On axis-traction forceps / by Alexander Russell Simpson.

[*With the Author's Compliments.*

ON

AXIS-TRACTION FORCEPS.

BY

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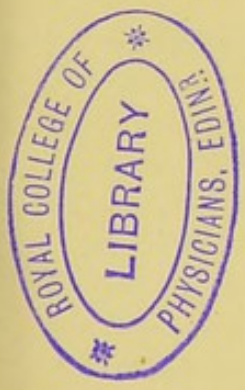

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ON AXIS-TRACTION FORCEPS.

I HAVE entitled this communication "On Axis-Traction Forceps;" but, with the indulgence of the Society, I shall—I. formulate the Indications for the Use of Forceps generally; II. note the different Modes of Action of Forceps; III. discuss some points in their Construction, and especially the meaning and value of arrangements for Axis-Traction; and IV. formulate the Rules that should guide us in their Employment, Application, and Working.

I. INDICATIONS FOR USE.

Indications for the use of the forceps arise either in Delayed Labours or in Labours immediately Dangerous.

A. DELAYED LABOURS.—There is a fault in one or more of the Factors of labour; and when two or even all the three factors are found to be faulty, it is always well to seek to determine in which of them the fault originated and is most pronounced—whether 1, in the Powers; 2, in the Passages; or 3, in the Passenger.

1. Fault in the parturient *Powers*, primary or secondary, or both.

1*st*, *In the Uterine Power*.—The primary or essential power of parturition, which is found in the great muscular system of the uterine walls, may be at fault from (1*st*) *Atony* or *Inertia*. In this case the labour becomes protracted or altogether arrested, and the condition is evidenced by the shortening of the pains, while the intervals become more and more prolonged. This may take place in rare cases already in the first stage. If in such a condition the membranes are still unbroken, it is best, in a primiparous patient, to get the labour suspended for a time by means of sedatives, in the expectation that after the uterus and the general system have been rested and restored, the parturient power will return with increased vigour. In multiparæ it is sometimes better to rupture the membranes so as, by escape of some of the liquor amnii, to develop uterine action. Rarely in such conditions does it become advisable to apply the forceps. Far more frequently the delay from inertia occurs in the second stage; and whether this set in in the case of a uterus that has acted imperfectly from the first, because of weakness resulting from frequent and rapidly succeeding pregnancies, or disease in the walls, or in the case of a uterus that has got worn out during an ill-managed first stage, the forceps

always offers the best means of terminating the labour. I am unhesitatingly on the side of those who in all such cases reject out and out the treacherous help that seems to be offered in the oxytocic power of ergot.

(*2dly*) *Irregular Action of the Uterus.*—The uterus, in certain cases instead of, as it were, sulking and ceasing its work, gets irritable, and is thrown into a series of irregular contractions. In this case pains are present, perhaps constant; but the contractions in the uterine walls are spasmodic and partial, and quite inoperative for the advance of the head. When the practitioner is sure that the bowels and bladder are clear, and the membranes still unbroken, the unmistakable indication is to bring uterine action to a standstill by large doses of opium, chloral, chloroform or nitrite of amyl; and only where the membranes have been long broken and the waters much drained is there a call for immediate recourse to delivery with the forceps.

(*3dly*) There is a group of cases where contractions of the uterus, perhaps vigorous and regular enough, are yet not producing their due effect in consequence of their *Mis-direction.* It is usually an anterior deviation of the fundus that exists in consequence of relaxation of the abdominal walls; and probably proper posturing of the patient, or application of a bandage, will render the uterine effort efficacious. If not, some practitioners will apply the forceps, whilst others elect turning.

2d, In the *Abdominal Power.*—The secondary or accessory force supplied by the action of the abdominal and respiratory muscles fails in cases of exhaustion, of general debility, of paralysis, or in diseased conditions of some of the abdominal and thoracic viscera. In many of our patients we happily find a compensatory relaxation of the soft passages, which offers such slight resistance to the progress of the passenger that the uterus is equal to the occasion, and expels its contents without the usual aid of the accessory power. Sometimes the accoucheur can supplement the uterine effort by pressure with his hands or a bandage. But often he gives most effective aid by application of the forceps.

2. The fault is in the parturient *Passages,* soft or hard.

1*st,* In the *Soft Canals.*—With regard, *first* of all, to the *Cervix,* I have to remark, that after all that has been said and written on the subject, I believe that the application of the forceps within the partially dilated os uteri is very seldom called for in practice. To my mind some other element of delay or danger must be present to warrant the extraction of the head with the forceps through an imperfectly expanded cervix; and in such conditions the extraction should be conducted cautiously, and with the clear conviction that undue rapidity of action is liable to cause laceration of the cervical tissues. The *Vaginal walls,* in the *second* place, may offer obstruction to the normal progress of the head either from original or

acquired narrowness which existed before labour, or, more frequently, from their having become swollen and dry during a too protracted labour. In either case, when the natural efforts are bringing the patient only into danger, the use of the forceps will rescue her. In many primiparæ, *thirdly*, the plane in the soft canals at which the chief difficulty is encountered is in the *Perineum ;* and whilst in some instances the head can be shelled out by pressure exerted on the forehead through the rectum, or from the cutaneous surface at the sides or tip of the coccyx, in others the difficulty is most easily overcome by the use of the forceps.

2*d, Hard Canals.*—The *degree* of pelvic contraction that requires and permits the application of the forceps ranges from a line less than 4″ to 3¼″ in the conjugate diameter of the brim. Their employment may sometimes be successfully had recourse to in a pelvis that is even reduced to 3″ in this diameter; in such a case the head must be small, and unless it be a flattened pelvis with transverse elongation, which would admit of successful turning, it is safer for the mother to have recourse to early perforation of the full-sized fœtal head.

