

CHAPTER XII.

EMBRYOTOMY: PERFORATION.—CRANIOTOMY.—CEPHALOTRIPSY.—CRANIOCLASTY.—EVISCERATION.

**B**ROADLY, embryotomy is an operation by which the volume of the fœtus is diminished in order to render delivery easier, or even possible. It is known under the various names which head this chapter. It has been practised from the earliest times where the infant is dead, but to-day it is still rejected by certain accoucheurs, notably Stoltz, where the infant is alive. Stoltz, however, is about the only one who absolutely rejects the operation where the infant is living, for the most pronounced advocates of the Cæsarean section resort to embryotomy where the mother refuses the section. For our part, we believe that the accoucheur should never forget that the life of the child is not at all comparable to that of the mother, and that, therefore, he ought never to hesitate to sacrifice the former in order to increase the chances of the latter. We must never forget, furthermore, that embryotomy will give the most favorable results the earlier it is resorted to, and the less the previous efforts to obtain a living child. Once then we are satisfied that Nature cannot accomplish her task, and we have tried by reasonable means to save the life of both child and mother, we are of the opinion that we should absolutely neglect the child and turn our whole attention to saving the mother.

The statistical results vary considerably according to the country and operator. Sichel gives us the following figures in regard to frequency of employment of various operations:

	Sichel	in 470,975 labors,	400 times.
Perforation	Oldham	" 22,681 "	81 "
	Johnston and Sinclair	" 13,933 "	130 "
	In Germany	" 434,371 "	189 "
		" 12,273 "	21 "
Cephalotripsy	" 304,150 "	22 "	
Embryotomy	" 422,686 "	97 "	
Cæsarean section	" 463,908 "	48 "	
Premature labor			

In a table constructed by Ploss, giving the statistics of perforation and cephalotripsy in the German maternities, there are 540 out of 291,618 labors.

Pawlick, recapitulating the cases reported of decapitation by Braün's book, gives a mortality of 24 per cent.; Spæth gives the recoveries as 77 per cent.; Müller in 17 perforations had only 2 deaths; in 26 premature labors 3 deaths of the mother, and 12 of the children.

At the *Clinique*, Paris, from 1852 to 1880 (the year 1853 lacking): Cephalotripsy, 202 cases.—Mothers living 145; mothers dead 57. Embryotomy, 56 cases.—Mothers living 39; mothers dead 17. Maternal mortality 28.68 per cent.

The statistics of Rigaud and of Stanesco give a mortality of 38.52 per cent. in 122 cephalotripsies.

Once having determined on embryotomy the choice of the method remains. In one operation the head of the fetus is alone involved, at other times the trunk. We will consider these methods under the following headings:

1. Perforation of the skull.
2. Cephalotripsy.
3. Cranioclasty.
4. Sawing of the head.
5. Sape sphenoidienne of Guéniot, intra-cranial cephalotripsy of Guyon, transforation of Hubert.
6. Decapitation, decollation, detruncation.
7. Evisceration, brachiotomy, spondylotomy.

#### I. PERFORATION.

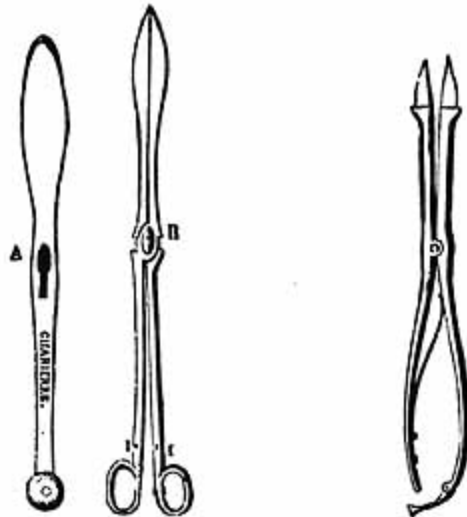
This is the most ancient of all methods for reducing the size of the head, and it consists in the artificial opening of the vault of the skull, in order to give exit to the brain, in addition, exceptionally, to the removal of pieces of the bone. Innumerable instruments have been devised for the purpose. Sadler and Levy have given a succinct description of all. We will note here simply the most important.

a. *Cutting Perforators*.—Those devised by Hippocrates, Albucasis, Paré, Guillemeau, Mauriceau, Roederer, Stark, Wigand, Waller, and others. These are to-day practically all rejected.

b. *Scissor Perforators*.—Those of Bing, Wallbaum, Smellie (Figs. 133 and 134.) Naegeli (Fig. 135), Levret, Stein, Denman, Brunninghausen, Siebold, Busch, Simpson, Oldham, Greenhalg, Blot (Figs. 137 and 138), etc. The last is decidedly the best, particularly since it is absolutely harmless to the mother and the accoucheur.

c. *Trephine Perforators*.—Those of Joerg, Mende, Ritgen, Kilian, Leissnig (Fig. 136), Braun, Martin, etc.

As we have said, the best instrument is Blot's. It is composed of two



FIGS. 133 and 134.—SMELLIE'S SCISSORS. (Modified.)

FIG. 135.—NAEGELI'S SCISSORS.

blades. When closed the dull edge of each covers the sharp edge of its fellow. By pressure at D the blades open like Smellie's scissors.

The indications for resort to perforation, are:

1. *The Fœtus is dead*.—Perforation is indicated whenever the disproportion between the head and the pelvis renders spontaneous delivery difficult, in particular where, if the forceps is used, damage to the maternal parts might result.

2. *The Fœtus is living*.—Whenever the capacity of the pelvis justifies, the forceps should first be tried, always, however, taking care not to damage the mother. If, after three to four attempts, the forceps does not

bring down the head, we believe it disadvantageous to the mother, and of no advantage to the child, to persist longer. We should perforate, and then resort to craniotomy or not according to the case.

One of the great advantages of perforation is that it may be resorted to before complete dilatation of the cervix. The cervix need only be dilated

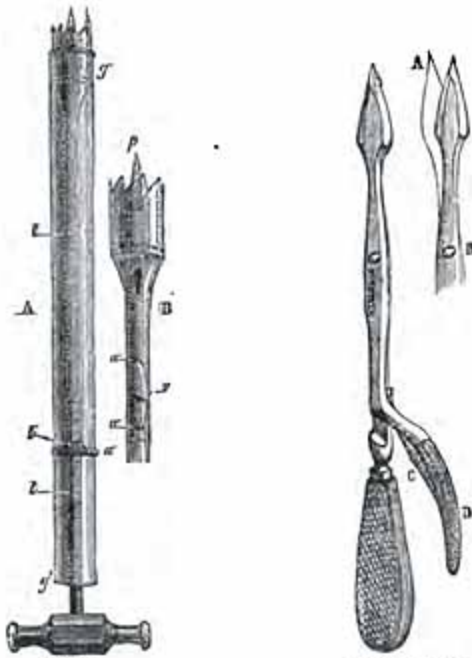


FIG. 136.

FIG. 137 and 138.

FIG. 136.—LEISSNER'S TREPHINE PERFORATOR, MODIFIED BY KIRWACH.—*g*, Upper portion, and, *g'*, lower portion of the canula. *b*, Steel screw holding the two portions together. *l*, Blade. *B*, Crown of the trephine. *P*, Point of trephine. *v*, Screw blade which works in *na*.

FIGS. 137 and 138.—BLÖT'S PERFORATOR, CLOSED AND OPEN.—*A*, Separated blades. *B*, Lock. *C*, Spring which keeps the blades closed. *D*, Handle, pressure on which opens the blades.

sufficiently to allow of the passage of the instrument. Under the influence of the contractions of the uterus, the skull empties itself of its contents, the bones collapse, and we have frequently seen labor terminate spontaneously where instrumental extraction would have been called for had the head remained intact. Usually, however, perforation is insufficient, and cephalotripsy must follow it.

In Holland and in Belgium, the perforated head is extracted by means of the lever. Tarnier prefers the forceps, particularly where the contraction is not great. We resort, in such instances, to Bailly's cephalotribe, which we will shortly describe.

We have stated that before perforating a few attempts should be made to deliver by the forceps. If this fails, it is advantageous to still hold the head in the forceps blades, and perforate between them, for thus we may fix the head by directing an assistant to make gentle traction on the handles; and further, by compressing the handles we assist in the expression of the cerebral matter and in causing the bones to collapse. Often thus we may complete extraction with the forceps, and thus do away with the necessity of inserting the blades of the cephalotribe. We cannot insist too strongly on perforating before using the cephalotribe, else we may deliver the mutilated fœtus and to our horror see it live for some minutes.

*Operative Method.*—We must consider this successively where the before-coming head, or the face, or the after-coming head, presents. We always use Blot's perforator.

1. *Presentations of the Vertex.*—The preliminary precautions and the position are the same as in any obstetrical operation. Since the operation itself is not painful, chloroform is only requisite when, in addition to perforation, immediate extraction or cephalotripsy is requisite, and then narcosis should be induced to the surgical degree. The rectum and bladder should always be first emptied. An assistant should steady the head firmly through the abdominal walls at the superior strait. The operator introduces the index and middle finger of the left hand into the vagina, and inserts them into the cervical canal against the head. The perforator is then guided by these fingers, and its point applied perpendicularly against the fetal head. It is not essential to perforate through a suture or fontanelle, but the point of the instrument is pushed boldly down to the bone, and then the instrument is rotated from right to left, and from left to right, in order to facilitate the passage through the bone. As soon as the instrument has penetrated the cranial cavity, by pressure on the handle the blades are opened, and the instrument is moved in every direction in order to thoroughly break up the brain. Pressure on the handle is then relaxed, the blades close, and the instrument is withdrawn. In these manœuvres the maternal parts are exposed to absolutely no risk.

On the withdrawal of the instrument blood and cerebral matter generally issue from the vulva. (Fig. 139.)

