

favorable experience in the use of chloroform in parturition, that I have found it not only a blessing to the patient but to the physician also. Without the means of relieving human suffering what a dreary, unsatisfactory and repulsive life that of the physician would be. Yet for ages and ages the lot of the woman in the throes of parturition was to suffer, to bear, and submit to its terrible tortures, hopeless of relief until the end came.

For the past half century the achievements of medical science in the discovery and perfection of remedies to relieve human suffering, to improve human health, and prolong human life, have astounded the civilized world and are a source of pride to our profession. And one of the greatest of all of these achievements is the discovery of chloroform.

DISCUSSION.

DR. A. LAPHORN SMITH, of Montreal, said, that in order to lessen the cries of pain, when a woman is approaching the last stage of labor, he does not refuse to give her an anesthetic, and it is his practice to administer the A.C.E. mixture and allow the woman to give it to herself until within the last half hour; then the assistant administers the anesthetic.

DR. H. W. LONGYEAR, of Detroit, also favored the administration of chloroform in cases of labor, notwithstanding the fact that it is said to predispose to post-partum hemorrhage by inducing inertia of the uterus.

DR. BROWN, in closing, says he has had more than three thousand obstetrical cases, and about fifteen hundred of them were subject to chloroform in more or less degree, and he has not had a serious result.

SOME ORIGINAL STUDIES ON THE OBSTETRICAL FORCEPS, WITH MECHANICAL DEMONSTRATIONS.

Read in the Section on Obstetrics and Diseases of Women, at the Forty-sixth Annual Meeting of the American Medical Association, at Baltimore, Md., May 7-10, 1895.

BY J. J. E. MAHER, M.D.

NEW YORK.

The obstetrical forceps is essentially a conservative agent, and by saving two lives at once, becomes the most useful instrument in surgery. It therefore well deserves the immense amount of ingenuity that has been expended in attempts to eliminate the defects discovered in the common or ordinary forceps. I shall proceed in the simplest possible manner, and leave all abstruse calculations and "*Reine Mechanik*," to be read rather than listened to.

For a workman to understand the character of the tool he requires, it is absolutely necessary for him to be able to appreciate the character of the work to be done. He must learn the conditions and the exigencies of them, before he can calculate the amount of force to be expended and the manner of its application to accomplish the work in hand. By work, I mean the application of force to overcome resistance. To understand this resistance to the descent of the child's head, we must be ready to appreciate certain conditions which obtain in the head of the child, and the obstetrical canal.

In considering the obstetrical canal, we will take two points, the axis of the canal and the character of the resistance offered by the walls. Hodge says: "The axis of the canal has been variously delineated by authors, but by no one with sufficient accuracy."

The circle of Carus, A, (Fig. 1) consisted of a two and one-fourth inch radius, having its center at the middle of the posterior surface of the symphysis pubis, and extended not more than one inch and three-eighths directly below the subpubic ligament, in the direction b. g.

Hodge took the middle of the subpubic ligament as the center of a circle, B, with a radius extending to the axis of the superior strait. This circle might get rid of the difficulty at the outlet, but at the superior strait it was very faulty. Hodge did not believe a single circle could be described satisfactorily; for he, like Naegele, Velpeau, Pierre Dubois and Caseaux, believed, what is apparently true, that the head descended practically in a straight line in the axis of the superior strait.

The circle of the planes C is also faulty in approaching too closely to the pubis.

Dr. W. S. Gardiner¹, of this city (Baltimore) deviated from the ordinary manner of describing a circle on the intersection of the planes of the superior and inferior straits produced beyond the pubis. He very properly showed that the tip of the coccyx did not make any part of the inferior strait. For him, and correctly, too, the end of the sacrum and a point half an inch below the subpubic ligament constitute the proper extremities of the inferior strait. While I would admit this as perfectly correct, I can not accept a circle D with a radius of seven inches, and which is four and one eighth inches below the subpubic ligament, as representing the axis of the outlet.

