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# THE PRINCIPLES AND PRACTICE OF OBSTETRICS

By

**JOSEPH B. DE LEE, A.M., M.D.**

Formerly Professor of Obstetrics and Gynecology, Emeritus, University of Chicago; Consultant in Obstetrics, Chicago Lying-in Hospital and Dispensary; Consultant in Obstetrics, Chicago Maternity Center

and

**J. P. GREENHILL, B.S., M.D.**

Attending Obstetrician and Gynecologist, Michael Reese Hospital; Obstetrician and Gynecologist, Associate Staff, Chicago Lying-in Hospital; Attending Gynecologist, Cook County Hospital; Professor of Gynecology, Cook County Graduate School of Medicine

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## FORCEPS

**Definition.**—The forceps of obstetrics is an instrument designed to extract the fetus by the head from the maternal passages without injury to it or to the mother. As soon as the right of either is encroached upon, the instrument ceases to be the forceps of obstetrics, and becomes simply an instrument of extraction, similar to the craniotomy forceps, and not so good.

**History.**—Hippocrates advised pulling on the head with the hands, but probably used the maneuver only for small heads; the Arabians used a 3- or 4-bladed hooked tractor for dead fetuses; circa 1000 Avicenna wrote of the delivery of a live child by forceps; in 1554 Rueff described a jointed forceps similar to that used in lithotomy; the Japanese for centuries used whalebone loops and silk nets brought over the head by means of strips of whalebone; Smellie tried to draw fillets over the occiput and chin. It is remarkable that the idea of the obstetric forceps was so long in coming. This was probably because men were not allowed at the confinement bed except in the most difficult cases. And here, for lack of experience in normal cases, they knew little except to mutilate the child and extract it, and often also the viscera of the mother, with sharp hooks. Unless the child presented by the breech or shoulder, so that the obstetrician could grasp a leg on which to pull, he was powerless, except as stated. Small wonder the women took alarm when a "man midwife" had to be called, because they had observed, says Smellie, that "either the mother or the child or both were lost."

In 1720 Palfyn laid before the Academy of Medicine in Paris his forceps for the extraction of the child without mutilation. This rough, clumsy instrument was modified by others. Dusée crossed the blades and lengthened them, and Levret, 1746, added the pelvic curve, also the French lock. The forceps depicted on Palfyn's memorial plaque in the cathedral in Ghent shows a pelvic curve.

About 1580 a serviceable forceps was invented by Peter Chamberlen. In 1670, Hugh, one of the large family, went to Paris and tried to sell the instrument for \$7500. Mauriceau, to test the value of Chamberlen's pretenses, suggested that the latter attempt the delivery of a woman with extreme contraction of the pelvis, upon whom he had decided to perform cesarean section. Chamberlen declared that nothing could be easier, and at once, in a private room, set about the task. After three hours of vain effort he was obliged to acknowledge his defeat. The woman died from injury to the uterus, the negotiations for the sale were dropped, and Chamberlen returned to England with his secret unrevealed. Later, after wrecking a bank, he fled to Holland, where he sold the secret to a Roonhuysen, who sold it in turn to any doctor having the necessary large amount of money, but sold only half the forceps—the vectis—adding fraud to infamy.

In 1753 Vischer and van de Poll purchased the secret and made it public, but by this time, through Palfyn, Drinkwater, and others, the forceps had become common property. The original forceps of the Chamberlens were found in 1815 in a hidden attic of a house in Essex, England, occupied by several generations of the family (Ingraham). Numberless alterations and modifications have been made on the forceps. For history of forceps see Das.

**Description.**—The forceps consists of two blades, which are named right and left according to the side of the mother's pelvis in which they lie when applied. Each blade has a handle and a hooklike projection. Some of the latest forceps are unfenestrated (the McLane-Tucker, the Luikart). The blades are curved on the flat to fit the head—the "cephalic curve"—and on the edge to fit the concavity of the sacrum—the "pelvic curve." The two blades are fitted together by a lock, which in the English forceps consists of opposing shoulders with a flange; in the French forceps, a screw or pin; and in the German instrument, a sort of combination of both principles. Smellie and the English used a very short forceps, because the operation was practiced only after the head was well down in the pelvis. The French used long forceps, since they often extracted the head before engagement occurred. The German forceps are rather long, and resemble the French in having a small cephalic curve and a marked pelvic curve.

