problem to cause an approximately spherical body along a curved canal, whose lateral direction is determined by the lateral planes of the pelvis, and therefore is not regular, *i. e.*, tending constantly in the same direction. To move a body uniformly along a canal of this description requires, first, that the force should be applied primarily in the axis of the long diameter; second, that the traction shall, at the same time, be downward and backward; and third, that it shall finally raise or lift the body off of the floor of the perineum in order to avoid the damage of a direct pull upon its structures. In order to accomplish this, apparently impossible, result by one constant force, not only the canal is to be considered

in relation with the force, but also the body to be moved through it. It is evident that the most favorable position at which to apply the force must be as near the centre as possible, for the nearer the centre it is acted upon the more nearly equal will be the radii of curvature as it rotates.

It is evident that if these conditions can be supplied, only one is left for consideration, to wit, the necessary freedom of lateral variation, which, as has been before insisted, it is impossible to obtain in simple manual attempt at axis-traction.

First, then, to apply the force in the axis of the superior strait. This is to be accomplished by a compensating device attached as near as possible to the centre of the blade of the forceps; the nearer this

FIG. 5.



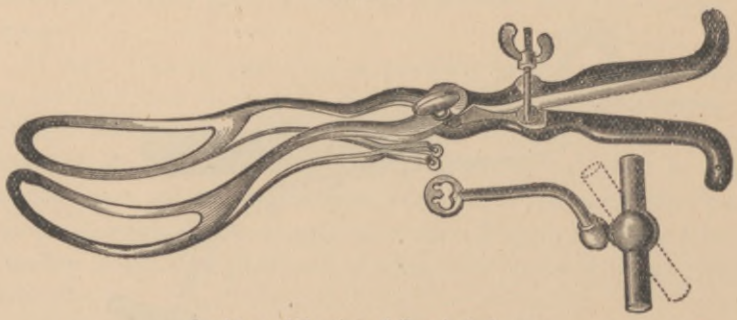
Simpson's modification of Tarnier's forceps.

attachment the more nearly will the centre of the child's head, the centre of the pelvic cavity, and the point of application of the force be at the same point, and the less of the force wasted in resolution. The next desideratum is that the compensating rod or cords shall bear such a relation to the forceps that when force is applied to its handle that force shall be resolved into two parts, one of which shall act downward, while the other produces a revolution backward along the posterior wall of the canal. At the same time the handles of the forceps are rising, as the blades with the enclasped head are sinking down upon the pelvic floor. Now, as the relative position of the traction-rod and the handles of the instrument is still the same, and the force is still applied to the same point of the blades, the

*

point of application of the force alone having changed with the constantly-shifting position of the head, it is evident that the traction, relatively the same upon the forceps, must vary in its effect upon the fetal head with its position, and that now the traction, which at first brought the head down upon the perineum, will, as it is continued, raise the head from the floor of the pelvis and bring it under the arch of the pubis. In other words, the diagonals of the applied force form the curve representing the pelvic axis. The motion of a body in a circular path is explained by the same law. What is here explained by the parallelogram of forces is also capable of direct mathematical demonstration.[1] These, then, are the principles upon which axis-traction rests its claims for recognition

Fig. 6.



Lusk's modification of Tarnier's forceps.

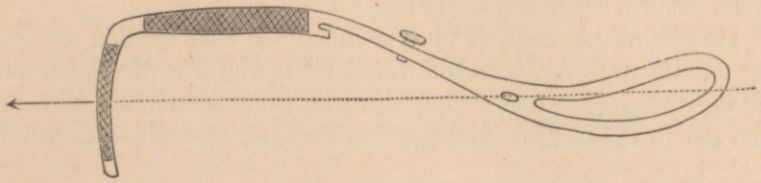
as the foundation of all instrumental obstetrics. One other point remains to be considered: the variation in motion on the lateral planes of the pelvis. This, it must be held in mind, is to be permitted, and to this end must the traction-rods be constructed. It is evident that during the motion of the head downward it will move laterally in the line of the least resistance. This must be considered the passive result of traction in the principal axis. The more easily such motion is permitted the more nearly will any instrument approach perfect traction.

Of the many attempts to accomplish axis-traction, the instrument in which all of Tarnier's various efforts have culminated, or as it has been modified by those who have accepted his idea, is perhaps best

[1] Tarnier: "Description des deux nouveaux Forceps. Paris, 1877.

known. Foremost among the modifications are those of Simpson (Fig. 4) and Lusk (Fig. 6). By many Tarnier is regarded as the inventor of axis-traction, as he is indeed styled by Lusk. This is, however, erroneous, and, for the purpose of more fully illustrating

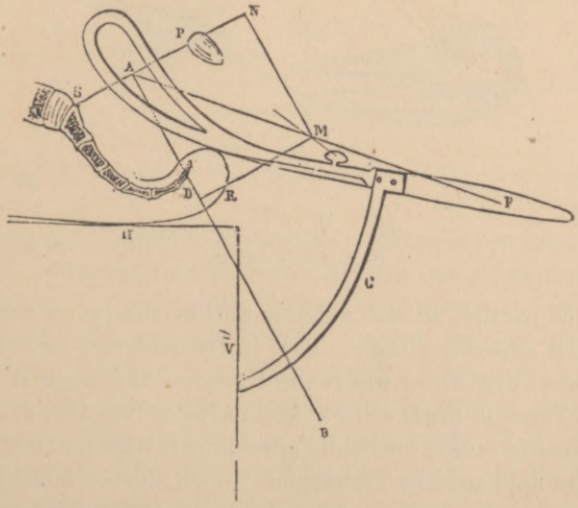
FIG. 7.