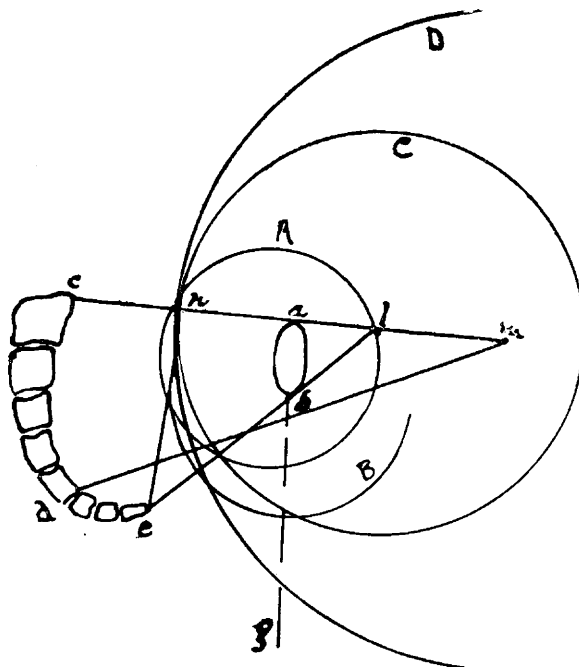


Fig. 1.—a, b, c, d, e, represent an antero-posterior section of pelvis; c, a, the plane of superior, and e, b, that of so-called inferior strait; cl, the intersecting planes of these straits; d, m, the produced plane of inferior strait, after Gardiner; b, g, vertical line measuring the various axes offered, at outlet; N, E, the axis of superior strait; A, circle of Carus; B, circle of Hodge; C, the generally accepted axis, or the circle of the planes; D, Gardiner's circle of the planes.

It is easy enough to obtain a single circle, a segment of which shall delineate the axis of the obstetrical canal in a very practical way, if we go about it right. The anterior and posterior walls must be observed separately. Taking the anterior wall, we find it offers a uniform unyielding resistance, and that it extends from the top of the symphysis pubis to about half an inch below the subpubic ligament, as demonstrated by Dr. Gardiner. Now, we can easily conceive this anterior wall of the obstetrical canal to form a segment of some circle of which we should find the center. Let us take this point half an inch and any two other

¹ American Journal of Obstetrics, p. 60, July, 1892.

points on the posterior surface of the symphysis, as any three points in a given segment of a circle, to find the center. By uniting these three points by two chords, then drawing two radii from the center of, and at right angles to, the two chords, and then describe a circle from the point of intersection of the two radii, as the center, passing through the three points on the anterior wall, we have consequently the true anterior wall and the circle *a, b*, (Fig. 2) of which it forms a segment. The posterior wall differs materially from the anterior. Instead of two inches, it is more like ten or twelve inches long. The intrapelvic portion of it, about four inches long, limited by the planes of the superior and inferior bony straits, offers like the anterior wall an unyielding resistance; this with the tip of the coccyx pushed back to its extreme limit, is all that need concern us in the study of the posterior wall; because this wall in the extrapelvic canal is so yielding that it offers no *point d'appui* on which to calculate.

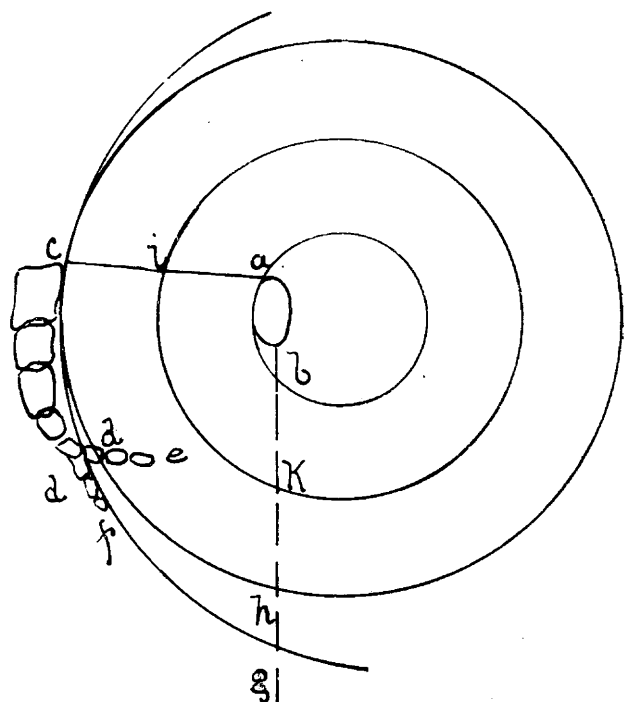


Fig. 2.—Same section of pelvis as Fig. 1, but *d, f*, shows coccyx pushed back; *a, b*, segment of the circle, *a, b*, represents the anterior wall of the pelvis; *c, d, f*, the eccentric circle of the posterior wall; *e, h*, the concentric circle describing the same segment; *i, k*, the circle delineating the axis of the obstetrical canal, almost mathematically correct.