The operation with which forceps application, however, comes most frequently into competition in a pelvis, say of 3¼″ or 3½″ in the conjugate of the brim, is, as I have hinted, the operation of turning. In making our choice between turning and forceps, the most important guide to a satisfactory decision is found in a study of the *form of the pelvis.*

The *form* of pelvic contraction most favourable for forceps application is the uniformly or universally contracted pelvis—*pelvis equabiliter justo minor;* and the index is to be found, as I have pointed out elsewhere,[1] in the very pronounced flexion of the fœtal head, which takes place high up in such a pelvis, rendering the anterior fontanelle quite inaccessible, whilst the posterior fontanelle comes low and lies near the line of the pelvic axis. Where, on the other hand, we find the anterior fontanelle on the same level with the posterior or depressed below it, while the sagittal suture is lying in the line of the transverse diameter of the brim, we are safe to conclude that we have to do with a flattened pelvis, in which we give mother and child the best chance of a safe delivery by having recourse to early version.[2] Other varieties of pelvic deformity—as the funnel-shaped pelvis, coccygeal anchylosis, small tumours, etc., may call at times for the use of the forceps. In all of them the dipping of the hindhead—the depression of the triangular fontanelle—makes us hopeful of securing a satisfactory grasp and a safe extraction.

3. Fault in the *Passenger.*

1*st, Large Size of Head.*—We often enough see a woman who has had a difficult first labour, which may even have demanded the

[1] See my *Contributions to Obstetrics and Gynecology*, p. 167.
[2] *Ibid*, p. 171.

forceps for its completion, give birth to her subsequent children without a repetition of operative interference. The relaxed dilated condition of the canal which remained after the passage of the first child allowed of the birth of the others by the natural powers of parturition. But occasionally the converse takes place. A patient has had one or two labours that were strictly natural, but a subsequent child requires to be extracted with the forceps. The cause of the difficulty lies in the greater bulk of the body passing, and notably in the increased size of the fœtal head. The increase in bulk may be simply the larger size of the male over the female head, or of an unusually large child of either sex, as is seen in some cases of protracted gestation. Or the head may present such a degree of ossification of the bones as to interfere with the moulding, which allows of the expulsion even of a tight-fitting head under the natural efforts. In such cases the head comes down with the occiput and triangular fontanelle markedly depressed —the large head finding its way through the normal pelvis, as the normal head makes its way through the undersized pelvis, with an exaggerated degree of flexion. Such enlargements of the head form a very fair group of cases for extraction with the forceps; but the instrument becomes dangerous in its application to cases of morbid enlargement, as for hydrocephalus. It is not easy to define the degree of enlargement at which danger begins; but in any case where the practitioner finds that much force is required to approximate the forceps handles, and he has satisfied himself that he has not an antero-posterior grasp of the head, he may be sure that to persevere with their use will entail great dangers. There is to the mother the risk that the bulky mass that is dragged into the pelvis will contuse and tear the soft parts, whilst for the child the instrument will have much the same effect as an ill-constructed cephalotribe.

2*d*, *Malposition of the Head.*—An ill-placed head may require extraction with the forceps, when it is getting delayed in the cavity with the occiput persistently posterior. In such a case some failure of parturient power has often set in before the application of the forceps is indicated. Whether or not the labour is like to come to a standstill, and it only progresses when traction, perhaps combined with a rectifying movement, is effected with the forceps, in such a case it is always important to seek to promote the flexion of the head before impressing on it a rotation movement. And this leads to the remark that a last indication on the part of the passenger is found in

3*d*, *Malpresentation of the Head.*—In cases where we find a head presenting badly at the commencement of labour, fitting itself to the pelvic brim, with the anterior lower than the posterior fontanelle, and constituting a brow or face presentation, we will often give mother and child the best chance by turning as soon as possible after the waters have escaped and the cervical canal is dilated.

But where the head so presenting has come through the brim and is delayed in the pelvis, we must deliver with forceps; and even when such a presentation exists above the brim, and long escape of the waters now makes turning dangerous or impossible, we must, before thinking of diminishing the size of the fœtal head, apply and attempt extraction with the forceps. These face cases more particularly do not constitute a very happy group for forceps application or extraction, but sometimes a child so presenting has been extracted alive without damage to the mother, when the only other alternative lay in some craniotomy procedure.

B. Dangerous Labours.—In labours that present features of special danger from Complications on the part of the Mother or the Child, the forceps may be required to save the lives of one or other, or both of them.

1. *Maternal Complications.*—In many cases of labour complicated with utero-placental hæmorrhage, with rupture of uterus, with convulsions, syncope, etc., the artificial delivery that is urgently indicated can be most safely effected, both for mother and child, with the forceps. In cases of this kind the operator has frequently enough no choice. He may find himself called on to deliver a patient in immediate danger, and having only his hands at command, he must have recourse to turning. Even where he has a choice, the labour may still be in such an early stage that he prefers version. But the power we have of promoting the dilatation of the parturient canals by the hydrostatic bags tends to increase the proportion of cases in which we may eventually apply the forceps, and so give the child, and perhaps also the mother, a better chance of safe delivery.

2. *Fœtal Complications.*—Under this heading we have merely to note cases of irreducible prolapsus funis, where rapid extraction with forceps will be effected in preference to other modes of delivery, when the waters have some time escaped and the head is entering the pelvis.

II. Mode of Action of Forceps.

1. *Traction.*—The great and primary use of the forceps is as a tractor, and, in the ordinary run of cases, it effects the delivery solely by the power it enables the operator to employ of making simple traction. It has, however, other modes of action, which must not be left out of sight, and which may sometimes be utilized.

2. *Compression.*—The compression influence of the forceps is one that, in most cases, we would willingly dispense with, seeing that diminution in one direction is usually compensated by increase in another. With the ordinary forceps no traction can be effected without some degree of compression. According to Delore,[1] the

[1] *Gazette hebdomadaire de médecine et de chirurgie*, 1865, quoted in *Dict. Encyclop. des Sciences Médicales*, article "Forceps," p. 574. Paris, 1879.

pressure on the head is about equal to half the amount of force exerted in traction.