2. *Presentation of the Face.*—Perforation, in this instance, is a trifle more difficult. The instrument may be made to penetrate either through the orbit, the frontal bone, or the palatine arch, the last offering the greatest difficulties. We prefer the frontal bone, although we do not agree with Naegelé and Grenser in believing it indispensable to perforate through the frontal suture.

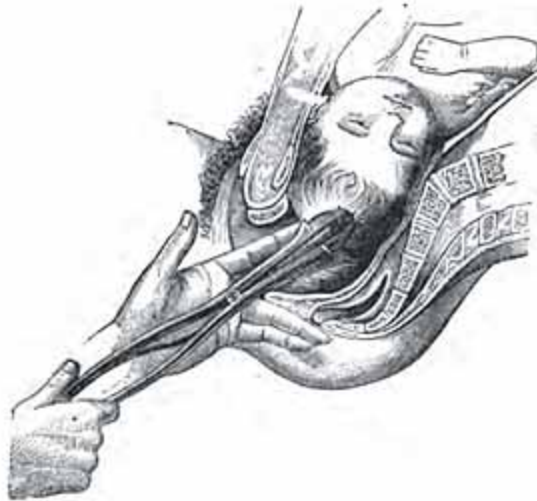


FIG. 139.—CRANIOTOMY WITH THE SCISSOR PERFORATOR.

3. *The after-coming Head.*—Here manipulation is still more difficult, since the body of the child is in the way and the occipital bone is so thick.

We must, therefore, perforate either under the chin, or else, as is preferable, through one of the posterior lateral fontanelles. (Fig. 140.) Chailly prefers perforating through the palatine vault for the reason that he believes the point of the instrument is less likely to slip. He recommends the insertion of two fingers into the mouth, forcible depression of the inferior maxilla, and penetration with Smellie's scissors through the palate into the skull.

Perforation alone rarely suffices. Cephalotripsy must ordinarily be

superadded. For extraction of the head, blunt and sharp hooks have been recommended (Figs. 141 and 142), but we absolutely condemn them on account of the risks which they entail. Bone forceps have also been devised (Fig. 143), and the simplest of all is that of Danavia, described

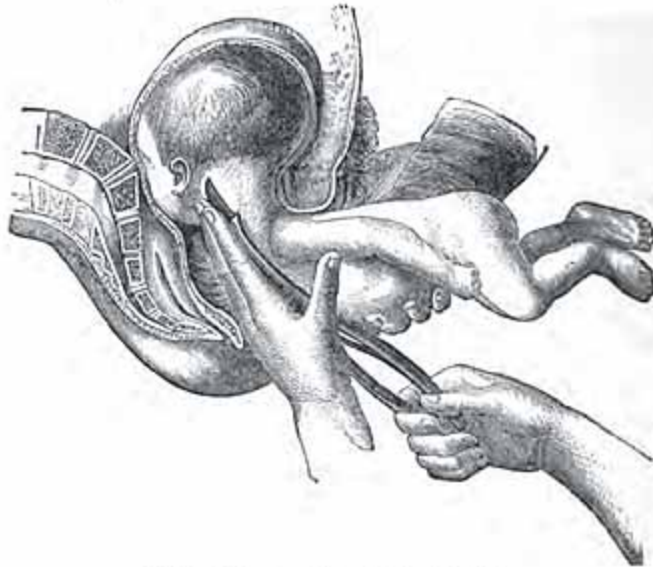


FIG. 140.—PERFORATION OF THE AFTER-COMING HEAD.

by Baudelocque, and recommended by Pajot. This instrument, however, is often not effective, owing to the yielding of the bones, and either the forceps or the cephalotribe is better.

## II. CEPHALOTRIPSY.

This is an operation which consists in crushing the head of the fœtus, in order to diminish both its volume and its resistance. The operation was in reality first placed on a scientific basis by Baudelocque, the nephew, in 1829. It was not, however, till 1834, that he gave to the instrument its present shape.

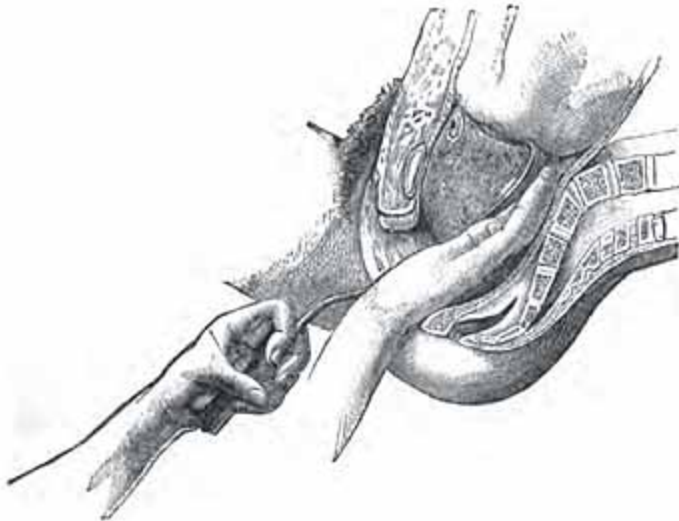


FIG. 141.—EXTRACTION OF THE HEAD BY MEANS OF THE BLUNT HOOK.



FIG. 142.—SHARP HOOK.

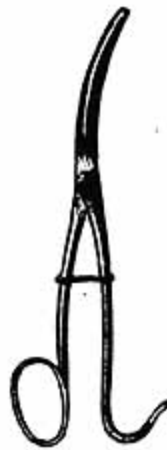


FIG. 143.—BONE FORCEPS.



Baudelocque's cephalotribe (Fig. 144) is composed of two strong blades, 21 inches long, weighing about 4½ pounds, with no fenestræ. The maximum breadth is about 1½ inches. The lock is similar to that of Brunninghausen's forceps. The distance between the blades is about 1 inch,

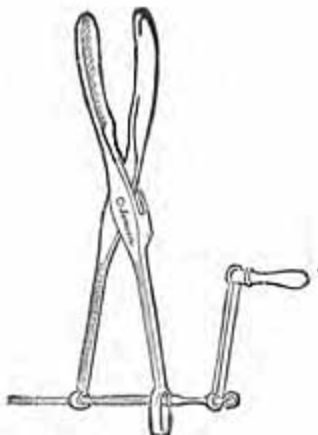


FIG. 144.

FIG. 144.—BAUDELLOCQUE'S CEPHALOTRIBE.



FIG. 145.

FIG. 145.—DEPAUL'S CEPHALOTRIBE. *a*, Screw working the chain *b*, *c*, *d*, Groove for passage of chain, *e*, Lock, *f*, Blades.

and these are slightly convex externally, and concave within. The pelvic curve is about 4 inches. The blades are approximated by a screw rod.

Since the time of Baudelocque the cephalotribe has been modified as extensively as the forceps. (For a detailed description of each form, see Lauth's thesis, 1863.) The best known instruments are those of Busch, Cazeaux, Ritgen, Langenreith, Martin, Dubois, Kilian, Depaul (Fig. 145),

Kiwisch, Chailly (Fig. 146), Scanzoni (Fig. 147 and 148), Braun, Breisky, Bailly, Tarnier, Blot.

We will describe simply the three last.

Blot's cephalotribe (Fig. 149) is composed of two blades; like the forceps, each blade is fenestrated. The blades are a trifle more curved than is the case in Baudelocque's instrument. They are convex on one surface



FIG. 146.—CHAILLY'S CEPHALOTRIBE.

FIG. 147.—SCANZONI'S CEPHALOTRIBE. (Closed.)

FIG. 148.—SCANZONI'S CEPHALOTRIBE. (Disarticulated.)

and concave on the other. Their extremities touch. The instrument is constructed of steel, and the handles are roughened for firm grasp. The left blade holds the pivot on which the compressing bar articulates; the right blade is bifurcated at its extremity to allow of the passage of the same bar. The lock is Brunninghausen's. The blades having been applied, even as with the forceps, the compressor bar is articulated and passed through the bifurcated extremity of the right blade, and then, to

crush the head, it is only necessary to turn the screw, and the blades are approximated.

Bailey's cephalotribe (Fig. 150) is thus described by the inventor: "My idea in devising this instrument was to possess one which, while strong enough to crush, would seize the head better than the ordinary cephalotribe. My instrument has the form of the forceps and its large and con-



FIG. 149.—BLot's CEPHALOTRIBE.



FIG. 150.—BaILey's CEPHALOTRIBE.

cave blades and, in addition, the power of the cephalotribe. The internal surface of the fenestræ is studded with points, which dig into the head and hold it firmly as compression is made. Antero-posteriorly the breadth of the blades is 2.2 inches. When their extremities are in contact the greatest width between them is 2.1 inches. My cephalotribe, therefore, may be used in contractions of the pelvis between  $2\frac{1}{4}$  and 3.7 inches. In contractions below  $2\frac{1}{4}$  inches it is not applicable. The compressing mechanism is similar to Blot's."

For our part, we can affirm that between these limits Bailly's cephalotribe is an excellent instrument. We have used it in twenty-three instances: 17 times in vertex presentations, 5 times in face (once with coincident prolapse of a limb), and once where a large fibroma obstructed delivery. The instrument has never slipped, and we have always been able to extract the head. The only possible objection to it, indeed, is the

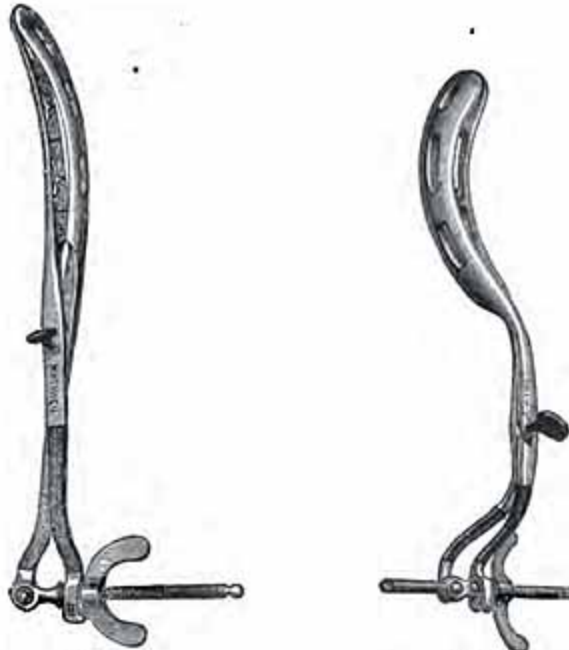


FIG. 151.