Hubert's forceps, first form.

the subject, the inventions of several who preceded him are here shown: those of Hermann, of Berne, in 1844; Hubert, in 1860; Hartmann, in 1870; Moralès, about the same period. That of Hubert *fils* was invented in 1877, the time at which Tarnier's first design made its appearance.

FIG. 8.



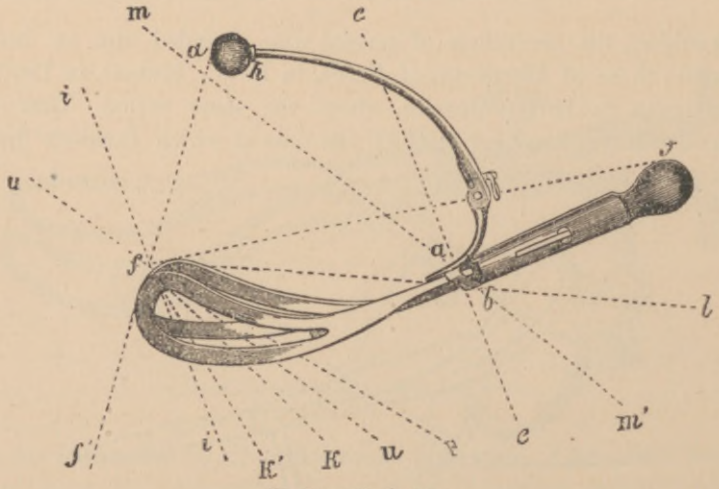
Hubert's forceps, second form, applied at the superior strait.
S P sacro-pubic diameter; *A B* axis of superior strait; *A F* line of traction upon the handles of the forceps; *C* traction-rod, *A D M N* equals parallelogram of forces.

Hermann's forceps has both pelvic and perineal curvature. It is characterized by the "traction" attachment, varied in its applica-

tion according as the head is above or below the superior strait. It does not fill all the indications of axis-traction—nor of the Tarnier instrument—chiefly in that it does not permit all the required movements of rotation. Its failure is common with all other instruments in which traction and pressure are made at the same point of the forceps. (Figs. 1 and 2.)

Hubert, of Louvain, in 1860 modified the then existing forceps by introducing a compensative traction-bar as a part of the handle of the forceps (see Fig. 7), and directed from before back toward the axis of the superior strait, so that traction, when applied, would

Fig. 9.



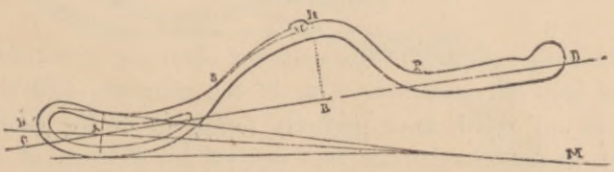
Hartmann's forceps.

be in a line parallel to the anterior wall of the pelvis and in the axis of the superior strait. This instrument was replaced by a second form (Fig. 8), in which the traction-rod is applied as there shown. Traction made at its extremity is in the line of the axis of the superior strait, but while approximate axis-traction is made by such an appliance, as Tarnier has shown, the instrument fails in compelling traction to be made at the extremity of the long arm of the lever, and in failure also to regulate the force of compression upon the fetal head—an indication already referred to. As in all instruments of this variety, no freedom is allowed the fetal head to permit *lateral* rotation.

Hartmann, in 1870, modified Hubert's (*père*) idea by placing the compensating-rod above instead of below the articulation of the forceps to which it is adapted (see Fig. 9). When the rod *a d* is applied, and pressure is made directly upon it in the line *e e*, the force exerted upon the fetal head will be in the line *i i*. Traction upon the forceps being constant in its axis *f f*, the resultant of the two forces will be in the line *f l*. If pressure is made upon the rod in the line *m m'*, the head is directed in the line *u u*, and the extraction force still made on *f f* in the axis of the instrument, the resultant or diagonal of the parallelogram of forces must be in the line *f p*.

Again, if force is exerted upon the bar along the line *d f f''*, the traction remaining as before, the diagonal-resultant in which the head tends to descend will be in the line *f k*. It is easily seen that, the traction-force remaining constant, the direction taken by the

Fig. 10.



Moralès's forceps.

head must vary according to the direction of the force applied to the rod *a d*.