3. *Rotation.*—During the progress of the head effected under the simple traction, the head tends to undergo the usual movement of rotation if the operator is simply careful not to hinder it. Cases may arise where the rotation may be promoted by a judicious movement with the forceps.

4. *Leverage.*—In common with many other practitioners, in employing the ordinary forceps I have found it handier, when the head was not descending under straight forward traction, to secure its advance by an alternate lateral lever movement. A forceps that will give us the power of perfect traction renders less necessary such pendulum action.

5. *Dynamic Action.* — It has often enough been observed in lingering cases, where the parturient powers had become almost inert, that after the head began to be dislodged in the grasp of the forceps the parturient energy revived. This has led some to attribute to the forceps what they have called a dynamic action, which Kilian at one time fancied might be increased by having the blades made of different metals, so as to add a galvanic to the supposed dynamic action.

III. Construction of Forceps.

In choosing an instrument which will fulfil all the indications, because possessing all the powers, required in an effective pair of forceps in the various emergencies of practice, the obstetrician should be careful to select a double curved forceps that can grasp the head either at the floor of the pelvis, in the brim, or above the brim. It is important to accustom the mind and hands to the relation and working of an instrument that will be available for every case. The head, even when grasped at the floor of the pelvis, is best carried along the curve of the canal with a curved instrument. With such an instrument the Fellows of this Society are all very familiar; for since Sir James Simpson in 1848 laid his forceps before it, most of us have had abundant opportunity of testing their efficacy, and have come to the conclusion, that what ought in any case to be effected by means of forceps can be effected by these. They are essentially a pair of long forceps[1] intended and adapted for application either above, at, or below the brim, and I find it difficult to comprehend how Dr Barnes can have fallen into the error of misrepresenting them as if they were only to be used in low forceps operations.[2] Some of the best points in their construc-

[1] *Selected Obstetrical and Gynecological Works*, by Sir J. Simpson, vol. i. p. 37, edited by Dr Watt Black.

[2] We may as well take the opportunity of demurring to Dr Barnes' dogma enunciated on the same occasion in the London Obstetrical Society (*Trans. L. O. S.* for 1879), p. 243, that obstetric experience is a matter of population, in the sense, at least, that only in large centres of population are we to look for

tion have been copied in others of more recent date. Whilst, like some other British forceps previously in use, they are long enough to allow of application to the head above the pelvic brim, they present the advantages, *first*, of having the shanks thrown widely enough apart to allow of the introduction of a finger between them close to the lock during traction; *second*, of having knees or projections above the Smellie lock, "of such size as to prevent the blades readily unlocking in the intervals between the pains, thus giving it the fixed character of the locks of Levret and Brunninghausen without their complexity." At the same time, *thirdly*, "the joints are made so loose as to allow of their lateral motion and overlapping to a very considerable degree, thus facilitating their introduction and application." *Lastly*, the handles, which are grooved and marked on the anterior sides, are provided with transverse rests or hooks borrowed from the handles of the German forceps (Fig. 1.) For it may be interesting here to note that the

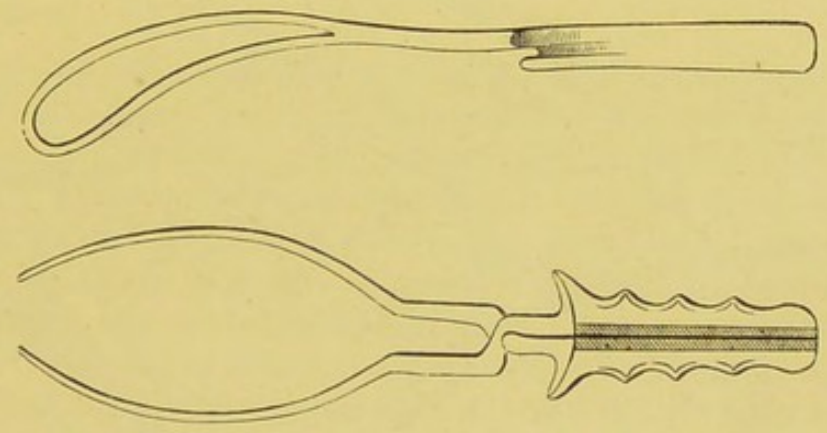

Fig. 1.—Sir J. Y. Simpson's forceps shown locked, and left blade shown singly from outside of blade.

traction power used to be attained in French, German, and British instruments at different parts of the handles. The handles of typical French forceps end in hooks curving outwards (as in Fig. 2), and through these proximal hooks traction is effected. German obstet-

advances in obstetrics. Palfyn's Ghent, Naegele's Heidelberg, Rigby's Norwich, Solayres' Montpellier, and many another comparatively small town, European and American, protest against the dictum. Professor Stephenson of Aberdeen was in the right in claiming that Scotland had given the British Empire the keynote to the proper use of the long forceps. And if Dr Barnes be correct in saying, with regard to England and Ireland, "that it is in the great centres of population—London, Manchester, Birmingham, Dublin . . . that the longer forceps have come into use," we can only say that the practitioners in smaller centres must have been miserably taught; while for two generations, at least, the practitioners in Scottish villages have made due use of the long forceps. There is a kind of "experience" that is very hindersome to progress. It might be well for Dr Barnes to consider what advances in obstetrics and gynecology during the last half century have come respectively from London, Dublin, and Edinburgh. The land of the mountain and the flood has its drawbacks, but a Scotch mist does not follow its victims into their homes and halls like a London fog.

ricians placed their traction hooks nearer the lock, usually close to it, as in Naegele's. Until Simpson borrowed the Naegele hooks, British obstetricians obtained traction power by grasping the handle in all its length, sometimes supplementing it by passing a finger between the shanks of the blades.