FIG. 152.

FIGS. 151 and 152.—TARNIER'S CEPHALOTRIBES.

fact that its utility is limited to the lesser degrees of contraction.

*Tarnier's Cephalotribe.*—Tarnier has invented a number of cephalotribes. (Figs. 151-153.) One of his modifications is furnished with a number of transverse projections to grasp and firmly hold the head; in another he has added a perineal curve; in his last model he has modified Blot's lock, so as to render it easier to adjust the compressing bar.

[Lusk has devised an excellent and effective instrument, which presents

certain advantages over Blot's. It has a cephalic curve of  $2\frac{1}{4}$  inches. The pelvic curve is a trifle beyond 3 inches in length. The blades are fenestrated, and are grooved on the inner surface. With this instrument it is possible to grasp the head above the pelvic brim, and since, after the head has been crushed, "the points approach each other closely, the instrument

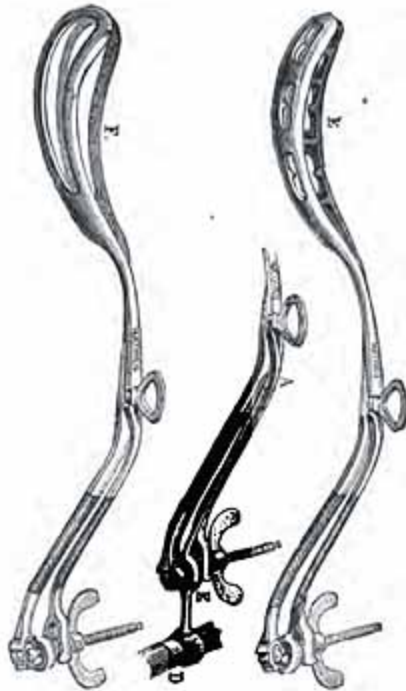


FIG. 153. FIG. 154. FIG. 155.  
FIGS. 153, 154 and 155.—TARNIER'S CEPHALOTRIBE WITH PERINEAL CURVE.

becomes a perfect tractor, holding the head as securely as an ordinary forceps. Its construction is, however, the abandonment of two favorite but chimerical ideas regarding the capacity and mode of action of the cephalotribe, *viz.*, that it is capable of flattening the head so that the latter can be drawn through a pelvis measuring but two inches in the conjugate diameter, and that this can be accomplished by rotating the in-

strument, so as to make the flattened head correspond to the shortened diameter of the pelvis." (Lusk.) Lusk's instrument, further, is less bulky than any, actually so efficient, as yet devised.—Ed.]

*Indications.*—Cephalotripsy is indicated whenever delivery is impossible, without mutilation of the fœtus. Benoit in his thesis, 1881, divides the indications into the following categories: 1. Those from the side of the mother. 2. Those from the side of the child. 3. Those dependent on both. Before studying the indications, we wish to emphasize our previous statement, that before resorting to cephalotripsy we ought, whenever the pelvis allows, to make one to two attempts at delivery with forceps, always within the limits of prudence, and that only when we have thus assured ourselves of the impossibility of delivery without mutilation are we justified in first perforating and then crushing the head. In many instances, we would also add, it is advantageous to allow a number of hours to elapse after perforation, before using the cephalotribe.

1. *Indications from the Side of the Mother.—Pelvic Deformity.*

a. *Pelves of 3.9 to 3 inches.*—The operation is only exceptionally called for, since forceps and version ordinarily suffice for delivery. In case the infant is dead, however, it is preferable to resort to the cephalotribe, since thus the mother is spared the risk of energetic tractions.

b. *Pelves of 3.3 to 2.7 inches.*—First try the forceps, then the perforator and Bailly's cephalotribe.

In this instance the cephalotribe gives fairly satisfactory results.

Lauth	in 50 cases,	. . .	Mortality	32%
Rigaud	" 22 "	. . .	"	50%
Stanesco	" 33 "	. . .	"	24%
Benoit	" 14 "	. . .	"	14.28%

c. *Pelves of 2.34 to 1.93 inches.*—The forceps has little chance of success. With the cephalotribe Stanesco, in 18 cases, had a mortality of 22.22 per cent.

d. *Pelves of at least 2.5 inches.*—Authorities differ as to the choice of methods. It is our opinion that the cephalotribe should be used as long as it will pass. Stanesco gives the following figures: Pelves from 2.5 to 2.15 inches, mortality 41.17 per cent.; pelves of 2.15 inches, 3 cases with 3 recoveries. Maygrier gives the following figures:

Pelvic measurement,	Cases	Mortality
2.54 in.	32	40.62%
" 2.45 in.	" 1	
" 2.42 in.	" 1	
" 2.38 in.	" 2	" 50. %
" 2.34 in.	" 20	" 50. %
" 2.3 in.	" 1	
" 2.22 in.	" 1	" 100 %
" 2.15 in.	" 4	" 25 %
" 2.1 in.	" 1	
" 1.9 in.	" 3	" 33.33%
" 1.4 in.	" 1	" 100 %

As was to be expected, the mortality rate increases with the degree of contraction, as also the difficulty of the operation. To obviate this Pajot proposed repeated cephalotripsy without traction. In reference to this operation, he says: "Struck by the numerous failures of cephalotripsy in exaggerated pelvic contractions, remembering the deplorable consequences for the women of the use of excessive force, and objecting to the Cæsarean section practised from choice and not from necessity, I have proposed a new method under the name of 'repeated cephalotripsy without traction.' After the skull has been perforated, the first application of the cephalotribe should be made as early as possible, with the usual precautions. After crushing the head, I endeavor to turn it by means of the instrument, so as to place the diminished diameter in the contracted portion of the pelvis. If this rotation cannot be made with ease I abstain, for experience has taught me that the uterus itself will usually mold the diminished head and rotate it, with less risk of injury than by artificial rotation. The instrument is to be withdrawn without making any attempt at traction whatsoever; it is reapplied a second and a third time, the head again crushed, and after each crushing the instrument is withdrawn, always without traction. The woman is placed in bed, and according to her general condition and the uterine contractions, I repeat these multiple crushings every two, three, or four hours. When the head has been completely crushed, the trunk ordinarily presents obstacles which necessitate one to two crushings. By this method I have had six successes in eight cases, in the presence of extreme pelvic deformity, where many accoucheurs would have resorted to the Cæsarean section."

*c. Pelves contracted at the Inferior Strait or in the Excavation, by Tumors, Exostoses, Spondylizema, Spondylolisthesis.*—It is impossible

to fix exact limits. Everything depends on the degree of contraction. The same holds true of fibrous tumors, osteo-sarcomata, etc.

### 2. *Indications from the Side of the Fœtus.*

Such are excess of volume of the head, advanced ossification of the skull, complicated or irregular presentations, in particular those of the face, fetal monstrosities, the death of the fœtus, etc.

As for the contra-indications to cephalotripsy, we know of but one, and this is the opposition of the mother. In such an instance we must either let the woman die undelivered, or else resort to the Cæsarean section.

The operation is performed in four stages: 1. Insertion of the blades. 2. Locking of the blades. 3. Crushing of the head. 4. Extraction, where Pajot's method is not followed.

*• Introduction of the Blades.*—The woman having been anæsthetized and placed in the obstetrical position, the head, perforated or not, (it is our practice always to precede cephalotripsy by perforation), is to be steadied at the superior strait by an assistant. The blades are to be inserted so as to grasp the head firmly by its base, in order to crush it at its most resisting part. The blades, hence, are usually applied at the sides of the pelvis, and usually, indeed, this is the only way the cephalotribe may be employed, since the pelvic contraction is ordinarily in the antero-posterior diameter of the superior strait, and the greatest space exists at the extremities of the transverse diameter of the pelvis. The rule in a nut-shell, however, is to grasp the head how and where we can, remembering always that the cephalotribe is a thicker and more massive instrument than the forceps, and that the space in which it must work is very limited. Patience and gentleness, therefore, must characterize the insertion of the blades. Down to 2.34 inches Bailly's cephalotribe may be used, and this instrument being scarcely at all different from a strong forceps with narrow blades, the insertion is very much simplified; but below 2.34 inches we are obliged to use Depaul's instrument, or that of Blot or Tarnier, where the blades are narrow, and therefore it is not so easy to grasp the head. Whatever instrument is used, it must be inserted deeply, so as to seize the base of the skull well, and often the lock will be in the vagina.

The general rules for application are identical to those of the forceps, the difficulty, of course, being greater, and frequently the entire hand must be inserted into the vagina.



*Locking.*—The same rules apply to this procedure as to the forceps, although greater care, if possible, is necessary, for the cephalotribe being more massive than the forceps, the risk of injury to the maternal parts is greater.

*Crushing.*—As Pajot well says the responsibility of the assistant who steadies the head is here great, for the classic cephalotribe being very narrow, the head tends to slip and the operation may on this account fail. Further still, the assistant is able to appreciate how the head has been grasped.

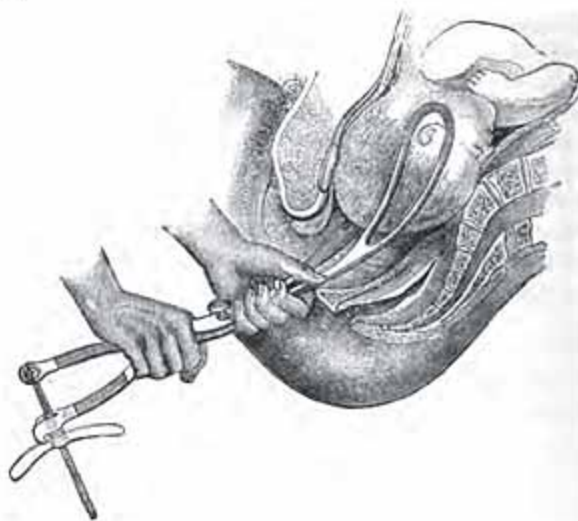


FIG. 156.—APPLICATION OF THE CEPHALOTRIBE.