Over 600 kinds of forceps have been invented and reinvented (Das). We recommend for general use the Simpson or Vienna School forceps. DeLee lengthened the shanks so as to keep the handle away from the anus, made the hooks larger and flatter so as not to hurt the hand and modified the handles a little to secure lightness and ease of cleansing (Fig. 732).

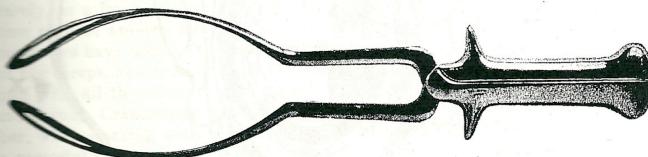


FIG. 732.—SIMPSON'S FORCEPS.  
Made longer and handle modified by DeLee.

**The Function of the Forceps.**—Levret, in 1746, said that the forceps should be a tractor and nothing else, to supply from below the force that was lacking from above. Smellie, in 1752, used his short, straight forceps as a rotator, Scanzoni, in 1865, developed an operation in which instrumental rotation was the main feature. Tarnier, in 1881, demonstrated the principle on which the forceps may be used to correct the position of the head in the pelvis. He pointed out that, owing to the pelvic curve of the instrument, if one twists the handles, the blades, with the head in their grasp, do not turn on the axis of the shanks, but tend to describe part of a circle within the pelvis (Fig. 761). In order, therefore, to make the head rotate around an axis it is necessary to sweep the handles of the forceps through a large circle outside the pelvis (Fig. 762). The apex of the forceps blades then will act as a center and the head will turn around on it. Bill has improved on Tarnier's maneuver by first raising the head out of the pelvic floor gutter, and then sweeping the handles around to impart the movement of rotation to the head within the pelvis. Kielland, in 1915, devised a forceps without a pelvic curve, and with the blades bent a little downward (Fig. 776). With this instrument a head may be grasped biparientally, no matter in which diameter it lies in the pelvis and it may, according to Kielland, be twisted safely to any position desired. Mann has invented a forceps with a universal joint near

the head, and Jacobs one with adjustable blades so that it may be used as a straight instrument for rotation and then like the classic forceps with a pelvic curve for extraction.

Farabeuf constructed special instruments for grasping the head above the inlet. These are now obsolete but Barton has reinvented Farabeuf's "prehens-

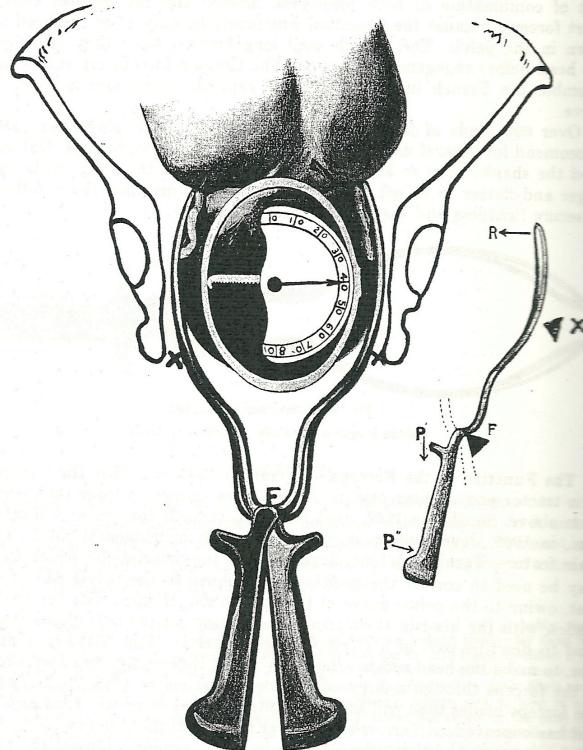


FIG. 733.—EXPERIMENT TO SHOW COMPRESSION EFFECT OF TRACTION.