Let us suppose any of them applied to the head at the brim of the pelvis, and let us ask in what direction the traction is applied, and what will be its effect. Let us suppose, *e.g.*, the traction applied through hooks at the extremities of the handles, as in the French instrument. If we study this in such a diagram as is shown in Fig. 2, it is seen that the central point of the head C ought to

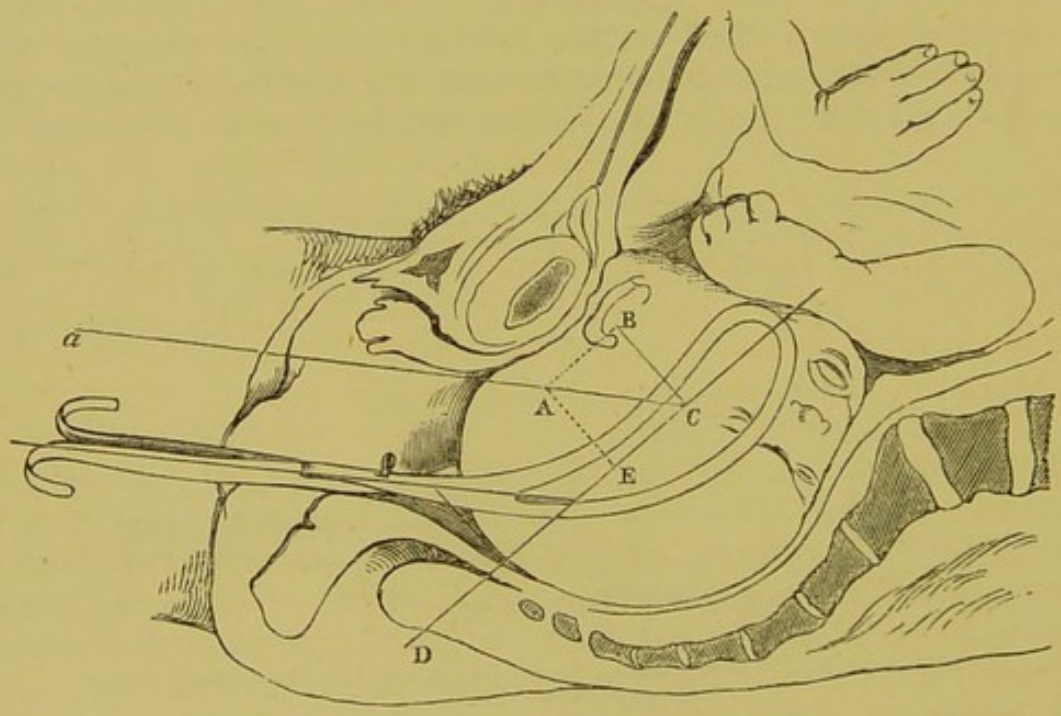

Fig. 2.—Levret forceps applied to a fœtal head in the pelvis. The parallelogram of forces, A B C E, illustrates the amount of force lost (= difference between C A and C E), and the amount misdirected (= C B), when traction is made with straight handles.

travel downwards in the direction of the line C D, along which it would be driven by the natural powers. But traction applied simply through the hooks *a* will act in the direction of the line *a* A C, running parallel to the handles. Only a part of the power thus applied will be available for dragging the head in the axis of the brim. If we resolve the force into its components, we find that these are constituted by the lines C E and C B. Of these, the useful component C E in a case where a force A C of the weight of 50 lbs. meets the line of descent C D at an angle of 40° would be only 38½ lbs. And it is important to observe that whilst a force of only 38½ lbs. is acting in a useful direction, a force of 32 lbs. is being exerted in a vicious direction, crushing the head against the symphysis in the direction and to the extent indicated by the line C B. It is important to note that as the actual line of traction diverges from the axial one the amount of detrimental

pressure very rapidly increases. If the pull be directly in the axis, the force would be all available and there would be no detrimental pressure on the walls of the passage ; but as it diverges from that line we find the available force diminish and the detrimental pressure increase according to the proportion shown in the following table, for the calculations of which I am indebted to Mr Alfred Daniell, B.Sc., Lecturer on Medical Physics :—

Angle of traction made with axis.	Available force.	Detrimental pressure.
	lbs.	lbs.
0°	50	0
10°	49·24	8·68
20°	46·98	17·10
30°	43·30	25·00
40°	38·30	32·13
50°	32·13	38·30

The first who clearly demonstrated these disadvantages of the double-curved forceps, and made suggestions for overcoming them, was Professor Hubert of Louvain, from whose lectures,[1] as published by his son, I have partly borrowed in constructing these diagrams. In 1860 he proposed to bend the free extremities of the handles back at right angles, in order to correct the line of traction. In 1866 he fixed a bar to the handles, close to the lock. (See Fig. 3.)

In 1868[2] Dr Aveling of London showed to the Obstetrical Society there a pair of forceps, the handles of which were curved backward ; and in 1878,[3] in a very able and interesting communication, he discussed the curves of midwifery forceps, their origin and uses, and demonstrated the advantages of an instrument having not only pelvic but perineal and handle curves. In 1878[4] Dr W. L. Reid of Glasgow showed to the Medico-Chirurgical Society of that city an ingenious pair of forceps which differed from the usual forceps in various respects, and among others in having a compensatory curve on the handles to allow of direct traction in the chord of the blades of the pelvic curve. In 1861[5] M. Chassagny of Lyons, in constructing an apparatus by which the traction could be kept up continuously by a screw, passed tapes through perforations in the posterior rim of the fenestrae of the forceps blades.

[1] *Cours d'Accouchemens*, Louvain, 1878. I am not overlooking the forceps proposed by Hermann of Berne in 1844, the originals of which I have had the opportunity of seeing through the kindness of Prof. P. Müller. But though they have some features in common with Tarnier's forceps, the principle of their action is not the same.

[2] *Transactions of London Obstetrical Society*, vol. x.

[3] *Ibidem*, vol. xx.

[4] *Glasgow Medical Journal*, June 1878.

[5] *Bulletins de l'Academie de Médecine*, xxvi. 414.