Now, if we take the promontory of the sacrum, the end of the sacrum, and the tip of the extended coccyx, as the three points necessary to find the circle of which the posterior walls form a segment, we shall have a circle passing through each of these points, *c, d, f*. This circle might be objected to on account of the eccentricity formed by the hollow of the sacrum that is not involved. The hollow of the sacrum conduces to the amplitude of the pelvis, is an advantage, and is therefore not to be taken into account when considering the disadvantages or the narrowness of the unyielding straits in a forceps operation. But when we come to consider this circle in its distance below the subpubic ligament, we find it unsatisfactory. This fact led me to concentrate the circles, which might readily be done by slightly increasing the sacral eccentricity, which really does not exceed one-fourth of an inch at the lower end of the sacrum,

and in the upper half means nothing. This deviation from the purely scientific procedure gives a more satisfactory result. We then have the circle *c, d', h*, representing the posterior wall. To find the circle of which a segment shall represent the axis between the two walls just described, we have only to take half the sum of the radii of the circles of the anterior and posterior walls, as the radius of the third circle *i, k*, which shall be the most equidistant between both walls of the pelvis, of all the axes I have ever studied.

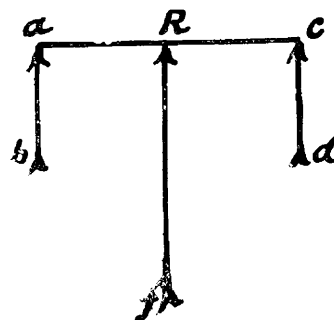


Fig. 3.—*a, c*, body to which the forces *ba, dc*, are applied, and which is equally as well opposed to the central balancing or resulting force, *f, k*.

Having determined the most practical axis of any obstetrical canal, we should now consider the fact that, at the inlet, the resistances offered by the pubis and sacrum are uniform and equal; neither will yield; they are absolutely unyielding. Now, if these resistances are equal, they combine so as to be represented by a resultant or single resistance, whose direction is that of the axis of the superior strait.

It is well known that if the two equal and vertical forces *ba, dc* (Fig. 3) are opposed to the two extremities of the body *ac*, they can be replaced by a single vertical force *fR*, equal to their sum and passing through the center *R*, of the body *ac*.

The resistance *io eo*, (Fig. 4) opposed by the walls *ab, cd* of the pelvis are, in reality, obliquely directed upward and inward; but these oblique resistances decompose into the inward or horizontal *if, ef*, and into the upward or vertical *im, en*.

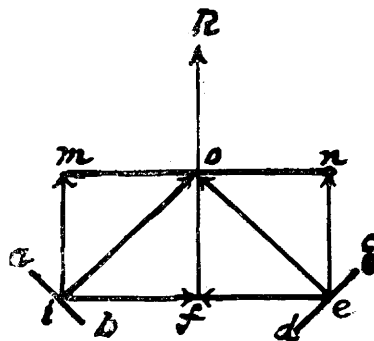


Fig. 4.—*ab, cd*, the antero-posterior walls of pelvic inlet; *io, eo*, the resistances or forces presented by (and at angles to) these walls to the body; *im, en, if, ef*, the resistances into which *io, eo*, are decomposed; *f, R*, the resultant resistances replacing *im, en*.

These two latter, as we have already seen, have a common resultant *fR*, equal to their sum and vertical like them, passing through the center *o* of the body *mn*. The horizontal or inward resistance *if, ef*, tend to effect the reduction of the cranium, while the vertical or upward resistances *im, en*, represented by *fR*, oppose its descent.

If two oblique forces could be opposed directly to the two oblique resistances offered, say, by the pubis

and the promontory of the sacrum, *io, eo*, what would be the effect? The directions of the forces would be opposite to those of the resistances, that is, downward and outward; the downward force being directly opposed to the axial resistance *fR*, would be entirely useful in overcoming it, but while the inward resistances *if, ef*, are useful in producing reduction of the cranium, the outward forces *fi, fe*, opposed to them must produce the contrary effect, expand the cranium, and hence increase the resistance.