(1) Traction applied at F works on the fulcrum or resistance at X-X. The tractive force is resolved into pressure on the head commensurate with the power of the traction, and this alone. (2) Traction applied at P' works on the fulcrum F and causes pressure at R which is added to that at X-X. (3) Pressure applied at P'' (squeezing the forceps handles) works on the fulcrum F and multiplies the compression of the head and both 2 and 3 are superadded to the pressure at X-X. Moral: make traction only at F.

ur," and added an axis-traction device (Fig. 773). Forceps should never be used to dilate the cervix.

Compression of the head is inevitable, but we seek to reduce it to the minimum. Experiments have proved what a little reflection would have shown, that the volume of the fetal head can be reduced but a few cubic millimeters by means of outside force, and even this is attended by great danger to the child. If one

applies forceps to the head of a stillborn child in mannikin practice, it will be observed that closing the blades causes the head to bulge out in the diameter at right angles to the direction of compression, but only slightly. What is more noticeable is the lengthening of the head in its long diameter. Much depends on the softness of the head and the shape of the canal through which it is to pass. Reference to Fig. 733 will show how the head suffers compression in two ways. By squeezing the handles of the forceps together at P'', the action is that of a lever of the first class, the lock being the fulcrum, F, the resistance being the head, R. Traction downward at P', with the fulcrum at X (the maternal parts), also produces a lever of the first class, resulting in additional compression of the head. The compression at P'' we can regulate ourselves, but the amount exerted at P' depends entirely on the amount of pull exerted to deliver the head and increases with the resistances met. The power is applied at P', or, as is advised in practice, at F, but the fulcrum is at X, and the power is applied to the long arm of the lever, obviously the most dangerous circumstance for the fetal head. By eliminating resistance (*e. g.*, episiotomy) we reduce compression to a minimum. Compression of the head has noxious influences on the brain. If suddenly applied, the child suffers from concussion. If slower in action, the circulation is hindered, the pneumogastric nerve is stimulated, the pulse is slowed, asphyxia results and smaller or larger hemorrhages occur in addition to direct injury to structures or fracture of bones. Children vary much in their ability to stand compression. Some seem to have charmed lives.

While traction is the dominant function of forceps, strength is giving way to art, and a skilful operator can use the forceps also as a rotator and, though rarely, as a lever, without serious damage to mother or child. How much traction may be applied safely is hard to say. Attempts to measure it with dynamometers have failed. It is rarely necessary to pull with more than the strength of the biceps, as shown in Figs. 741-749. To brace the feet against the table and pull with all the strength of the back and shoulders is brutal, unscientific, and murderous. Craniotomy is more humane. The physician should always remember, when working with the forceps, that he has a child's brain in the grasp of a powerful vise, and that only the greatest care and gentleness will save its wonderfully delicate structure from injury.

**Indications for Forceps.**—These are the same as for extraction in general, comprising those conditions which threaten the life of the mother or child. The physician should not allow the woman to remain many hours in the second stage, waiting for signs of actual danger to the mother or child, when it is apparent that she will not be able to deliver herself. When the signs of danger to the mother or the child are present, often real damage has been done. Certainly the physician should anticipate the dangers. In America 75 per cent of forceps operations are done because of *insufficiency of the powers of labor* when the head has come onto the perineum, or even is visible during a pain. Either the head is a little too large, or the perineum a little too resistant, or the woman's nervous system cannot tolerate the labor. In either case labor has come to a standstill, the pains weaken, the woman bears down less and less strongly, and, if not relieved, may become highly nervous, even delirious, which is not without after-effects on her constitution. The child suffers, too, the heart tones are slowed, then grow faster and irregular, and a caput succedaneum forms and soon attains large dimensions and hardness.