By far the most valuable suggestion for obtaining the full benefit of forceps with a pelvic curve is that made in 1877 by M. Tarnier

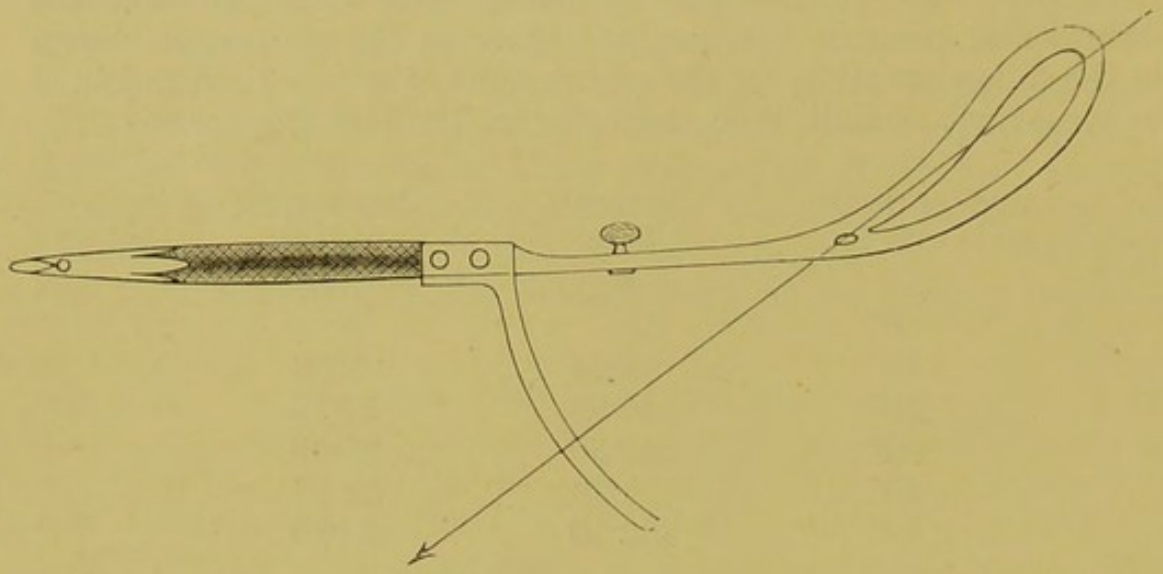

Fig. 3.—Hubert's forceps, with axis-traction bar fixed to the handles

the distinguished accoucheur of the Paris Maternity, which is ably explained and clearly illustrated in his memoir.[1] (See Fig 4.) The

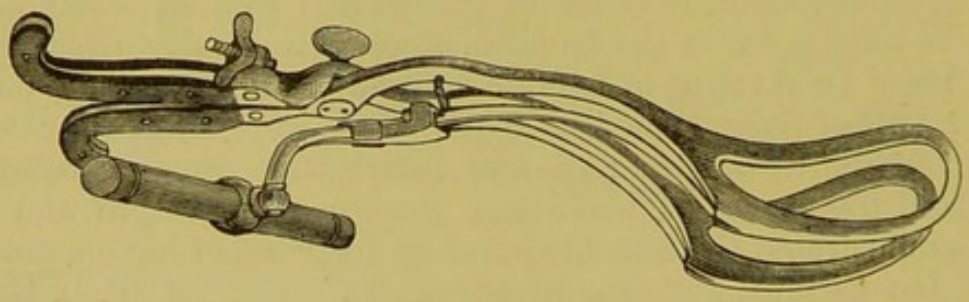

Fig. 4.—Tarnier's forceps.

Fellows of this Society will remember that the Tarnier forceps were demonstrated to us by Dr R. Bell[2] of Glasgow, and that whilst they present peculiarities in the form of the blades and in the curve of the shanks, their most important and novel features consist in the addition of metallic traction-rods to the posterior edge of the blades, and of a fixation-screw in front of the handles, immediately below the lock. During the application of the blades the traction-rods are each fixed by a catch to the back of their respective shanks, so that the blades are introduced in the same way as an ordinary pair of forceps. After the blades are locked the rods are freed from the catch, and their free extremities fitted and fixed by a slide into a single curved stem, which has a transverse bar

[1] *Description de deux nouveaux forceps.* Paris.
[2] *Transactions of Edinburgh Obstetrical Society*, v., 1879.

attached to its other extremity. This transverse bar, which is freely movable in every direction, constitutes the traction-handle, and by drawing on this alone through the medium of its connexion with the blades, the advance of the head is effected. It is in consequence of the direct connexion of the traction-rods with the fenestral rim that the addition of the fixation-screw is necessitated. In ordinary forceps, when traction is made by the handles, the handles are kept in contact, and the blades are kept in position by the very grasp that is needful for traction. But in making traction with the curved rods the application-handles need never be touched. It might be quite possible to keep those handles compressed in one hand, while traction was made on the traction-handle with the other. But in practice it is found much easier to secure the blades by a turn of the fixation-screw, so as to leave the second hand free to assist in the traction, or to guard the perineum, or to watch the progress of the head through the pelvic canal.

I confess that when I first read M. Tarnier's monograph I was more impressed with what I thought were the dangers of this fixation-screw, and the seemingly complicated character of the instrument, than with the value of the principle that underlay their construction. Even after Dr Bell's emphatic testimony to the facility of their application, I still felt that it was too cumbrous and costly[1] to be likely ever to get into general favour. But the more I considered the objects sought to be attained by them, especially after I had experienced their value in one or two difficult cases as well as on the phantom, the more I became convinced that all forceps extractions ought to be effected with some such instrument.