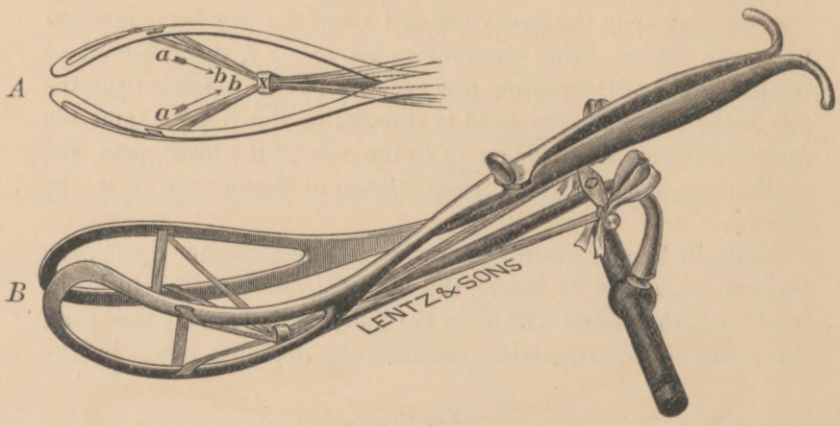
The essential features of the forceps of Moralès (see Fig. 10) are : A handle combining a curve with a straight line whose axis is that of the blades : *C B* axis of the blades ; *D M* real axis of the blades ; *H R* height of instrument ; *S H P* curved portion of handle ; *P B* handle ; *A* centre of head (supposed). This form of instrument, as will be seen by the curvature in the handle, must protect the perineum. The real axis of the instrument (*D M*) does not, however, coincide with the line of traction by the handle *P B*, and there is no true compensative traction.

Again, traction is made far from the fetal head, and at the long arm of the lever, and hence there is not allowed the freedom of movement necessary for unimpeded lateral rotation.

It is interesting here to mention the forceps of Hubert (*fils*), an

instrument with parallel blades, which, though invented in 1877, had never been, up to 1883, applied in a test-case.

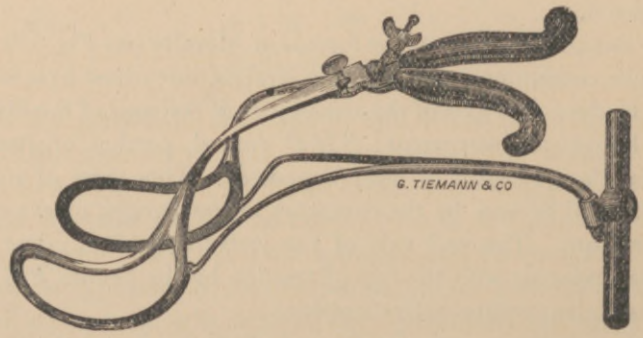
Fig. 11.



Poullet's forceps.

To the more complex instruments for obtaining axis-traction I shall not here call attention. One of the simplest—and the one which, to my mind, most perfectly fulfils all of the conditions required in axis-traction—is that devised by Poullet, of Lyons. Strange to say, the instrument has but lately found place in the

Fig. 12.



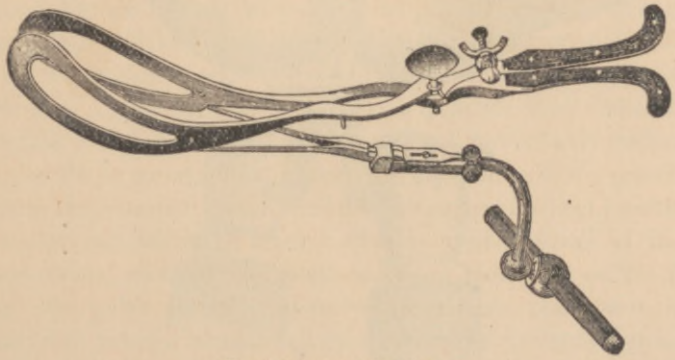
Tarnier forceps, first form.

permanent literature of obstetrics. It will at once be seen (Fig. 11) that the principle upon which it is constructed is identical with that

of Tarnier's. The means for accomplishing the axis-traction effect are markedly different. The traction device of the Tarnier instrument is metallic, while that of the Poullet is a combination of tapes with a swivel and metallic rod bent at an obtuse angle of a little more than ninety degrees. The method of making traction is seen in Fig. 14.

In the Tarnier the traction is applied approximately (Fig. 13) at the heel of the blade[1]; in the Poullet the ribbons pass through perforations in the centre of the blade on either side of the fenestrum, while before they are attached to the swivel on the traction-rod, these tapes are made to pass through an eye at the extremity of the rod, thus

FIG. 13.