The process of crushing should be slow and intermittent, and should be kept up until the handles of the instrument have been brought into contact. As the head collapses and the cerebral matter escapes, compression must be more energetic, or else the instrument will slip at the first traction.

*Extraction.*—After an interval of a few minutes, the cephalotribe should be seized in both hands, and rotated so as to bring the lesser curve of the instrument towards one or another thigh of the mother. (Fig. 156.) This movement aims at bringing the crushed diameter of the head into the conjugate—that is to say, the most contracted diameter of the pelvis.

The head having been crushed in one direction, elongates in the other, and this elongation is in the conjugate of the pelvis. Traction is then made, and these must be slow, sustained, combined with lateral movements. Ordinarily, the instrument rotates itself as the head engages, and we must favor this spontaneous rotation. The head once in the cavity, rotation in the inverse direction is made, and thus the lesser curve of the instrument is brought under the symphysis. Traction, even as with the forceps, should always be made in the pelvic axis, and during delivery the perineum should be as carefully watched. The head once delivered, the body follows quickly, except in case of great contraction. "We may then," says Pajot, "apply the cephalotribe on the thorax, or else, by traction on the body and rotation of a shoulder under the symphysis, we may be able to hook a finger in the axilla, bring down an arm, and thus deliver."

Each of these periods may offer difficulties which render cephalotripsy one of the most delicate operations in obstetrics. It is often extremely difficult to place the blades, and it may be necessary to attempt the passage several times before our efforts meet with success. The irregularity of the pelvis and the narrowness increase the difficulty, whence the necessity of proceeding slowly, pushing the blades in deeply, making sure that the head is well grasped. A capital point to be remembered is, as Pajot points out, the necessity of carrying the handles as far backwards as is possible, in order to assure grasping and crushing of the base of the skull.

Bailly's instrument is, we think, the one which best enables us to accomplish our aim, owing to the breadth of the blades and the greater concavity. The head is thus grasped the better, and cannot so readily escape from the instrument. Where the pelvis is greatly contracted, however, if the blades are not carried sufficiently backwards, their extremities touch the posterior pelvic wall, and the projecting sacro-vertebral angle. Here it is that repeated attempts at application of the blades are necessary, and however gently these are made, the risk of injury to the maternal parts is greatly enhanced. The danger from cephalotripsy, therefore, increases greatly in direct proportion to the degree of pelvic deformity.

Generally, with Bailly's cephalotribe, locking is not difficult, but the same does not hold true of the classic instrument, on account of the narrowness of the blades.

During crushing, slipping of the head is more likely as it is badly

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grasped and movable. The chief difficulty, however, is to crush the base of the skull. With Bailly's instrument, whenever it can be used, we are able to obtain most readily complete destruction of the base. During extraction, the chief thing to guard against is slipping, which may cause such injury to the maternal parts. It is to avoid this risk that Tarnier and Bertin have proposed, after a few attempts at extraction, if the head does not engage, to resort to podalic version. The objection we would make to this proposal, is that the uterus is often retracted on the fœtus, and that version is hence impossible without running great risk of rupturing the uterus. Further still, version is far from being practicable in every pelvis.

*Prognosis.*—One of the risks resulting from cephalotripsy and perforation is from the spicule of bone which project, and may injure the maternal parts. These must, hence, be removed with care before exerting traction. Otherwise the lesions which may follow cephalotripsy are the same as those likely to be caused by the forceps, and the more readily since it is a bulkier instrument, and the field of manipulation is more limited.

The prognosis, indeed, is very grave. Rigand places the mortality at 50 per cent.; Stanesco at 33.72 per cent.; at the Clinic, during thirty years, we find the average to be 28.21 per cent.; Maygrier puts it down as 41.79 per cent.; Sickel as 22.75 per cent.; English authors as low as 12.5 per cent., but certain among them never use the forceps, but resort at once to the cephalotribe as soon as delivery does not occur spontaneously. [The author gives no authority for this statement. Certainly no English-speaking obstetrician of the present day would practise or seek to justify such unwarrantable destruction of the fœtus.—Ed.]

In 1881 Castelain (Lille) proposed to perform cephalotripsy not on the before-coming, but on the after-coming head—that is to say, first to try the forceps; if this fails, version, followed by cephalotripsy. He divided pelves into the following categories, from the standpoint of this advice:

1. Pelves of at least 3.3 inches; forceps or version, cephalotripsy only exceptionally.
2. Pelves from 3.3 to 2.7 inches; the forceps, this failing version followed by cephalotripsy.
3. Pelves from 2.7 to 2 inches; the same procedures.
4. Pelves below 2 inches; Casarean section.

The chief utility of the method he advocates consists in the fact that thus it is possible to grasp the skull by its base. In four cases where it was tried at the Lille Maternity, there were four recoveries.

Although we admit, in a measure, the value of version in the lesser degrees of contraction, since we may thus hope to obtain a living child, and still be able to resort to cephalotripsy if need be, below 2.7 inches we reject it, for, as Castelain himself observes, the head can certainly not pass by the contraction. The only way, in these instances, to obtain a living child is by the Cæsarean section, and to this operation, as we have stated, we prefer cephalotripsy. [The time has not as yet arrived for positive statement, but we believe that the drift of opinion is towards the Cæsarean section or laparo-elytotomy in every case where the infant is living, in place of cephalotripsy or other operation which of necessity sacrifices the fœtus. It only remains to be shown that the risk to the mother is not thereby enhanced, and obstetricians have only to learn the advisability of not waiting too long before resort to one or another of the operations which take account of the child's life as well, and then both cephalotripsy and cranioclasty and embryotomy will be relegated to what we believe is their proper sphere, cases where the fœtus is dead. Such will be the verdict in the near future.—Ed.]

We reject absolutely, however, version as a preparatory step to cephalotripsy. Version practised in deformed pelvis is an extremely difficult operation, and one which by itself alone exposes the mother to great risks. To resort to it before cephalotripsy, is simply to expose the woman to two risks instead of to one, which by itself is grave enough. It is true that in Castelain's three cases the women recovered, but three cases are not sufficient to warrant the justifiability of a new method. As to the advantages which result from the ability of crushing the base of the skull, they are incontestable, but we believe that by pushing the blades in deeply enough, the before-coming head may be grasped sufficiently to enable us to crush it thoroughly. In very contracted pelvis, it is to Pajot's method of repeated cephalotripsy to which we should have recourse, remembering the point on which Pajot insists, that after each act the head should be placed in a different position, so that the instrument may grasp it differently. To add version to these repeated cephalotripsies in pelvis measuring from 2.7 to 2 inches, seems to us to act directly contrary to our aim, the succor of the mother.

## III. CRANIOCLASTY.

Devised by Simpson in 1860, the cranioclast is in reality a bone-forceps. [The name *craniotractor*, suggested by Mundé, is peculiarly appropriate, since it describes the action of the instrument exactly.—Ed.]

The instrument is composed of two blades, (Fig. 157), the one smooth



FIG. 157.—SIMPSON'S CRANIOCLAST.

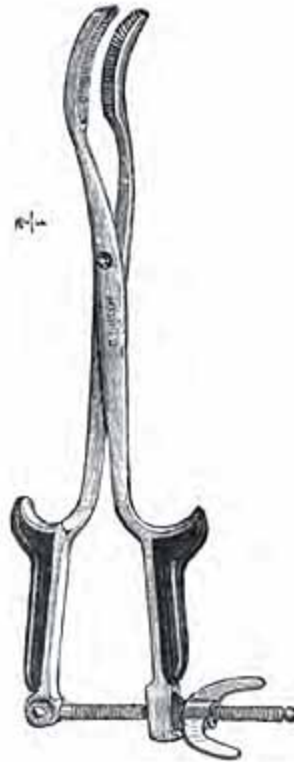


FIG. 158.—C. BRAUN'S CRANIOCLAST.

and fenestrated, the other solid and roughened, fitting into the first. When closed, the blades, slightly curved, resemble, as Guéniot says, the bill of a duck.

The use of the instrument is preceded by perforation, and then the solid blade is applied within the skull, the fenestrated externally, and through their approximation, the bones are crushed. The instrument may then be withdrawn and the expulsion of the head be left to Nature, or else it may be used as a tractor, and delivery thus completed.

The objections to Simpson's instrument are that it is too short, and therefore can scarcely be used above the superior strait, and further its lack of curve. Braün has lengthened and curved it, and has added a compression screw. (Fig. 158.) [These modifications make Braün's in-



FIG. 158.—THE BONES OF THE VAULT HAVE BEEN REMOVED, AND THE BACK OF THE SKULL IS GRASPED BY THE INSTRUMENT. THE HEAD, FACE FIRST, IS BEING DRAWN THROUGH THE CONTRACTED STRAIT.

strument not only an efficient *tractor*, but also an efficient *compressor*. Being lighter and less bulky than the cephalotribe, and accomplishing the same end, we personally prefer it, especially since it may be used in cases of deformity where the cephalotribe, on account of its bulk, cannot.—Ed.]

Wasseige thus states the advantages of the cranioclast: 1. It is a smaller instrument than the cephalotribe. 2. We may make traction with it as readily as by the body of the fetus. 3. The instrument rarely produces any lesions of the maternal parts. 4. It never slips, and if perforation has been effective, it always delivers. 5. Braün's instrument may be used.

in cases where the contraction at the superior strait is as low as 1.5 inches. 6. It may be used in case of all presentations. 7. It may be applied on hemicephalic and acephalic fetuses.