The Fellows of the Society will easily believe that I entertained a wholesome dislike to any attempt at tampering with our own well and widely approved forceps. Two of Sir James Simpson's most distinguished pupils have proposed modifications of it, which both only result in depriving it of valuable power. Dr Matthews Duncan removed the traction-hooks, so that the operator is compelled in every case to exercise a compression which the hooks enabled him sometimes to avoid. Dr Andrew Inglis cut off the handles till only the hooks were left, so that the operator had no power of producing any compressing action whatever. I have always felt that against any mutilating of the Edinburgh forceps we had a powerful mutual protest in the respectively modified instruments of the late obstetric professor of Aberdeen and the present obstetric physician of St Bartholomew's. But it became more and more clear to me that if we could adapt traction-rods to the well-tried blades in some way which would not materially increase the difficulty of their application, we should add immensely to their value as powerful and safe extractors. After a

[1] Tarnier's forceps cost £3, 10s. Mr Gardner, Surgeons' Instrument Maker, Edinburgh, makes the Simpson forceps, with axis-traction rods of Fig. 5, for £2, and applies the traction apparatus to an old pair of forceps for £1.

series of experiments I have succeeded in getting a pair of forceps made which I do not pretend to look on as finality, but which I am prepared to commend to my fellow-practitioners as having all the advantages of their own familiar implement with the superadded benefit of traction-rods articulated to the blades. (See Fig. 5.)

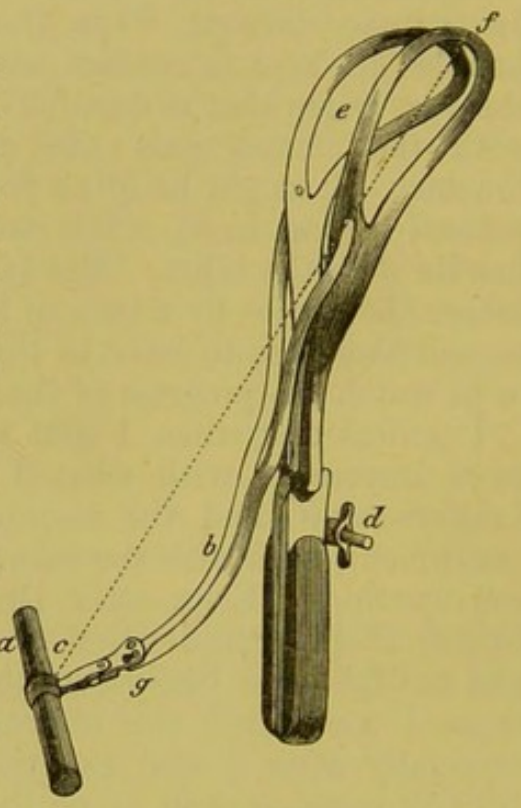

FIG. 5.—Simpson's forceps with axis-traction rods attached. *a*, Traction-handle; *b*, Traction-rods; *d*, Fixation-screw; *e*, Left fenestra; *g*, Locking-plate of the traction-rods; *f c*, Axial line of traction.

What I ask you to notice first is, that this forceps is simply in its basis the ordinary Simpson forceps without the knees or traction-hooks on the handles. The handles have had their hooks and ridges smoothed off them, because they are to be used solely for applying and fixing the blades, and are to be left untouched whilst traction is being effected. They are to be known as the "Application handles," in contra-distinction to the new "Traction-handle." The Fixation-screw is much smaller than that on the Tarnier forceps, because it can never be strongly enough impressed on the mind that the screw is not to be used in the slightest degree as a means of approximating the blades or compressing the head. When any degree of pressure is applied to the head in the grasp of the blades, the pressure is effected by the sentient hand of the operator, and he only fixes the screw when he feels that he has approximated the handles to a point that will secure a degree of compression at once *safe* and *sufficient*. If the compression be too great, the child's head will suffer; if it be too slight, the forceps will slip.

I have not found it necessary to make any change in the curves of the instrument; and in this connexion I may be allowed to express the pleasure it gave me to see, when I visited Paris three months ago, that M. Tarnier had found that the perineal curve of his forceps which he had borrowed from the instrument of Moralés was not necessary, and had begun to use one of the older varieties of the Levret forceps with his traction-rods adapted to the blades.

I am bold to fancy that the traction-rods attached to our forceps are an improvement on those of Tarnier. I have stated that his traction-rods are fitted into a single stem which, with the traction-bar, is detached from the rest of the instrument when it is not in use. This renders the traction-handle easy to be mislaid; and on one occasion I found that I had taken the forceps with me and left the

traction part behind. Happily it was only to a museum experiment, and not to an actual case. I have preferred to have the entire traction apparatus permanently attached to the blades. (See Fig 6.)