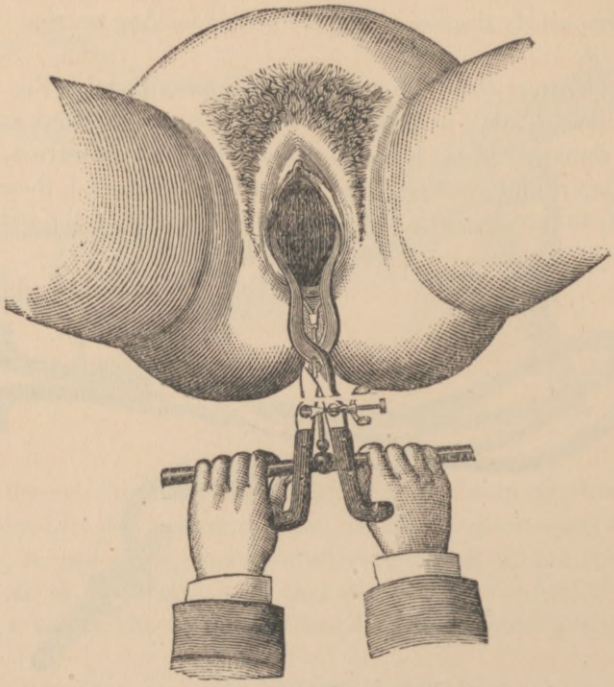
Tarnier forceps, last form.

bringing the traction force directly in the centre of the vaginal canal, and immediately in relation with the fetal head. Furthermore, in the Tarnier instrument the forceps are kept in relation with the fetal head by a compression-screw, while in the Poullet instrument the simple traction effort, being expended centrally (Fig. 10, *A*) and, therefore, falling inside of the blade, adjusts the forceps to the fetal head by a force entirely dependent upon the traction necessary to move it along the pelvic canal. In all these particulars, it must be confessed that it more nearly approaches the ideal axis-traction than

[1] In his latest improvement, Tarnier has made the attachment of the traction-rods to the blades by a detachable French joint. The force is thereby applied nearer the centre of the blade.

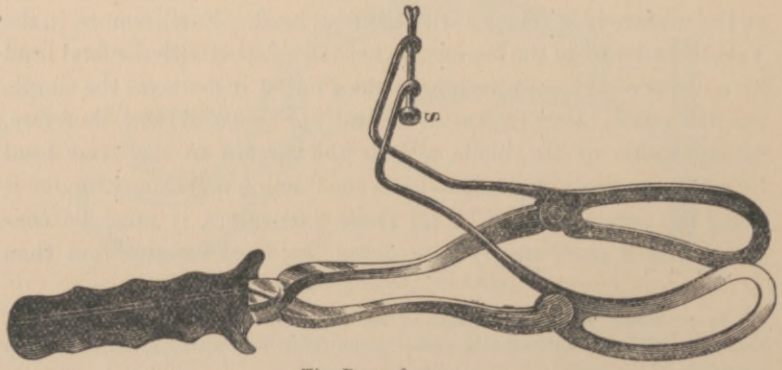
any other instrument. The pliability of the tapes, at the same time, permits the utmost freedom of revolution, and offers not the

Fig. 14.



Method of making traction by the Tarnier or Poullet instrument.

Fig. 15.



The Breus forceps.

least resistance to the lateral rotation above referred to. The handles of the instrument afford an exact index of the direction in which the head is laterally inclined to move.[1] The idea of traction by tapes is adopted from Chassagny and Laroyenne, who, however, made no use of a separate traction-rod. Chassagny's traction apparatus is too complicated for general acceptance. I shall, finally, refer to the traction instrument of Breus, which is in high repute among the German obstetricians. It, however—as is evident from its construction—does not fulfil the various conditions demanded by the axis-traction principle so well as either of the instruments just described, especially so far as permitting lateral deviation and the central application of the force.

Having advanced theoretically the requirements for instrumental delivery through the curved pelvic canal, it will be seen that such demands are fulfilled mathematically by the axis-traction principle, and are mechanically possible, except so far as lateral deviations are concerned. Even here it is evident in practice that these occur incidentally with downward traction. That perfect axis-traction is not possible, is no argument against the adoption of the principle, which is theoretically correct, and which approaches most accurately the normal mechanism of labor, and even possibly excels it in the lifting effects, whereby the head is raised from the pelvic floor under the pubic arch. Whatever arguments that have been advanced to prove that manual axis-traction is practically possible cannot stand successfully the test of exact demonstration, if for no other reason than that muscular force unaided, cannot successfully at a mechanical disadvantage accomplish its own resolution into effective lines.