The oblique forces therefore would expand the cranium, increase the resistance, and thus tend to damage the soft parts of the mother. Supposing the oblique force hypothetically opposed to the oblique resistance *io* were omitted and the force opposed to the oblique direction *oe*, then there would be left the inward resistance *if* and the outward force *fe*, acting conjointly in the same direction, *i.e.*, toward the pubis, thus increasing the resistance at that point, and producing pressure injurious to the mother in direct proportion to the force applied. Hence the application of a force in the oblique direction downward and forward at the superior strait, tends to drive the head against the pubis, make the head rotate about this point, increase the antero-posterior diameter of the presenting part, thus increase the resistance to be overcome, and cause unnecessary pressure to the soft parts of the pubic structure of the mother and a positive loss of a certain percentage of force applied.

This is precisely the effect of the ordinary forceps applied at the superior strait in a difficult case. Any forceps, ordinary or not, in the use of which, force is expressed in an oblique direction, shows the same effect more or less. Hence it can be readily observed without further detail, that to overcome the resistance met with at the superior strait, with the least damage to the tissues of the mother, the force should be directly opposed to the resultant resistance and consequently traction must be made directly in the axis of the superior strait.²

If the obstetrical canal were a straight one, this would be a very simple thing to accomplish, but since it is curved forward in such a manner as to have the axis of the inferior strait produce, with that of the superior strait, an angle of about 130 degrees (Hubert), it becomes necessary to have an instrument whose curve will approximate as conveniently as possible to that of the canal. As direct force can only be expressed in straight lines, the application of direct force to such a curved instrument as the forceps, as Simpson's, of which the axes of the blades and shanks form an angle of about 160 degrees, when adjusted at the brim, not only produces a certain amount of injury to the mother, but increases the amount of resistance to be overcome; because the direction of the force thus expressed would be along an oblique line from the middle of the blades *f* (Fig. 5), to the point of the instrument grasped by the operator, say near the lock *p*.

This direction of the force is by no means directly opposed to that of the resistance *KR*, met with in the axis of the superior strait as necessary to overcome it, but is oblique, downward and forward. It is thus a composite force, that can be decomposed into a vertical or downward *fs*, and a horizontal or forward force *ft*. The downward force being directly opposed to the resistance, will be entirely useful in overcoming

ing it, but the forward force, by crowding the head against and even above the pubis, can only increase the resistance and injure the soft parts of the mother by compression. This compressive effect of the ordinary forceps, bears a direct ratio to the size of the angle *sfp* produced by the oblique direction of the force and that of the axis of the superior strait. The larger this angle, the greater the compressive effect. With Simpson's forceps, this angle is about 30 degrees, and consequently over 55 per cent. of the force applied, is exerted against the pubis.

I might here state that, in the paper already referred to, I termed the above angle, the *angle of compression* and the angle *pft* formed by the forward direction and the oblique direction, the *angle of extraction*. But, to render the subject easier of comprehension, I made the axis of the blades (or rather the longest chord drawn on the axis) coincide with the axis of the superior strait, thus rendering the

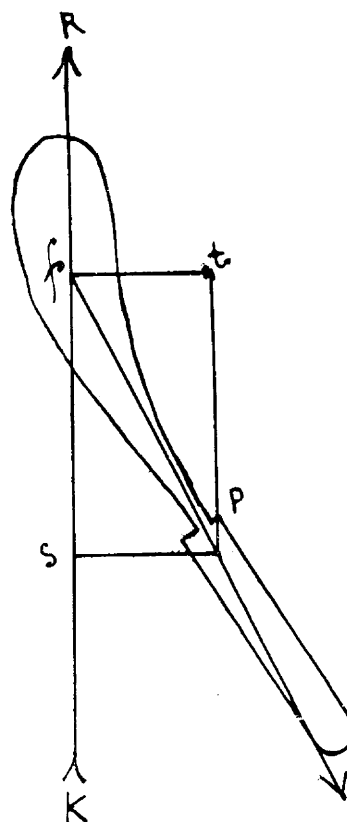


Fig. 5 represents the blade, shank and handle of an ordinary forceps: K, R, the axis of the superior strait or the direction of the resistance; f, p, the direction of the force applied to the center of head, f, from the handle near the lock; P, ft, fs, the two directions in which the oblique force fp is actually expressed.

angle of compression only about 15 degrees, which can rarely happen in practice, with a perfect perineum, and consequently the angle of compression is, in reality, twice as great as that given in the paper mentioned.