Barnes, who is a great advocate of the cranioclast, recommends, before traction, the removal of portions of the vault. Barnes, contrary to the assertions of Hull, has shown that the removal of the vault reduces the base of the skull, and that if the head be brought down even as in case of face presentation, only the diameter between the orbits and the chin



FIG. 100.—THE CRANIAL VAULT HAS BEEN REMOVED, THE REMAINDER IS BEING DRAWN THROUGH THE STRAIT. A, PROMONTORY. C, COCCYX.

presents at the strait, and this diameter is scarcely one inch. If then the conjugate is 1.5 inches, and the transverse 3 inches, cranioclasty is sufficient for delivery. Below this the Caesarean section is requisite.

Although the inventor of the cranioclast, Simpson much prefers version, and he bases this preference on the following figures: Cranioclasty 251 cases, mortality 1 in 5; version 169 cases, mortality 1 in 15. Further, he states that, *ceteris paribus*, version is resorted to earlier than craniotomy, and, therefore, will offer greater chance of success, the maternal mortality increasing always with the duration of labor.

Since 1862, the cranioclast tends in Germany to replace the cephalotribe, and Braün uses it exclusively. Rokitsansky, up to 1871, had used it 52 times in Braün's Clinic: before-coming head 47 times; after-coming head 5 times.

Braün, from 1871 to 1878, used it 82 times: Before-coming head 63 times; after-coming head 19 times. Mothers recovered 59; mothers died 23. Of the 23 deaths, 6 were in good condition before operation, and 17 in bad condition.

The causes of death were: Eclampsia 1; peritonitis 6; physometra 2; spontaneous rupture of uterus before operation 14.

Bidder, from 1873 to 1875, has used the instrument 32 times successfully.

Fritsch has used it 41 times, with 7 deaths. Braün always perforates with the trephine.

[The trephine best subserves the purpose of perforation of the before-coming head, and Naegel's scissors of the after-coming. After perforation with either, a sound or similar blunt-pointed instrument should be inserted into the skull, and the brain thoroughly broken up, especially the medulla, lest a gasping, still-living infant, be brought into the world to the horror of the attendants.—Ed.]

Wiener, of Breslau, comparing the results obtained from cranioclasty and cephalotripsy at the Clinic, from 1865 to 1876, gives the following figures:

Perforations, 101: Before-coming head, 92; after-coming head, 9. Primiparæ, 41; biparæ, 25; triparæ, 18.

Presentations, 92: vertex, 1st position, 50; 2d position, 34; face, 1st position, 3; brow, 1st position, 2; brow, 2d position, 3.

Head above superior strait, 47: occiput, 24; sinciput, 20; posterior parietal, 3.

Head at the superior strait, 13: Occiput, 5; sinciput, 4; posterior parietal, 4.

Head deeply engaged, 26: Occiput, 15; sinciput, 9; posterior parietal, 1; brow, 1.

Head in excavation, 10: Occiput, 8; brow, 1; face, 1.

Operation was performed: After the death of fœtus, 36 times; mother in critical state, 39; prolonged labor, 23; putrefaction of fœtus, 10; septic peritonitis, 1; eclampsia, 1; chorea, with affection of heart, 1.





In twenty instances many attempts at delivery with forceps had been made before perforation, the head above the brim. The results were: Died, 2; vesico-vaginal fistula, 1; vesico-uterine fistula, 1.

Version had been attempted in 4: Died, 2; recovered, 2.

Degree of pelvic deformity: 1st degree, simple flattened, 12; 2d degree, simple flattened, 14; 1st degree generally contracted, 17; 2d degree generally contracted, 39; 3d degree generally contracted, 4; funnel-shaped, 9; oblique-oval, 1; transversely contracted, 1.

Except in 9 cases where, after perforation, labor was allowed to terminate spontaneously, extraction was always resorted to. Until 1871 the blunt hook or the cephalotribe was used for extraction. Since then the cranioclast has been used.

Extraction with blunt hook, 20; extraction with cephalotribe, 17; extraction with cranioclast, 39; extraction with forceps 6.

While extraction with the cephalotribe succeeded 17 times and failed 11, the cranioclast succeeded 33 times and failed in only 7 instances. The cases in which the cranioclast was used are thus decomposed: Head above the brim, 19; head movable at the brim, 3; head fixed at the brim, 8; head in cavity, 8.

Where the cranioclast failed, labor was terminated by: Version and extraction, 3; cephalotribe, 2; forceps, 1; Cæsarean section, 1.

Where the cephalotribe failed, termination by: Blunt hook, 1; version and extraction, 2; cranioclast, 5; forceps, 2; post-mortem section, 1.

The characteristics of the puerperium were:

After cephalotripsy: Normal, 2; diphtheritic ulcers, 2; endometritis, 3; phlebitis, 1; vesico-vaginal fistula, 1; left parametritis, 1.

After cranioclasty: Normal, 15; intestinal catarrh, 1; abscess of left arm, 1; endometritis, 1; septicæmia, left pleurisy, 1; fever, 2; vesico-vaginal fistula, 4.

After blunt hook: Peritonitis, 4; endometritis, 5.

The total maternal mortality was 25.7 per cent. thus: Of 26 maternal deaths after: Cephalotripsy, 7; cranioclasty, 7; forceps, 3; blunt hook, 3; version, 3; traction on perforated head, 1; during extraction, 1; unknown, 1.

Wiener draws the following conclusions:

1. As soon as the necessity of perforation is evident, every other method of delivery, in particular the forceps, should be rejected.

2. Extraction should always follow perforation.

3. The objections to the cephalotribe are:

*a.* Risk of slipping. *b.* Augmentation of the diameter of the head in one direction, and decrease in the opposite. *c.* Frequent injuries of the maternal parts. *d.* Grave troubles more frequently follow its use than that of the cranioclast.

4. The advantages of the cranioclast are: *a.* It never slips if the internal blade be carried high towards the base of the skull, and the external blade grasps the head over the ear and maxilla. *b.* It may be used in a smaller space and the operator may place it where he pleases. *c.* It injures the mother less frequently than the cephalotribe. *d.* It diminishes the base of the skull.

Credé, without detracting from the value of the cranioclast, prefers the cephalotribe, because he has been enabled by it to end labor where the cranioclast had been tried in vain. In Italy, Fabri and Cuzzi, from a series of experiments with Braün's cranioclast, limit the utility of the instrument to instances where the sacro-pubic-diameter is not below 2.3 inches, and Cuzzi adds that if Rokitansky was able to succeed in greater degrees of contraction, it was because the fetuses had been dead for some time, and the bones and the sutures were, therefore, very movable.

Narich proposes the following procedure: Extend the head by introducing the fenestrated blade between the pelvic walls and the foetal face, and using it as a lever. Then perforate about  $\frac{1}{4}$  inch above the root of the nose. Make tractions downwards, accompanied by rotation, which will bring the bi-malar diameter towards one or another side of the sacral excavation. We may thus use the cranioclast in cases where the conjugate is diminished even down to  $1\frac{1}{4}$  inches.

If the objections to the cephalotribe are true when applied to the classic instrument, they are not at all applicable to Bailly's instrument, except, unfortunately, that it cannot be used in pelvis diminished below 2.5 inches. We have used it fully fifteen times, and it has never slipped, has always extracted the head, has always crushed the base of the skull when the blades were inserted deeply enough. We have lost but two women, and in these repeated attempts at delivery had been made before they were seen by us. It should be remembered that Narich's experiments were made on a bronze pelvis, and surely the conditions in the living woman are very different. Whatever the results obtained in

Germany, the cranioclast, we think, should remain an instrument of exceptional utility. Above 2.5 inches we would recommend Bailly's cephalotribe, and below 2.5 inches the cranioclast.

[We have not often, we are very thankful to say, been obliged to mutilate the living fetus, and, therefore, we cannot dogmatize in regard to the superiority of the cranioclast over the cephalotribe, and *vice versa*, although we prefer the former instrument. Our general practice is, where the case is seen in time (before or just after rupture of the membranes, and before engagement), to perform bi-polar version and endeavor to extract where the conjugate is not diminished below  $2\frac{1}{2}$  to 3 inches at the brim. Thus we may possibly obtain a living child, and if we cannot extract we can still perforate. Below  $2\frac{1}{2}$  inches the cranioclast is just as effective an instrument as the cephalotribe, and being less bulky is far less likely to injure the maternal parts. Why then ever use the cephalotribe? Thorough perforation and evacuation of the cerebral matter, followed by careful insertion of Braün's cranioclast and crushing by means of it, will certainly accomplish all that the cephalotribe can, and not do what the cephalotribe may, damage the mother.

Such we believe to be sound practice, for the present. We repeat, however, that we look forward to the approach of the day when custom will sanction resort to an operation in case of the living infant which will give it a chance and yet not increase the maternal risk.—Ed.]

#### IV. SAWING OF THE HEAD, OR CEPHALOTOMY.

In 1842, struck by the risk of damage resulting from the projection of spiculae of bone after perforation and cephalotripsy, Van Huevel devised a saw-forceps which permits of sawing into the head without splintering it. His instrument (Fig. 161) has been repeatedly used by himself, and Hyernaux, who advocates the instrument strongly, says: "It is now twenty-four years since Van Huevel devised his instrument, and we can vouch for its frequent success in cases where there was contraction even down to 1.5 inches, its limit of application."

Didot (*Lége*) has modified Van Huevel's saw-forceps, and has devised what he calls a *diatrypteur*, an instrument resembling a glove stretcher. It has never been used on the living.