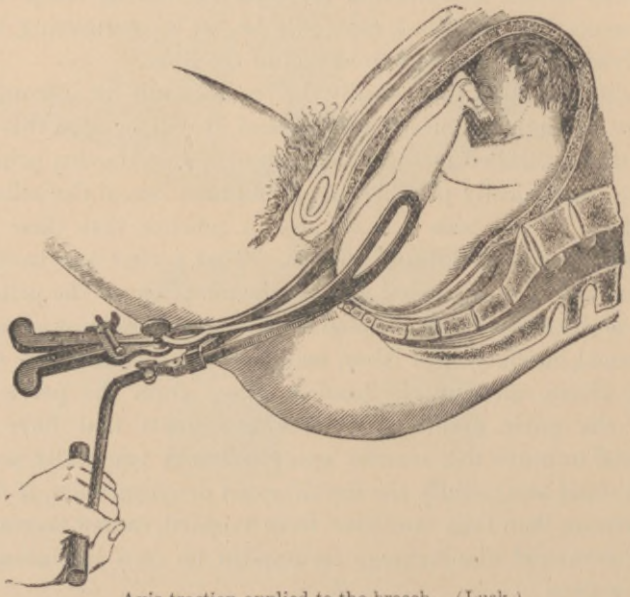
Arrived at this point, we may fairly summarize the peculiar advantages afforded by the axis-traction principle:

1. It permits the application of the forceps at the superior strait, without reference to the position of the fetal head, inasmuch as, owing to the freedom of lateral movement and of rotation, the head is brought into the canal, and permitted to take the position most favorable for rotation. I have seen the position of the blades actually reversed at delivery, owing to actual rotation, and this without damage to the maternal tissues or fetal head.

[1] See discussion.

2. In cases where the head is obstructed at the inferior strait, and where the perineum is most likely to suffer, the axis-traction principle, by lifting the head off the perineum and under the pubic arch, will save lacerations that are ordinarily promoted by the use of the short or the common long forceps; in other words, the axis-traction forceps offers the best possible means of protecting the perineum, either where the obstruction is due to rigidity of the soft parts, or to contracted pelvis.

Fig. 16.



Axis-traction applied to the breech. (Lusk.)

3. In contracted pelves, the more exact regulation, both of pressure and traction effort, must save many children, and protect the mother, in many cases, from serious harm.

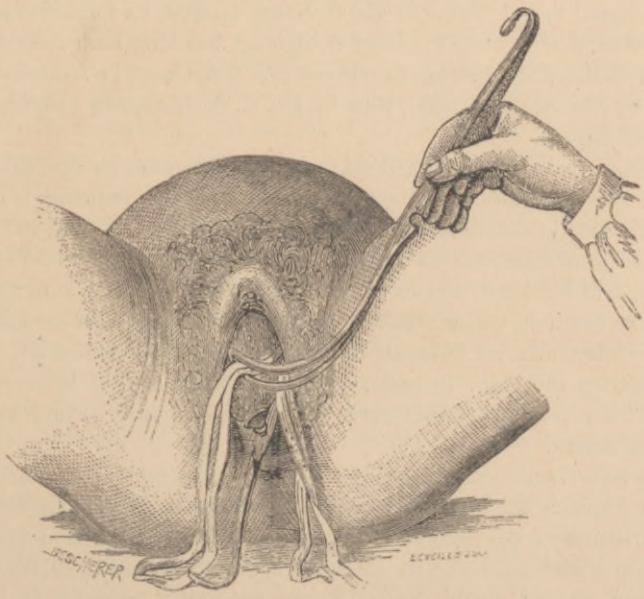
4. In breech presentations, especially with the Poullet instrument, in which the pressure upon the child is measured entirely by the resistance to axial movement, the application of the forceps may be safely attempted without fear of crushing the pelvis (Fig. 16).

5. At all positions along the pelvic canal where forceps are demanded, the axis-traction instrument affords the safest and most scientific aid to delivery.

This is true in all cases, both where the forceps is employed for the safety of mother and child, and where, after the death of the child when craniotomy is performed, it is desirable that labor shall be speedily and harmlessly terminated.

In conclusion, it is worth while to impress upon the minds of all that no matter what the forceps is to which the obstetrician has become accustomed, the axis-traction principle may be applied to it. The Poullet tapes and traction-rod are the most easily adjusted of

Fig. 17.



Forceps, with tapes for traction. (Tarnier.)

all the various designs, and are much more efficient. The ordinary metallic devices to be attached to the shank of any and all instruments may, I believe, be fairly called imperfect, and only approximate what may be obtained by the Poullet device, and cannot help being unsatisfactory.

If the entire Poullet idea be not adopted, the Tarnier principle (Fig. 17) of introducing tapes into the fenestra of the blades, as here shown, may be combined with the Poullet traction-rod, and an inexpensive and very efficient traction device obtained. Such an

arrangement removes the objection of cost formerly urged against traction instruments, and also that of complexity, which favors the accumulation of dirt in their joints.

DISCUSSION.

Dr. E. P. Bernardy, of Philadelphia.—I came here to listen and did not anticipate being called upon. Dr. Joseph Hoffman has so thoroughly covered the ground that he has left very little to say.

In regard to the action of the ordinary forceps, its imperfection in high cases, that is when the head is high up, has long been recognized. I believe the first attempt to correct the deficiency, in America, was made by Dr. Bethel (1853), then by Dr. R. A. Cleemann (1878), both of Philadelphia.