To eliminate the compressive effect in the ordinary forceps, much ingenuity has been spent in devising methods of using it. But these methods, such as that of Oseander and others, are effective to an uncertain extent and the success achieved is of an uncertain quantity; for such methods require, for any degree of success, a hand educated to their use—a hand that has become adroit and skillful by prolonged experience in the manipulation of three forces acting in

² For further details see article in Medical Record, June 10, 1893

three different directions at the same time. No wonder then, that such methods have not become popular, while other means have offered a more certain result.

This condition of affairs led to the development of forceps in which these three directions of the force were reduced to two. These forceps, among which are Hubert's and other similar models, I would term "method forceps," inasmuch as a method of manipulating these two forces is inseparably connected with their use. Then another class developed, in which ingenuity has endeavored to reduce the three directions of the force into one, and that one direction, that of the axis of the superior strait, hence the name, axis traction forceps. Of this class I have not found, in the market, a single positive representative. If we take the rule laid down by Milne Murray, of Edinburgh, as governing the construction of the correct axis-tractor, and published by him in the *Edinburgh Journal*, and republished by Dr. Keiller in the *American Journal of Obstetrics*, and examine it carefully, we shall find that no instrument made according to that rule is an axis-tractor.

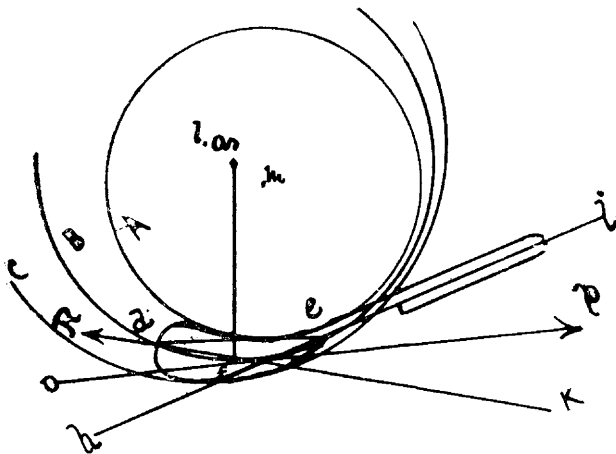


Fig. 6.—The central figure, *d,f,e,i*, represents an ordinary forceps blade, shank and handle; *A*, the circle of which a segment represents the smaller or anterior curve of the blade; *C*, the circle of which a segment represents the posterior curve; *B*, the circle of which a segment represents the axis of the blade; *h,i*, the axis of blade and shank; *d,e*, the cord of the arc forming the axis of the blade; *f*, is the center of the axis; *Op*, is a tangent to this arc drawn on the central point *f*, and parallel to the cord *de*; *KR*, represents the axis of the superior strait and the direction of the resistance.

Milne Murray draws a cord on the axis of the blade, and then draws a tangent line, passing through the central point of this axis, and parallel to the chord. He insists that, if the instrument is correctly made, the stud of the tractor handle lies along that tangent line.

If we take a Simpson forceps, and determine the axis of the blade by means of eccentric circles, made as before, we can readily prove this. The anterior or smaller curve of the blade is the segment of a circle *A* (Fig. 6), whose radius is five and one-fourth inches, and the posterior curve is the segment of another, *C*, with a radius of eight and one-fourth inches. Having the two circles, *A*, *C*, which do not intersect, it becomes an easy matter to find the third circle, *B*, whose radius is six and three-fourths inches, a segment of which represents exactly the axis of the blade, *d,f,e*. Murray and Keiller, by the way, determine their axis on the assumption of guess points, chosen where the curve of the blade is supposed to begin and end. If we draw the axis of the handles and shanks, *h,i*, its point of junction with

the axis of the blade, *e*, makes the beginning of the latter, and if we unite this point with that, at the intersection of the axis and the tip of the blade *d*, we shall have the longest possible chord drawn on the axis, which is five and three-fourths inches. If a tangent be drawn on the central point of this arc or axis, and parallel to the chord just described, we shall have the line along which Milne Murray tells us we must make traction. Now, if you will recall the fact that the axis of the superior strait is three inches behind the posterior commissure of the vulva, we can readily observe that since this tangent is not more than one and one-half inches behind the shanks, it is impossible to make axis-traction after Milne Murray's notion. On the other hand, the real axis of the superior strait is represented on the instrument, by uniting the highest point of the axis of the blade, *d*, and its center, *f*. Such a line produced, *KR*, would be three inches behind the shanks, near the handle. This, indeed, is the line along which the stud should lie and traction should be made, to be in the axis of the superior strait.