Tarnier has caused the construction of two models of a saw-forceps,

with parallel blades. The one (Fig. 162) has a single chain saw and is similar to Van Huevel's instruments; the other (Fig. 163) has two chains which move at the same time and cross one another, so that after the

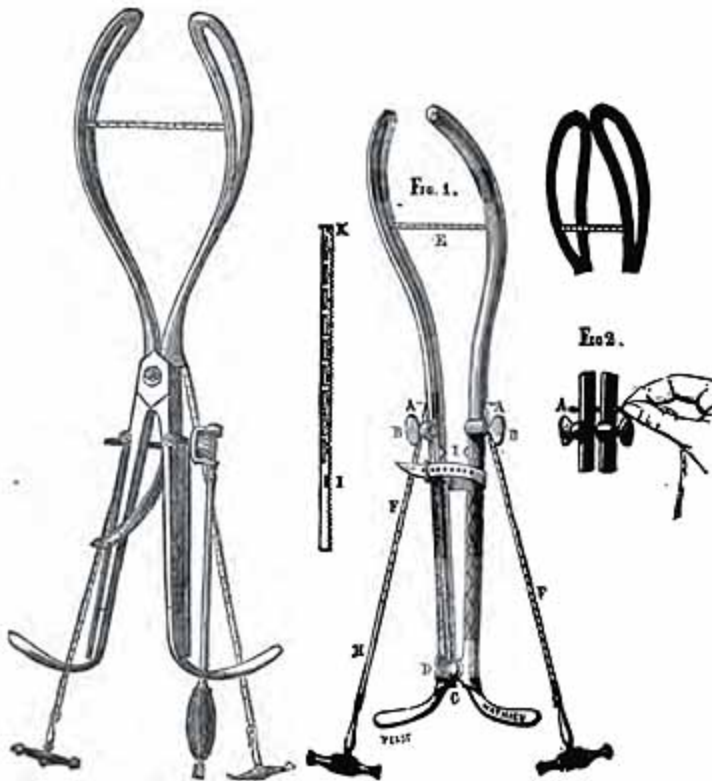


FIG. 161.

FIG. 161.—VAN HUEVEL'S SAW-FORCIPS. OF TARNIER. 1. A, Holes through which the chain passes. B, Key. C, Opening for passage of conductor. D, Lock. E, Chain saw. FF, Handle of saw. IK, Flexible conductor.

FIG. 162.

FIG. 162.—SAW-FORCIPS WITH SINGLE CHAIN OF TARNIER. 1, A, Holes through which the chain passes. B, Key. C, Opening for passage of conductor. D, Lock. E, Chain saw. FF, Handle of saw. IK, Flexible conductor. 2, Insertion of chain saw through openings.

sawing the section of bone is loose and may be at once extracted. The removed portion has the shape of a cone, with a base a trifle over  $\frac{1}{4}$  inch in thickness. In his experiments, Tarnier was able to extract, from a

wooden box through an opening  $2\frac{1}{2}$  inches long by  $\frac{1}{4}$  inch broad, the cadaver of a foetus after three successive applications of his saw-forceps, a result not practicable with any other instrument.

The saw-forceps is open to a number of objections: it is difficult to

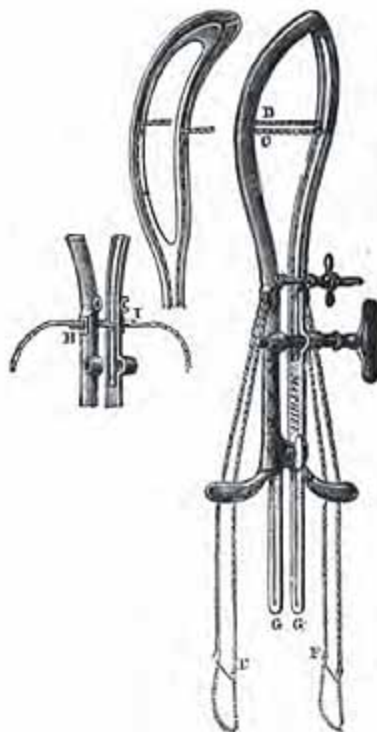


FIG. 168.—DOUBLE CHAIN SAW-FORCEPS OF TARNIER. *A*, Key. *B*, Screw bringing together the blades. *CD*, Chain saw. *EF*, Ends of chain. *GG*, Ends of conducting rods. *HI*, Chain saw passing through opening.

handle; where the pelvis is much contracted, a long time is requisite for completion of the operation; it is not an instrument for extraction; it is very expensive.

In case of extreme contraction, Barnes uses a *serre-nœud* and a metallic cord, and has operated by means of these in a rachitic pelvis measuring

not quite an inch in the sacro-pubic diameter. He thus describes his method: "Even as in cephalotripsy, it is useful first to perforate. It further facilitates the operation to twist off a portion of the parietal bones by the cranioclast. The wire loop thus buries itself more deeply, and it cuts its way through more readily. If the sphericity of the head

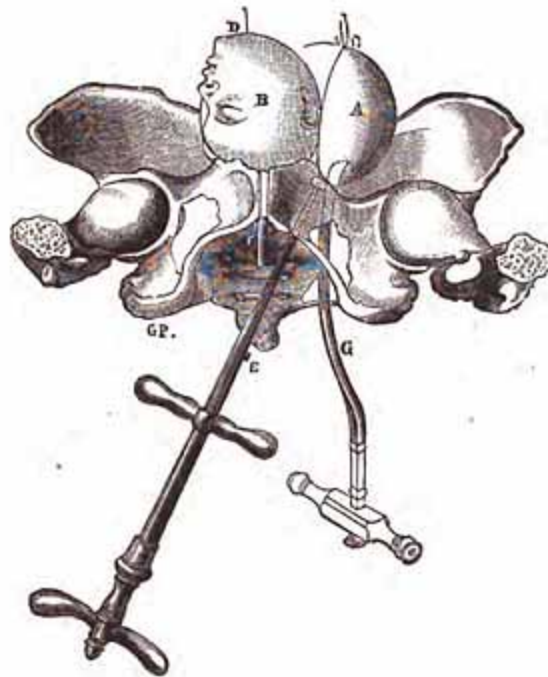


FIG. 164.—BARNES' OPERATION OF LAMINATION BY THE ÉCRASSEUR.

is not first destroyed, the wire loop is apt to glide off the head, seizing only the scalp when the screw is worked. The crotchet is next passed into the hole made by the perforator and held by an assistant, so as to steady the head. (Fig. 164.) A loop of strong steel wire is then formed large enough to encircle the head. The loop is guided over the crotchet to the side of the uterus where the face lies. The compression being

removed, the loop springs open to form its original ring. This is guided over the anterior part of the head (See Fig. B). The screw is then tightened and the wire is buried in the scalp. The whole force of the manoeuvres is expended on the foetus; there is no outward pressure on the



FIG. 106.—HUBERT'S PERFORATOR (TRENELLUM.)



FIG. 105.—PROTECTING BLADE.



FIG. 107.—HUBERT'S TRANSFORMATOR (Complete.)

maternal parts, as is inevitable with the cephalotribe or Van Huevel's saw-forceps. A steady working of the screw cuts through the head in a few minutes. The loose segment is then removed by the cranioclast. In minor degrees of contraction the removal of one segment is enough to

enable the rest of the head to be extracted by the cranioclast. But in cases of extreme distortion it is desirable to still further reduce the head by taking off another section. This is best done by re-applying the loop over the occipital end of the head (See Fig. A). It thus accomplishes what the cephalotribe does not, it breaks up the base of the skull. The small part of the skull still remaining offers no obstacle. It serves as a hold for traction. The cranioclast seizes it firmly and the delivery of the trunk is proceeded with. If the child be well developed, this task will require considerable skill and patience."

This method appears to us a very difficult one in practice, as much so as the saw-forceps, although theoretically it seems simpler.

We recall, finally, as matters of curiosity, Ritgen's *labiotome*, Finizzio's *sego-cefalotomo*, Joulin's *diviseur-cephalique*. The latter was used once on the living; the conductor perforated the uterus, and the woman died in a few hours.

It remains for us to describe the *transformation* of Hubert, and the intracranial cephalotripsy of Guyon, which methods are included by Guéniot under the term *sape-sphenoidienne*.

Hubert's transformator (Fig. 167) is composed of a *terebellum*, a steel rod at the end of which is a pear-shaped, sharply pointed screw, and a protecting blade about 1 inch thick, the extremity of which is perforated for the passage of the terebellum.

By means of this instrument numerous holes may be drilled into the skull, and then either expulsion be left to Nature, or else delivery by traction may be resorted to. With the transformator E. Hubert states the maternal mortality to be only 11.62 per cent., against 22 per cent. with the saw-forceps, and 18 per cent. the lowest obtained by cephalotripsy. Hubert gives the following comparative tables, which show at a glance the results obtained by these three methods.

*Craniotomy in General.*

	Cephalotribe. 235 cases.	Saw-Forceps. 130 cases.	Transformator. 43 cases.
Deaths .....	34.46%	22.30%	11.62%
Puerperal accidents .....	20.42%	26.15%	16.62%
Normal puerperium .....	45.12%	51.53%	76.42%



*Craniotomy in Cases where the Pelvic Measurements are Noted.*

	Cephalotribe, 187 cases.	Saw-Forceps, 91 cases.	Transforator, 43 cases.
Deaths.....	38.58%	23.07%	11.62%
Puerperal accidents.....	18.89%	29.78%	11.62%
Normal puerperium.....	24.53%	47.25%	76.42%

*Craniotomy in Contractions from 2.5 to 3.1 Inches.*

	Cephalotribe, 46 cases.	Saw-Forceps, 50 cases.	Transforator, 29 cases.
Deaths.....	26.08%	22%	10.34%
Puerperal accidents.....	21.73%	30%	10.34%
Normal puerperium.....	5.17%	48%	79.31%

*Craniotomy in Extreme Contractions, at least 1.8 Inches.*

	Cephalotribe 24 cases.	Saw-Forceps, 53 cases.	Transforator, 14 cases.
Deaths.....	54.16%	18.18%	14.28%
Puerperal accidents.....	8.33%	33.33%	14.18%
Normal puerperium.....	37.51%	48.48%	71.42%

This method, with the transforator, deserves the serious thought of accoucheurs in view of the most excellent results it yielded in the hands of the late Professor Hubert, of Louvain.