In the ordinary forceps application in high cases, the forceps, to make proper traction, must be pushed so far back that the perineum is badly bruised, and by the time the head is about to make its exit, the perineum is in no condition to resist the expansion necessary to allow the expulsion of the head, and rupture takes place. Another point: when we make traction, we instinctively make strong pressure on the handles of the instrument, an amount of pressure not easily estimated. The mortality to the child in easy or ordinary instrumental deliveries is about three per cent.; this percentage must certainly be increased in difficult labors.

The axis-traction forceps does away with the two main objections of the ordinary forcep; first, by the construction of the traction-rod the perineum is not interfered with; secondly, the traction is made downward, backward, and forward, the head rotating of itself, for while the head is held firmly in the blades, no undue pressure is made. After the forceps have been locked the handles should not be touched, traction being made by the rod.

It is really surprising how quickly a head can be made to descend, and the small amount of strength expended.

I rarely apply any but axis traction forceps in high and difficult cases. I am satisfied that I obtained better results both to mother and child than by the ordinary forceps.

Dr. William Wotkyns Seymour, of Troy.—At a previous meeting I read the teaching of my father in regard to the necessity of recognizing three planes in the pelvis instead of two. I think it is on the recognition of those planes that the actual scientific basis of the

axis-traction forceps depends. I will explain by diagram what I mean.[1]

Dr. Joseph Price, of Philadelphia.—This is a subject I have been very considerably interested in for some years. If Mr. Tait had taught some years ago what he teaches now we would give him some little consideration. We are not now ready to make supra-vaginal amputation unless there is some specific reason for it. We might apply to him what he said of Mr. Barnes: "His suggestion is simply ghastly." I value the axis-traction principle greatly, and value chiefly the Tarnier principle. The primary Tarnier principle has never been improved upon very much. You cannot lift an impacted head with that ease and readiness with any other forceps, *i. e.*, one not possessing the traction principle. True, the Tarnier forceps is a clumsy instrument, and like all the French forceps in respect to compression—they are nearly all compressors. Again, the angulation is bad—it is not that of the American or English forceps; but the traction principle is of paramount importance.

The Simpson forceps with the Tarnier principle is, in my opinion, the best in use; it is simple and easy of application, and not a compressor. The Simpson forceps makes the least compression of all forceps. Some six years ago, I commenced to use this forceps which I have here, and have used it constantly. I rarely try anything else, and it is exceptional now to deliver a still child. The axis-traction principle favors extreme flexion and extension, and lessens the sharply-defined pressure on the soft parts. You can demonstrate this in any delivery.

I called attention this morning to the high application of the Taylor forceps. Long before using the traction forceps I used the Taylor forceps. After using the traction forceps awhile I thought it would be of use to apply the traction principle to the Taylor forceps. It is easy of application at a high level, and the principle holds good with a long Taylor. It is almost impossible to do any mischief in the cervix or maternal soft parts with that narrow-blade forceps. I repeat, I consider the axis-traction a life-saving principle, and have myself saved many children such as I used to lose with the old forceps. I scarcely consider this a traction principle, this German forceps which I hold in my hand. The German hatred of the French, of course, led to the invention of this instrument.

Dr. Hoffman, closing the discussion.—I had hoped there would be more discussion of the subject, because it is one of a great deal of im-

[1] See pp. 79, 83, and 86, vol. ii. Transactions, 1889.

portance. The fact that I have tried to impress is, that there is no forceps here exhibited—apart from the axis-traction principle—that is not faulty. With these a young man understanding their principles and application can do more than an experienced accoucheur with the old style. Not to say that the young man's judgment will be as good as that of the older man, or his knowledge of the subject and statistics and general principles of obstetrics; but, acting upon the mechanical principle here utilized by these forceps, he must do more effective work than any man who refuses to use them. There is urgent necessity for widespread instruction in the merits of these forceps. I never saw a pair of axis-traction forceps until I got out of medical school, nor heard them referred to or described. I have called atttention to the Bethel forceps, described in the *American Journal of the Medical Sciences* of 1853. You will see that in the hands of an ordinary obstetrician that instrument could not help but be murderous. It is intended to be used with the manipulation advocated by Smith, and by the axis-traction attachment its danger will be entirely obviated, and there is no doubt that in a certain class of cases it can be made very useful. I have in my pocket a note from a gentleman whom I induced to purchase a pair of axis-traction forceps. He lately delivered a woman upon whom, two years ago, he pulled for ninety minutes with the Wallace forceps, and in an exactly similar position he delivered her this time in fifteen, without any effort, or exhausting himself or his patient. Dr. Price refers to the traction power of the Simpson forceps. There is no doubt that it is an excellent instrument, but to say it has less compression power than any other forceps is, I think, wrong. I demonstrated that this forceps (the Poullet) has only the compression-force needed to perform traction. The Simpson may have as little compression, but no forceps can have less than this.

Charpentier's estimate of the Poullet instrument seems to lack appreciation of the *principle* which it tends to act upon, and his criticism shows a non-appreciation of the fact that the force of compression *cannot* be greater than the force of traction, or, rather, is proportionate to it.