It is not easy to select just the right time to interfere in these cases. Needless to say, the conditions must all be fulfilled. In general, it is wise to operate long before exhaustion is marked and before the child presents evidences of asphyxia. It is impossible to assign an arbitrary limit. As a general rule one should not wait more than one and one-half hours after the head has reached the

perineum and progress has ceased. If the perineum seems to be too resistant, a deep episiotomy may allow the head to go through, a procedure which is much preferable to forceps. If episiotomy does not permit exit to the head, nothing has been lost, because the perineum would probably have been incised for the succeeding delivery anyway. (Compress bleeding areas; save blood!)

*Arrest of the rotation of the head* is another frequent indication for forceps. Occipitoposterior positions are most often here concerned, the occiput not turning completely to the front, but stopping usually in the transverse diameter of the pelvis—the so-called *deep transverse arrest*. It is not uncommon to find the child in the "military attitude," that is, one of slight deflexion, with the head set squarely on the shoulders. The sagittal suture runs across the pelvis, the two fontanelles being about on one level.

Third in frequency may be grouped a large number of *complications* which affect the mother, but secondarily, the child also, a few of which may be mentioned: eclampsia; infection during labor; acute diseases, as pneumonia; chronic diseases, as tuberculosis and heart disease; placenta praevia, abruptio placentae and prolapse of the cord.

*Face and brow presentations per se* do not indicate forceps or any interference, but the physician is more often called upon to intervene.

*Contracted pelvis* of itself is really a contraindication to forceps. Schröder says forceps fit the contracted pelvis like the fist on one's eye. After the head is molded so that it is almost ready to come down into the excavation, and in cases of generally contracted pelvis in which the powers give out after the head has engaged, it is justifiable to use the forceps as an instrument of trial, but the physician must be constantly aware of their murderous possibilities.

Finally may be mentioned the use of forceps on the *after-coming head*, a practice which should, in our opinion, supersede forced manual extractions.

**Prophylactic Forceps.**—In 1920 DeLee created much comment by reporting a method of delivery to which he applied the name "prophylactic forceps." Briefly the procedure is as follows: After complete dilatation of the cervix and when the head has come well down onto the pelvic floor in complete anterior rotation, and has begun to part the levator ani pillars (and not before), the perineum and the fascia over the levator pillar and a bit of the muscle are incised and the child delivered by forceps. Sometimes the pains are so good that the forceps are unnecessary after the episiotomy. After the birth of the shoulders pituitary extract is given hypodermically, and after the placenta is out, ergonovine if needed. A small dose of morphine and scopolamine is given to reduce the amount of anesthetic needed for repair. The method is easily done under local or peridural anesthesia.

The objects of this interference with nature are: (1) To reduce the muscular and nervous strain of the second stage of labor; (2) to save the pelvic floor and adjacent fascia from overstretching; (3) to save the woman's blood; (4) to save the baby's brain from the evil results of prolonged compression and congestion *ex vacuo*. These are true prophylactic measures.

DeLee strongly warned against the wide adoption of this procedure, believing that this would result in a high maternal and fetal mortality, which would defeat the very purposes intended. "Watchful expectancy" should still be the guide for the general practitioner and he should interfere only in the presence of immediate or prospective danger to mother or baby. On the other hand, the obstetric specialist, in his exquisitely equipped hospital, must do something to reduce the morbidity of the women and the mortality and morbidity of the babies. He must, when he can, improve on faulty nature. Many obstetricians have practiced this principle for years without applying any particular name to their forceps operations.

**Conditions for Forceps Delivery.**—These are the same as for extraction in general. (1) The pelvis must be large enough to permit delivery of the unmailed child. If this point cannot be settled beforehand, the forceps, if used, is only an instrument of trial—a diagnosis. Forceps must not be used on a hydrocephalus, since the blades will usually slip off. If the child is very small, a diminutive pair of forceps is to be employed. (2) The cervix must be effaced and dilated, or sufficient enlargement must be easily procurable. Dilatation of the cervix by means of the head pulled down by forceps is a dangerous and unjustifiable procedure. (3) The membranes must be ruptured and out of the

way, because of the danger of dislocation of the placenta. (4) The head must be engaged, or so nearly engaged that a cautious trial of the forceps may be permissible. (5) The child must be living. If the fetus is dead, craniotomy should be performed to reduce the damage to the pelvic floor; if in doubt, the forceps should be used.