Having, to some extent, determined the character of the work to be effected at the superior strait, and having supplied the requisite tool in the axis-traction forceps, we may safely imagine the head of the child to have passed the superior strait and to rest on the

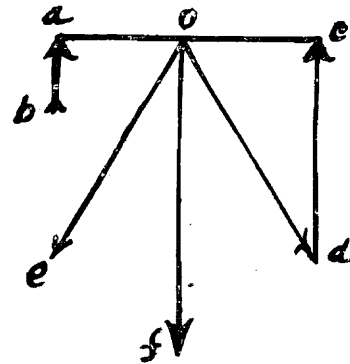


Fig. 7.—*ac*, body opposed by the two unequal resistances, *ba*, *dc*; *of*, the force applied in the axis or middle of the body, *ac*; *oe*, the direction in which the force, *of*, is actually spent, *i.e.*, in the posterior oblique; *od*, the anterior oblique representing *of*, *oc*.

floor of the pelvis. Now, we must consider that the conditions which obtained at the superior strait and necessitated axis-traction, being different from, and I might say absolutely contrary to, those at the outlet, the exigencies of the latter are of an entirely different character from those of the former; and consequently, when the direction of the force leaves that of the axis of the superior strait, the axis-traction instrument becomes a dangerous one. The conditions and exigencies of the outlet differ from those of the superior strait, in that the resistances are *unequal* and consequently can not be represented by a central resistance whose direction would be that of the axis of the canal—one part of the strait being composed of a fixed, bony, unyielding resistance, as offered by the pubic arch, and the other part composed of the yielding structure of the perineum, which offers much less resistance than the former. These two *unequal* resistances allow the balance of the force applied in the axis of the canal, to be spent on the perineum, as the point of less resistance, which can rarely escape rupture.

When all the resistances opposed by the walls of a canal to a body moving in it, are *equal*, they can be represented by a single resistance, expressed in the

center or axis of the canal, and overcome completely by a force exerted along that axis, as illustrated at the superior strait; but when the resistances are unequal and the force is applied in the axis of the canal, the body is arrested at the point of greatest resistance, and the force continuing, it is propelled in the direction of the lesser resistance, as well as in that of the axis of the canal. In fact, it rotates around that point of greater resistance, as around a pivot, thus producing extension of the head, and increasing the antero-posterior diameter of the presenting part.

If the two unequal and vertical resistant forces $b a d c$, (Fig. 7) be applied to the body, $a c$, they can be replaced by a single vertical force, not passing through the center o of the body $a c$, but through a point corresponding to its percussion point, approaching the greater resistance, $d c$, in proportion to the greater weakness of the resistance, $b a$. If, for example, the resistances were in the proportion of 1 to 3, these resistances would be equally overcome if the force were applied three times nearer the point of greater resistance. But, since this is impracticable, and an axial force, $o f$, tends to propel the body, $a c$, backward toward a and downward toward f , or along their any resultant o, e , in an oblique direction downward and backward; to relieve the strain on the

curity and uncertainty, for the muscular sense of the operator is always called into play the same as with the common forceps.

The perineum may be pushed back by the shanks of the instrument, without seriously altering the position of the blades, just as in the use of the common forceps. This, in some cases, is an absolute necessity, depending upon the situation of the posterior commissure of the vulva. This adaptability

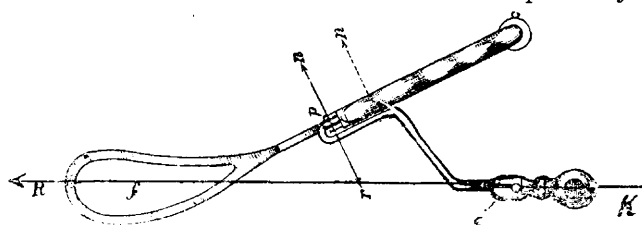


Fig. 9.—Side view of forceps, with its mechanical effect: KR, direction of resistance as met with at the superior strait; f, center of blade; D, ball and socket joint. Notice that the socket piece and the ball end of the rod are in the same straight line. P, decussation of shanks showing the socket receiving the hook end of the traction rod; pn, pe, the actual expression of the force evolved from the lever effect of the traction-rod; en, the direct leverage force translated to pn.

of the instrument to the canal is possessed by no other non-rigid forceps. There is, in fact, no other instrument that will permit of rotation during the traction, and allow of axis-traction in every case.