Hence, when he says the instrument *cannot slip*, because the compression force upon the fetal head *is much greater* than in the Tarnier instrument, he errs in two respects. First, because, like all other forceps, the Poullet does occasionally slip; and, secondly, its pressure-force, if traction be made on the tapes alone, cannot be greater than in the Tarnier, which is adjusted upon the fetal head by a compressing

screw. The pressure-force with the Tarnier principle must vary according to the forceps to which it is applied. The variation of pressure with the Poullet principle is, in every case, according to the resistance (see Fig. 11, *A*).

Charpentier's estimate of the Tarnier forceps is also so evidently prejudiced and warped that it loses much of its force and ceases to be valuable. When he says, "It is an instrument purely theoretical, which, I am sure, will be sooner or later abandoned, even by Bailly, who now defends it so forcibly," he places it, and especially the principle which it represents, at an estimate entirely too low, and loses sight of the fact that there must always be a matter of "personal equation" in the choice of forceps, and that the question of modification is more a matter of individual choice than of actual necessity. So far as the writer himself is concerned, he unhesitatingly prefers the Poullet principle with the Levret blade to the Tarnier forceps, but he does so without a word of disparagement of the latter instrument. As you have just heard, Dr. Price just as warmly champions the Simpson forceps with the Tarnier attachment.

The liability of the tapes in the Poullet instrument to break is a real disadvantage, but by steady traction and the avoidance of sawing motion this can be so far obviated as to be in a great measure negatived.

The criticism against the Tarnier instrument, that it gives to the ignorant obstetrician a sense of false security, must apply to any other instrument, whose principles must be understood before it can be expected to yield the best results. It is not expected that it or any other traction forceps can work miracles, and the accoucheur who looks for such must be disappointed and fail.

Opponents of the Tarnier instrument of the latest form decide against it as both failing to give accurate indication of the lateral deviation of the fetal head, and when traction is made at or above the superior strait. That it gives absolutely exact indications for traction, I think cannot be maintained, but that it approximately yields such information I think sufficient reason for employing it in preference to an instrument which yields no indication at all.

Herein lies the superiority of the Poullet instrument, which, by reason of the freedom of motion afforded by the tapes—a point to which I referred in the paper proper—affords an almost absolute indication of any lateral change in the rotation of the head, and offers no opposition whatever to such rotation.

As will be readily seen by the accompanying diagrams, traction can be made continuously downward by direct traction, while the head with the forceps revolves in any direction to any extent.

Figs. 18 and 19 show traction directly in the vertical axis of the pelvis, while Fig. 20 shows the lateral deviation of the head to the right

Fig. 18.

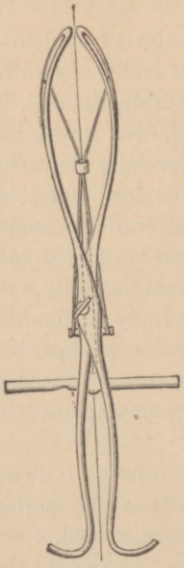


Fig. 19

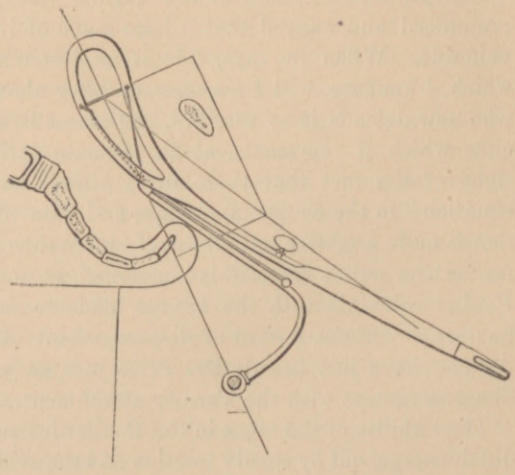
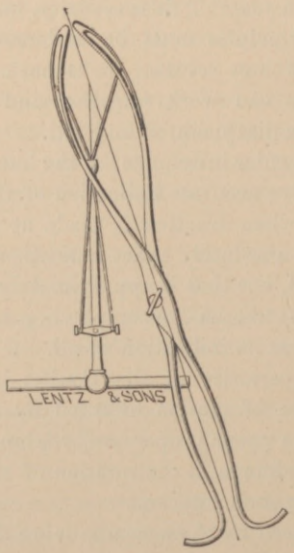


Fig. 20.



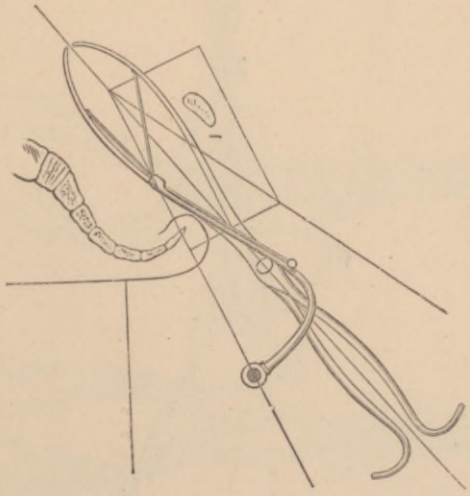
and the corresponding variation in the position of the forceps, thus indicating the path the head by its rotation is seeking to follow.