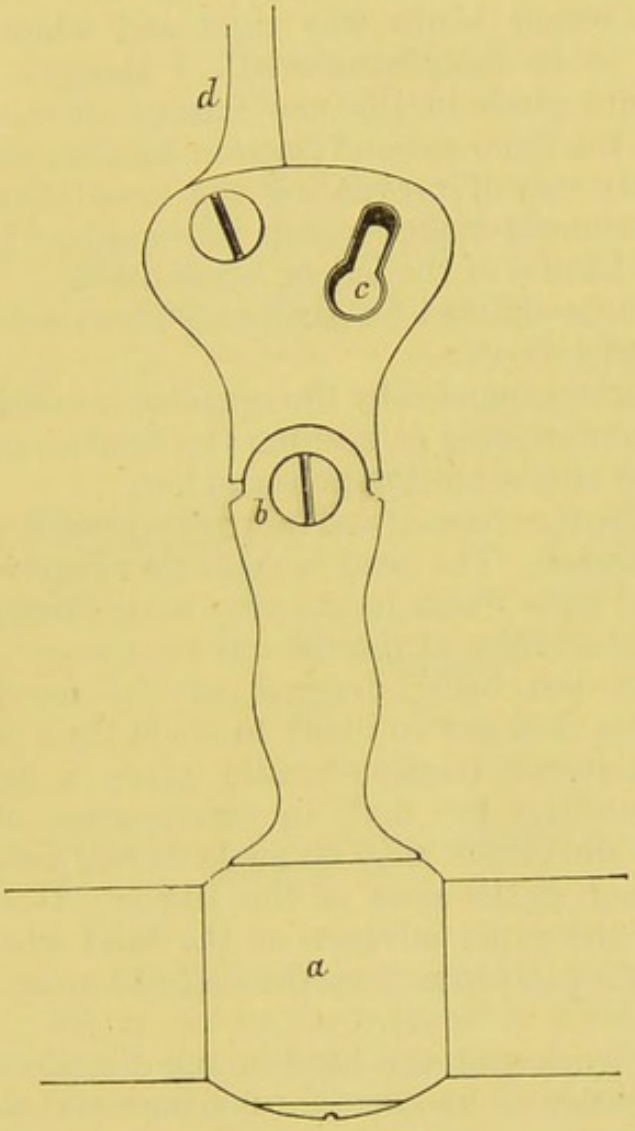

Fig. 6.—Locking-plate and joints of the traction-handle (full size). *a*, Joint for rotation of traction-bar; *b*, Joint for lateral movement; *c*, Opening and slot for locking of right traction-rod; *d*, Left traction-rod permanently jointed to locking-plate.

The traction-bar or handle is jointed (*a*) to a plate which is permanently jointed in its turn to the left traction-rod (*d*), and which has an opening with a slot (*c*) wherein the free extremity of the right rod is readily locked. The left rod can be fixed with a catch to the shank of its own blade, so that the introduction of it is effected in the same way as the blade of the ordinary forceps. The right rod swings free; and it is important to observe that this rod must be pushed forward past its shank during the introduction of the second blade. It is clear that if it were allowed to hang behind the shank it would interfere with the application and locking of the instrument. When the blades have been applied and locked, the left rod is freed from its catch, and the right rod is pushed back and fixed in the locking plate before adapting the fixation-screw.

My description of the instrument would be incomplete if I

did not call attention to another small peculiarity in it. Students have sometimes great difficulty in learning how to recognise the one blade from the other; and I have known a practitioner who had not occasion to make frequent use of forceps puzzled to remember which blade was right and which was left, and which ought to be first introduced. I thought at first that it would be a sure guide in the new forceps to remember that the left blade had the fixed rod and traction handle attached to it; but I find the only way of preventing the possibility of error is to make the instrument-maker stamp the words, "LEFT—LOWER—FIRST" on the handle of the left or lower blade.

The advantages claimed for such axis-traction forceps as I have described are as follows:—

1. All the force expended by the operator is useful. He expends no energy in compressing or keeping the handles together while he pulls, and none of the pulling power is lost.

2. There is no unnecessary and injurious pressure produced on the maternal structures. The head is made to advance under the pull of this artificial *vis a fronte* in the very same direction as it would move under the impulse of the natural *vis a tergo*.

3. The head not being dragged by the forceps against the symphysis pubis, it is not so likely to elude their grasp.

4. The transverse traction-handle gives a solid grasp and purchase for pulling by, and, in consequence of its power of moving in all directions, may be made to run parallel to the axis of the instrument at the close of the labour. It can be used in repressing the too rapid advance of the head where it is advisable to save the perineum from the risk of too rapid expulsion of the head.

5. The compression of the head in one direction, and the compensatory elongation in another, are not increased during tractions made through traction-rods, as they do when traction is made through the ordinary handles. The compression and moulding is altogether a closer copy of the natural configuration than is produced by the old forceps.

6. The rotation of the head is not resisted in any degree, and in the rare cases where it requires to be favoured or effected, the rectification of the position can be brought about by one hand grasping the application handles, while the other makes traction through the rods.

7. The direction of the application handles furnishes a constant guide to the direction in which traction can be made with most effect. This is one of the most important advantages of the adaptation of jointed traction-rods to the forceps blades, and is of itself, to my thinking, enough to make it supersede the use of all the instruments that have perineal and handle-curves. To avail ourselves of it, it is simply necessary to keep the traction-rods constantly parallel to the shanks of the blades; and the proper line of traction

is thus kept up whether the head be passing through brim, cavity, outlet, or vulva. (See Fig. 7.) To this list of advantages, which I have borrowed from Tarnier, I would add—