Bearing in mind the correction of the conventional error hereinbefore mentioned, a very adequate description of the forceps will be found in the *Medical Record* of June 10, 1893.

This instrument is manufactured by Richard Kny & Co., of New York city.

THE VAGINAL ROUTE FOR OPERATIONS ON THE PELVIC VISCERA.

Read in the Section on Obstetrics and Diseases of Women at the Forty-sixth Annual Meeting of the American Medical Association, at Baltimore, Md., May 7-10, 1895.

BY D. TOD GILLIAM, M.D.
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Everything indicates that we are about to have an epidemic of transvaginal surgery. Salpingectomy, cholecystotomy, nephrectomy and operations for appendicitis have ceased to be novelties and have therefore to an extent lost their charm. Men are merely boys grown up and, like boys, are fond of exploit and adventure. This in the main results in good by advancing knowledge, developing manual dexterity and evolving new methods. The pity is that in the name and guise of science and the legitimate pursuit of this noblest art so much is done for self, to the detriment of the patient. The surgeon should never aspire to a record; the best interests of his patient, the advancement of his art and the greatest ultimate good to his race should be the aim and object of his life. To such an one, fame, honor and confidence of the profession and people will come in due time, and will come to stay. From this standpoint let us look into the merits and demerits of this new fad; endeavor to prescribe its scope and limits, and by comparison with older and better known methods strive to affix its proper status in gynecologic surgery.

That many operations on the pelvic viscera through the vagina are practicable is well known to every one at all conversant with gynecologic history, and there are few gynecologists of long or extensive practice who have not essayed most of them. Some years

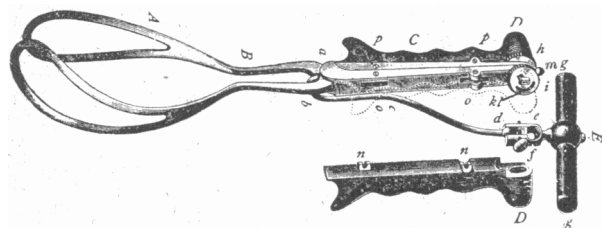


Fig. 8.—A, blade; B, shanks; C, handle; DD, detachable rubber side pieces; E, the axis traction attachment; a, socket between shanks for hook b, of traction rod; d, ball end of rod; e, clamp socket for d; f, thumb-screw for screwing the ball and socket joint; gg, the rubber screw bar; h, the ordinary Elliott wheel and threaded bar; i, an additional wheel with a half-threaded slot on opposite side, which both form the lock; KI, a quarter-circle slot and piece limiting the motion of lock-wheel or small knob on lock-wheel; n, n, metallic lugs which hold side pieces in place; oo, grooves in the metal for the reception of the lugs; pp, screws passing antero posteriorly through the metal and flat where they pass through the grooves; a quarter turn of these screws, locks or unlocks the side pieces securely to the metallic portion.

weaker structure, the perineum, we have only to divert the oblique direction of the force $o e$ into the opposite oblique direction, $o d$. Thus it will be observed that this anterior oblique direction of the force, $o d$, corresponds with the oblique direction of the force $f p$ (Fig. 5) in the ordinary curved forceps, as demonstrated above.

Hence, the proper or perfect obstetric forceps is one in which the force can be expressed in the axis of the superior strait, and in the anterior oblique direction at the outlet.

The forceps which I have the pleasure of exhibiting to you, (Fig. 8) consist of the old familiar Simpson blades and shanks, the Elliott handles, and this simple traction rod, and an exceedingly practical lock, and permits admirably of just such expression of the force (Fig. 9). At the superior strait it is an excellent axis-traction forceps; at the outlet it is the most desirable model of the ordinary forceps. Though the fetal head is free to rotate, the instrument can not slip. It is not a Tarnier model, and possesses none of the defects of such; nor does it require an expert to use it. Whoever can use an ordinary forceps can use this as readily and as successfully as any expert. It does not produce that feeling of inse-