Fig. 21 shows a revolution of the fetal head through an arc of ninety degrees, while the traction, as will be seen, is still downward and in the axis of the pelvis.

It will be interesting to study for a moment the principle of both the Tarnier and Poullet instruments, so far as they combine the ideas of some of the other forms above described. Tarnier's idea combines the traction-rod of Hermann, with the curve of Hubert's instrument, together with Chassagny's plan of employing traction ribbons—replaced, however, by rods.

Poullet, in his instrument, has sought to utilize the tapes of Chassagny, at the centre of the blades, while the traction-rod also conforms

Fig. 21.



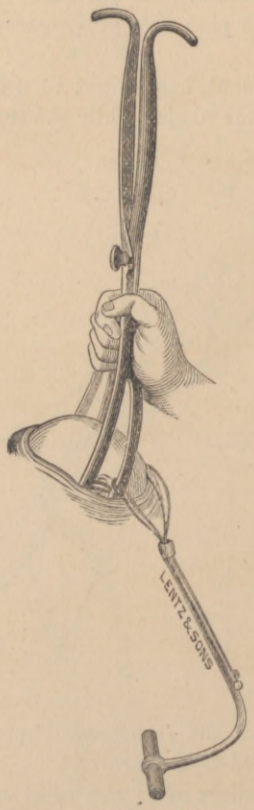
with that of Hubert, and the transverse bar upon which traction is directly made is borrowed from Tarnier.

The method of procedure after the head has reached the vulvar orifice is pictured below.

The question is often asked, Are not the indications for the application of the axis-traction principle few? The answer is, that with the advantages it possesses, as detailed throughout this paper and in the conclusions therein reached, the principle is to be applied wherever the forceps are demanded. The instrumental correction of dystocic variations of position are better corrected by its application, we believe, than by any other method. Manual correction of such variations is unnecessarily rough, and correspondingly less likely to be exact and more likely to be protracted.

It is evident from Fig. 21 that the Poullet traction-principle at least, permits also the application of the forceps in any position, not restricting them to the sides of the pelvis, so that the objection, that by the traction principle the use of the forceps as compressors is limited, does not obtain.

Fig. 22.



Showing method of delivery of the head without the traction tapes.

A word, in conclusion, as to the Breus instrument. I wish to compare it especially with the forceps of Carl Braun, which it resembles in all essential particulars, without some of its apparent advantages so far as cleanliness is concerned.

As will be readily seen, both instruments must fail in the high application, when Braun's practice is to resort to the Tarnier, Simpson's modification. Two apparent advantages possessed by the Breus are its

lightness and the possibility of its being applied in oblique positions, owing to the joint in the blades, which allows the locking of the instrument when they are not parallel. Neither instrument, however, fulfils the complete idea of axis-traction, and one can only wonder at the prominence given the latter instrument by Winckel, in his latest edition, to the almost entire exclusion of all other traction forceps.

Fig. 23.

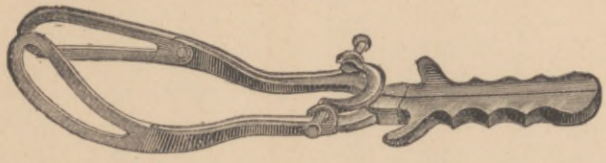


Fig. 24.

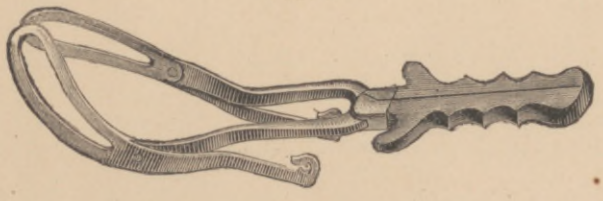
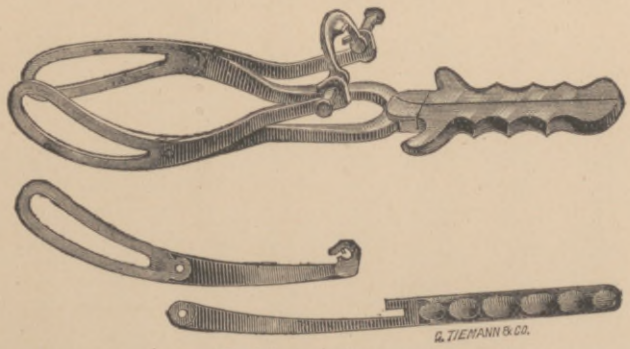


Fig. 25.



Karl Braun's forceps.

In conclusion, I would urge that a fair trial be made by all obstetricians of the axis-traction principle. Many arguments have been made, both against its necessity and the correctness of its theory, only to be refuted and retracted, for the most part, by the objectors when practice had taught them their error.