Intra-cranial cephalotripsy of Guyon is thus described by Kalindero: "The apparatus consists of two long trepans, and of one small forceps. The instrument is used as follows: The index of the left hand seeks the point of the skull where it is desired to perforate, and the trephine rod (Fig. 168) is guided to this point, and screwed down and into the bone. The large trephine is then adjusted to the rod, and by working it, a round piece of bone is removed. Through the resulting hole the smaller trephine is inserted, carried to the sphenoid bone, the basilar apophysis, and destroys it. The aim of the trephines then is to break up the base of the skull, and this once accomplished, the small forceps is applied in the ordinary manner, and compression of the handles by the hand suffices

to crush the head. Before making traction the instrument is rotated to bring the greatest diameter of the head into that of the pelvis, and then extraction is easy.

The instrument has been used six times, in three successfully; in the remaining three, two were already *in extremis*, and the third died at the Necker hospital of sepsis, during the prevalence of an epidemic. The procedure is certainly as harmless as it is ingenious, and the intra-cranial



FIG. 166.—SCREW ROD.



FIG. 169.—FORCEPS.



FIG. 170.—TREPHINE.

touch allows us to readily trephine the sphenoid bone, but as Guéniot justly remarks "the difficulty is increased in case of obliquity of the head." The capital point of the method is that intra-cranial touch allows us to guide the trephine to the portion of the skull, which we desire to attack.

#### V. EMBRYOTOMY.

Embryotomy, properly so-called, is an operation which consists in cutting off the neck or the body of the fetus, when delivery is not possible,  
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either by the forceps, version, or cephalotribe. It is, hence, an operation which is only exceptionally called for. The indications may be summed up under the following heads:

1. In presentation of the shoulder, where version is not practicable, owing to contraction of the uterus, or deep engagement and immobilization of the presenting part.

2. In pelvic contraction where the fetus cannot be extracted without risk to the mother.

3. In case of monstrosities, where there is excess in size of the fetus.

Of these indications it is unquestionably the first which is the most frequent.

The study of embryotomy has been pursued most completely by Pinard, in 1875, and by Thomas, in 1879. Pinard resumes the contra-indications of version as follows:

A. *Non-dilatation of the Cervix.*—The contra-indication is temporary, or else, in certain instances of cancer and fibrous tumors, it is absolute.

B. *Deep Engagement of the Fetus.*—The contra-indication is absolute.

C. *Tetanic Retraction of the Uterus.*—The contra-indication is similarly absolute.

D. *Extreme pelvic Contraction.*—Version contra-indicated in all pelves measuring less than 2.73 inches, if the infant is living; version is allowable whenever the hand can be introduced, if the infant is dead; below 2 inches version is not possible. The same rule applies in case of any osseous tumor obstructing the parturient canal.

We cannot accept in its entirety this classification, and although we share Pinard's opinion in regard to the three first indications for embryotomy, where version is impossible, we are absolutely at variance with him in case the infant is dead. In presence of the difficulty of version in contracted pelves, in presence of the death of the fetus, it is not to version we would resort, but to embryotomy, in particular to decapitation. When carefully performed, decapitation is without risk to the mother: in 7 cases where we have resorted to it, in slight degrees of pelvic deformity, it is true, we have had 7 recoveries. Evisceration, evisceration, on the contrary, is much more grave, and in the three cases where we have performed it, we have had but a single recovery. To attempt version, however, where the infant is dead, and where there is marked pelvic contraction, seems to us just as grave a procedure as evisceration.

The operations which may be performed on the fetus in presentation of the shoulder are :

1. Decapitation, detruncation.
2. Section through the entire body.
3. Evisceration.
4. Section of the vertebral column, or spondylotomy.
5. Section of the upper extremities, or brachiotomy.

Detruncation is certainly the simplest of all these operations, but unfortunately it is not always possible to reach the neck.

Although embryotomy has been practised from the earliest times, since it may be found mentioned by Hippocrates, it is only since the beginning of the present century that precise rules for its performance have been formulated, so that we are in a position to state definitively the aim of each one of the possible procedures. Pinard ranges these aims in the following categories:

1. Evisceration or exenteration, preceded or not by brachiotomy, aiming at forced version.
2. Evisceration or exenteration, without brachiotomy, but occasionally with spondylotomy, aiming at forced evolution.
3. Spondylotomy at the neck or the centre of the body, aiming at the successive extraction of the fetus in portions.

1. *Method which aims at forced Version.* A. *Robert Lee's Procedure.*—This consists in performing brachiotomy, then perforating the thorax, and by means of a hook inserted into the pelvis or the lower part of the vertebral column, to make traction on the fetus, and deliver without damage to the maternal parts.

Rejected by Chailly and Cazeaux, brachiotomy has been practised by Dubois as a means to assist in decapitation. Stoltz, Pajot, Depaul, Blot, admit that it is useful, and in certain instances indispensable. By brachiotomy we mean, of course, disarticulation of the shoulder.

B. *Giuseppe Portas's Procedure.*—It consists of two stages: The first is to pass a flet over the arm, and make traction so as to engage the shoulder and the axilla deeply, when perforation is performed by means of a bistoury into the thorax, and thence the abdominal and thoracic viscera are removed; the second is to seek the feet and deliver by podalic version.

2. *Method which aims at forced Evolution.*—There are five procedures.

A. *Veit's Procedure*.—The fœtus is eviscerated, without brachiotomy, traction is made on the arm and the breech simultaneously, and the infant extracted doubled on itself.

B. *Michaelis's Procedure*.—Evisceration, followed by spondylotomy and forced evolution of the fœtus.

C. *Macdonald's Procedure*.—Spondylotomy without evisceration, extraction of the fœtus by the feet—in other words, delivery by forced version.

D. *Boens's Procedure*.—Removal of procident portions, that is to say, brachiotomy, thoracic and abdominal evisceration, crushing of the thorax by the fingers. Finally, section of the fœtus in two, followed by separate extraction.

E. *Championnière's Procedure*.—Evisceration; spondylotomy by a screw rod; at times brachiotomy; removal of the fœtus in two portions. Results; 3 operations with two deaths.

3. *Method which aims at successive Extraction of Portions of the Fœtus*.—Section of the fœtus may be practised on the neck or on the trunk. In the first instance we are dealing with decapitation, method of Celsus.

The instruments with which decollation may be performed are ranged as follows by Thomas: *a.* Knife embryotomes. *b.* Scissor embryotomes. *c.* Saw embryotomes. *d.* Embryotomes which act by pressure and laceration.

*a. Knife Embryotomes*.—In this category belong the bistouries of Steinen and of Busch, the knives of Albucasis, Paré, Rizzoli, Mauriceau, Ram-



FIG. 171.—DUBOIS' SCISSORS FOR DECOLLATION

botham, Jacquemier, the crochet of Simpson, the decapitator of Scanzoni, etc. In general, these instruments are defective, and by no means as valuable as the scissors.

*b. Scissor Embryotomes*.—The best instrument is that of Dubois. It consists of long handles, very strong, short blades slightly curved on the flat, with blunt ends. (Fig. 171.) In using them, having carefully de-

terminated the presentation, Dubois inserts the left hand into the vagina, and guides along the fingers a blunt hook which he endeavors to pass around the foetal neck. When successful, he withdraws the hand, and grasping the handle of the hook he makes strong traction to bring down the foetal neck. He then hands the hook to an assistant, inserts his hand again into the vagina, and places the end of his finger at the point where he intends to cut the neck. He passes the scissors along this finger up to the foetus, and cuts the integuments little by little, separating the blades only slightly, in order not to damage the maternal parts. During this procedure the finger which surrounds the neck must never leave it, but must take account of the progress of the section.

Mattei uses strong scissors which he calls *endotomes*; Lazarewitch uses an instrument which is at once a sector and a tractor. Tarnier contends that the scissors attack with difficulty the soft parts, and all the more the bone. Never, however, have we seen the operation last longer than ten minutes when performed by Depaul, and never, except in one case, has it required longer in our personal experience. The difficulty is not in the cutting, but in the passage of the hook around the neck. Where the neck is accessible, we believe the method to be the best. Where the neck is not accessible, we must eviscerate.

c. *Saw Embryotomes*.—Here belong Jacquemier's embryotome (Fig. 172,) Van der Ecken's crochet (Fig. 174), the crochets of Kilian, Mathieu, Heyerdahl, Kierulf, Hohl, Wasseige (Fig. 173), Stanesco (Fig. 175), Tarnier (Fig. 176), etc. All these crochets are intended to carry behind the neck or behind the trunk of the foetus, a saw or *écraseur*, in order thus to break up the infant.

Of all these instruments the simplest is that of Pajot. With a stout piece of silk or twine the foetus may be sectioned in a minute, the twine being worked backward and forward, and without risk to the mother. The twine may usually be passed around the foetus by means of a blunt hook, and I have had a hole drilled in the blunt crochet of the forceps which receives the twine, and to the twine may be attached a small leaden weight, which assists the accoucheur in reaching the end which has been passed around. Tarnier has suggested Belloc's sound for the passage of the twine. [A gum-elastic catheter, the uterine sound, instruments which are apt to be in every accoucheur's bag, are as serviceable as anything else.—Ed.] When the twine has been passed, the hook is with-

drawn, the ends of the twine brought out through a cylindrical speculum, which is inserted to protect the vagina, and then by to-and-fro movements the operator may readily saw the neck, or the trunk. This method was



FIG. 17K.—JACQUEMIER'S EMBRYOTOME.

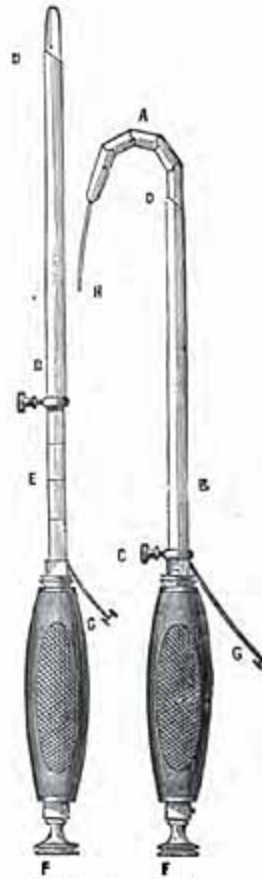


FIG. 17L.—WARRIOR'S CROCHET.

first advocated by Boyer, and has been successfully used by Pajot, Tarnier, Rey, and others.