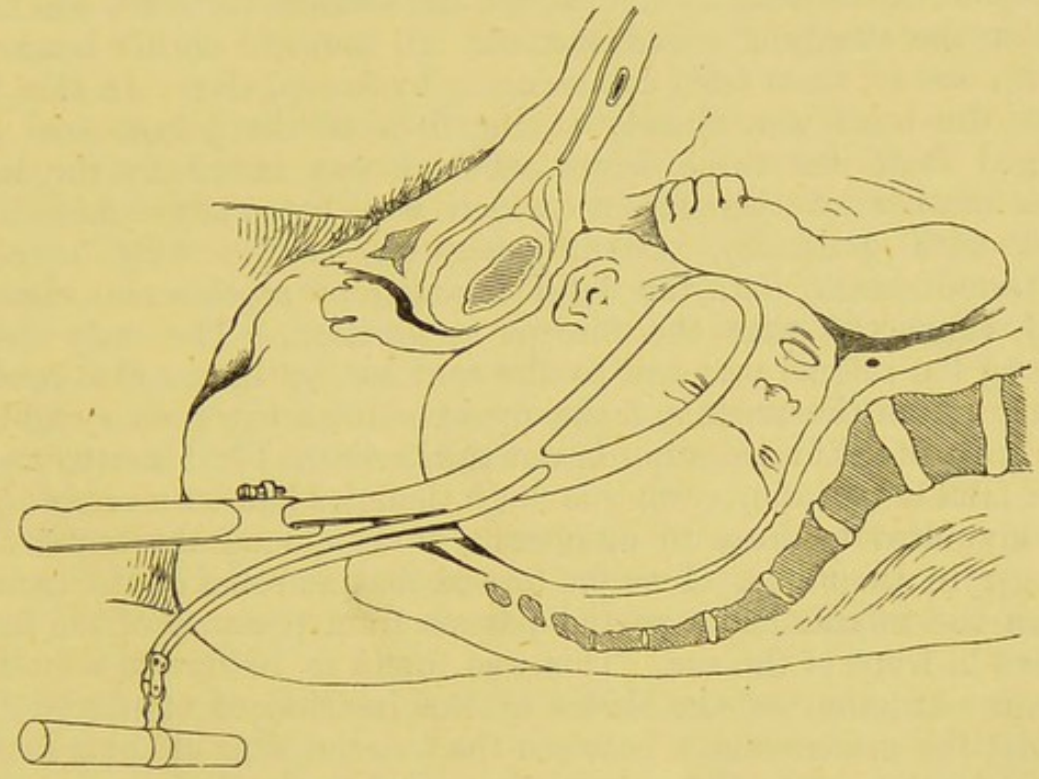

Fig. 7.—Axis-traction forceps applied to the head of the fœtus, placed as in Plate C of Braune's well-known Atlas.

8. The transverse handle enables us to keep up a sustained and continuous pull, which causes the traction to resemble that which Chassagny effected by a screwing apparatus, and the benefits of which have been illustrated by Poullet of Lyons in his admirable tocographical charts.

And 9, there is no impairment of the muscular sense any more than of the muscular power. The operator is therefore better able to judge of the amount of force expended, and to recognise when the distension of the perineum, *e.g.*, is becoming dangerous.

I have not ventured to advocate the value of axis-traction forceps on theoretical grounds alone, without being able to adduce experience gained from the employment of them in a series of nearly twenty cases. In sixteen cases I have used the Simpson forceps with axis-traction handle either personally or by the hands of my assistants, Dr Hart and Dr Barbour. The cases illustrated a wide variety as regards the indication for their use, but they all illustrated the value of the method of extraction. Eleven were primiparæ; five were multiparæ. In some the indication was found in rigidity of the soft canals. In two there was a pelvis justo minor. One of these presented this special interest, that at her first labour her medical attendant had turned the child, but

only succeeded at last in effecting its delivery by perforation and crushing of the after-coming head. In some there was failure in the powers; one of these patients, a primipara, having disease of the mitral valve. In three we had to deal with occipito-posterior positions of the head, in all of which the rotation occurred regularly under the steady effective traction. In two the child's head was large, one of them from commencing hydrocephalus. In this last case the head was already at the floor of the pelvis, and had lodged there for three hours when I was called to the case. The mother of this infant, which was born alive and lives still with gradually widening sutures, is the only case of maternal death, and the fatal issue from septicæmia was no way connected with the forceps application. The only death among the infants was due to the cord having been coiled several times round the neck, and the upper coil having been caught in the grasp of the forceps-tip. It was the first time I had seen a forceps case fatal to the infant from this cause, though I had been accustomed in my class lectures to enumerate it as among the sources of danger in their use. I ought to add that in some of the earliest cases the infants had a partial paresis from pressure of the facial nerve in front of the ear. This was found to be due to a fault in the construction of the blades of the instrument employed; for whilst the measurement between the anterior rims at three inches from the point was the normal three inches, the distance between the posterior fenestral rims was only two inches and seven-eighths.

IV. Rules for the Use of Forceps.

I proceed to formulate rules for the employment of forceps, adapted from the plan of procedure of my predecessor.

A. *Preliminary Rules.*

1. Be perfectly assured of their necessity.
2. Tell the relatives always—the patient generally.
3. Be cautious in your prognosis regarding the infant.
4. Have the bladder and rectum emptied.
5. Place the patient on her left side, her body across the bed, with nates at edge of it. (Sometimes it becomes desirable to turn the patient on her back during the extraction.)
6. Warm and grease the instrument, and if necessary lubricate the maternal passages.
7. Anæsthetize the patient.
8. Assure yourself of the precise position and relations of the head, introducing the hand as far as is necessary.

B. *Rules Regarding Introduction of Forceps.*

1. Insinuate, do not force on the instrument, and withdraw it partially when any great resistance offers.

2. Keep its point always in contact with fœtal head.

3. Introduce each blade so that its concavity adapts itself to the convexity of the fœtal head.

4. Enter and apply each in the proper axis of the pelvis.

5. Introduce the instrument during the intervals between the pains, and always suspend the attempt during the continuance of the pains.

6. Introduce first the left blade, which has traction-rod and handle attached to it, and is stamped, "Left—Lower—First."

7. Hold it in the left hand, and use the fingers of the right as a guide. (The left blade may be held in the right hand; but, as a general rule, I think the memorable aphorism of Pajot is correct: *branche gauche, tenue de la main gauche, et introduite à gauche; tout doit être gauche, excepté l'accoucheur.*)

8. When it is fully introduced keep it *in situ* with thumb and two last fingers of left hand, and use again the first two fingers as guide.

9. Introduce the right blade *with the traction-rod swung forward,* pointing it at first toward the hollow of the sacrum.

10. Carry it round the head till it comes into complete antagonism with the left.

11. Slacken the left rod, swing back the right one, and adapt it to the traction-plate.

12. Adapt, but do not tighten the fixation-screw.

C. *Rules for Working the Forceps.*

1. Grasp application handles, and fix screw at the point where safe and sufficient compression is secured.

2. Make traction with traction-handle during pains; or, if no pains are present, at intervals.

3. Keep the traction-rods parallel with the shanks. (This insures progress of the head in the proper axis of the pelvis.)

4. After each traction slacken, but do not unship, the screw, and examine the progress of the head.

5. Where rotation has to be aided effect rectification with the application handles.

6. Support the perineum carefully with the left hand.

7. Make the head distend, and pass over it very slowly; allowing the uterus itself to complete as often as possible the expulsion of the head, and always that of the body.

8. Immediately after the birth of the head slacken the screw, free the right rod, and remove the right and left blades successively.

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