The crochets of Kidd, of Tarnier, of Hubert, of Wasseige, of Stanesco, are certain ones articulated, and others not.

d. *Embryotomes which act by pressure or laceration.*—The simplest of all is Braun's blunt hook. It is composed of a steel bar bent at an acute angle in the shape of a crook. (Fig. 177.) The foetal arm is pulled down



FIG. 174.—VAN DER ECKEN'S CROCHET FOR DECAPITATION.

FIG. 175.—STANESCO'S CROCHET.

FIG. 176.—TARNIER'S CROCHET.

as much as possible in order to make the neck accessible. The left hand is introduced into the vagina and one or two fingers are passed around the neck. The hook is then passed flat along the hand and behind the foetal neck, guided by the fingers. The handle of the instrument is then lifted up, and vigorous traction made horizontally until the ligaments of the vertebral column are heard to rupture. The hook is then turned



around several times, traction being simultaneously made. The vertebral column and the tissues are thus torn. The fingers should not be withdrawn during this manœuvre, since they are there to protect the maternal parts against injury. The foetal trunk is readily extracted by pulling on the arm, and the head may be removed either by the hand, the forceps or the cephalotribe. (Fig. 178.)



FIG. 177.—BRAÜN'S BLOODY HOOK.

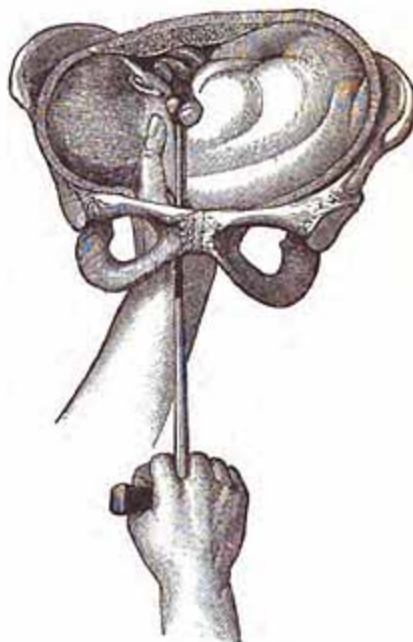


FIG. 178.—DECAPITATION AFTER BRAÜN.

Pierre Thomas has devised an apparatus which consists in: 1. Braün's hook. 2. A chain-saw. 3. A vaginal protector.

Braün's hook is perforated for the passage of the chain-saw, and is used for passing the chain around the foetal neck. This accomplished, the hook is withdrawn, and the two ends of the chain passed through the tubes of the vaginal protector (Fig. 179, B), and the neck is sectioned by working the chain. Thomas says of his method: "We believe that it has the following advantages over Braün's: 1. The maternal parts cannot

be injured either by the hook or the chain. 2. The operation is less painful, and is more certain and rapid." We have already stated that Barnes carries an *écraseur* wire by means of Ramsbotham's hook, in order to perform brachiotomy.

The two most recent embryotomes are that of Tarnier and that of Thomas, which is simply a modification of Tarnier's.

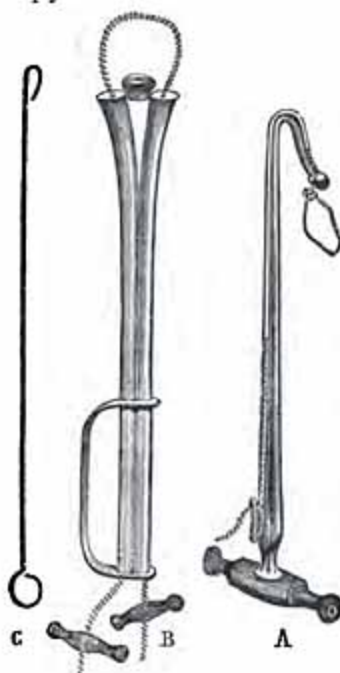


FIG. 179.—PIERRE THOMAS' INSTRUMENTS FOR DECAPITATION.

Tarnier's embryotome is composed of two blades, two conducting rods, a chain-saw. One blade is called the posterior and the other the anterior. These blades are grooved. The posterior blade is curved to fit into the concavity of the sacrum. The anterior blade is slightly curved for insertion between the fœtus and the pubes. The blades are applied around the fœtus, and are locked and screwed down until the handles are close together. The chain is then pushed through the groove in the blades by

means of the conducting rods, and worked along as well by the screw key. The fœtus is divided from below upwards. The entire thickness of the body may be cut through in five seconds, according to Tarnier.

Thomas's latest embryotome consists of two blades, two stylets, a special saw. (Fig. 181.) The instrument is used as follows: The posterior blade is inserted behind the neck or the trunk of the fœtus, and the an-

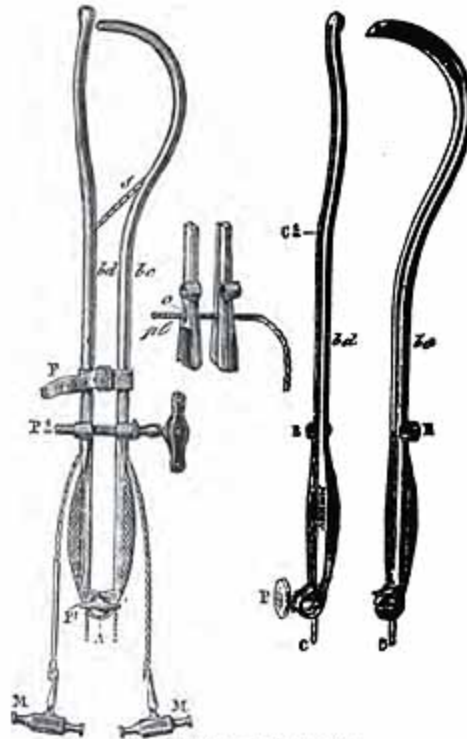


FIG. 180.—TARNIER'S EMBRYOTOME.

terior blade in front. The blades are locked and brought in apposition. The chain-saw is then carried by the stylets through the blades. The instrument is steadied by an assistant, and by rapid to-and-fro movements of the chain the fœtus is sectioned from below downward. The maternal parts run no risk of being damaged by the saw, being protected by the blades of the instrument.

We see then that it is not instruments which are lacking. The real difficulty in embryotomy is the contraction of the uterus. Where then the blunt hook cannot pass, the same will hold true of other instruments. The simplest method is that of Braün, but it requires an amount of force which may be dangerous to the mother. The same does not hold true of Dubois's scissors. We should then prefer them, resorting to Pajot's

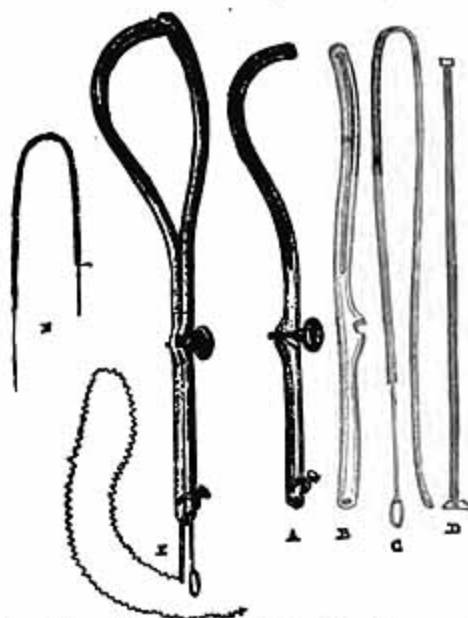


FIG. 181.—PIERRE THOMAS' EMBRYOTOME.—A, Posterior blade. The exaggerated curve of the uterine portion is shown, also the groove for the passage of the chain saw. B, The anterior blade is slightly curved at its uterine part. C, D, Stylets. E, Instrument articulated. The conducting stylot is inserted. F, Chain saw.

device if they failed. In every case where we have been called upon to detruncate or eviscerate, Dubois's scissors have answered us well. We have had six successes in seven cases.

After decapitation the body of the fetus readily follows on traction on the arm. The head may give us trouble. In case it resists our gentle efforts with the hand, forceps or cephalotribe, we may try a blunt hook inserted into the mouth.

Embryotomy is always a grave operation. The mortality rate is, therefore, high, even where practised with the greatest possible care and expertness.

Such are the operations which may be practised on the foetus. May they be compared one with another, from the standpoint of the results

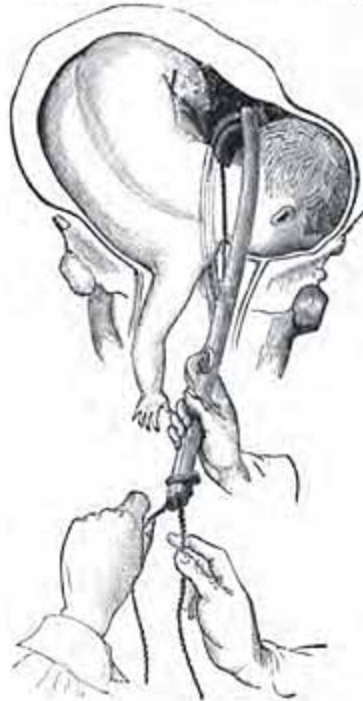


FIG. 182.—EMBRYOTOME AROUND THE NECK OF THE FŒTUS, HELD BY AN ASSISTANT.

which they give for the mother and the infant? We do not think so; the conditions vary too markedly according to the case, the mode of intervention and the necessity. The statistics which we have given, it should be remembered, have been copied and recopied, and they vary much according to each author. There is further the element of expertness, which we must take into account, and which explains fully the success of some where others have failed.