A clear mental picture of the shape of the pelvis, as well as its size, is an invaluable prerequisite of the forceps operation. This knowledge gained by the x-ray and the educated finger will guide each step of the procedure.

Technic.—We speak of "high," "low," and "medium" forceps, but there is no uniformity of teaching as to what these terms mean. It would be better to designate the operation by the name of the plane in which the biparietal diameter is found, for example, *outlet* (for "low"), *midplane* (for "medium" or "mid") when the parietal bosses lie in the bispinous line, and *inlet* forceps (for "high") when the head lies in the plane of the inlet, but has not yet completely engaged. To apply the forceps on the floating head is usually a *lapsus artis*.

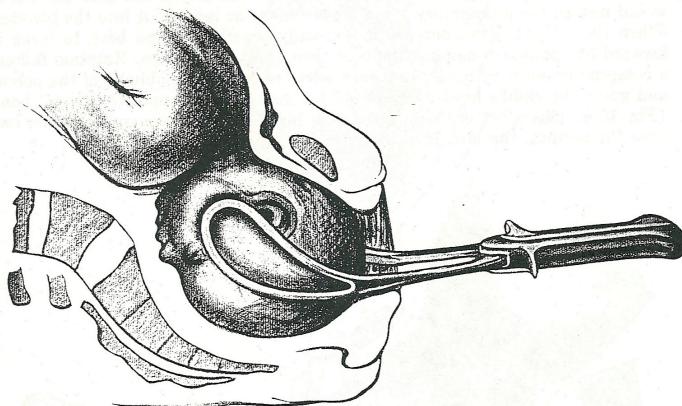


FIG. 734.—THE FORCEPS LYING IN THEIR MOST FAVORABLE POSITION (0, 0°). ("IDEAL APPLICATION.")  
The head is on the perineum and rotation is complete.

Greater scientific accuracy may be obtained by using the plan shown on page 263. One will say, the forceps were applied to the head at 0 or at +1 or +2, as the case may be.

A few commonly used expressions require explanation. The "front" of the forceps is the side of the concavity, the side on which the lock opens, and to which the tips of the blades point. The tips are called the apex. The forceps may lie in the pelvis in any of its diameters. The forceps is said "to lie in this or that diameter" when a line drawn through the centers of the fenestra lies in the diameter specified. The front of the forceps, therefore, would look in the diameter at right angles to the one the forceps lies in. The best diameter for the forceps to take is the transverse, because then their pelvic curve corresponds to the mother's pelvic curve. The child's head is said "to lie in this or that diameter" of the pelvis when the sagittal suture lies in that diameter. When the head lies in the anteroposterior diameter and the forceps lie in the transverse, the head will be grasped in the most favorable manner, and the delivery of the child will be attended with the least difficulty (Fig. 734). When the head lies in

an oblique diameter of the pelvis, the forceps should be applied in the opposite diameter, the front of the forceps pointing in the direction in which the point of direction, *i. e.*, the occiput lies (Fig. 735). Some operators still place the blades in the sides of the pelvis, that is, in the transverse diameter, letting them grasp the head whichever way they will. Most operators try to apply the blades to the sides of the head, the original method taught by the pioneers. This might be called the "ideal," or normal application. When the child's head lies with its long diameter transversely in the pelvis, the only way the forceps can secure a good hold on it is when they lie in the anteroposterior diameter, but then one blade would rest on the promontory while the anterior one might cut into the bladder. When the occiput is not anterior it is usually practicable, and best, to bring it forward by combined manipulation and then apply the forceps. Rotation failing, a compromise must be made, and the blades are laid in one oblique of the pelvis, and grasp the child's head over one malar bone and the opposite parietal bone (Fig. 737). This is better than to place one blade over the face and the other one over the occiput, the instrument lying in the transverse, as in Fig. 736.

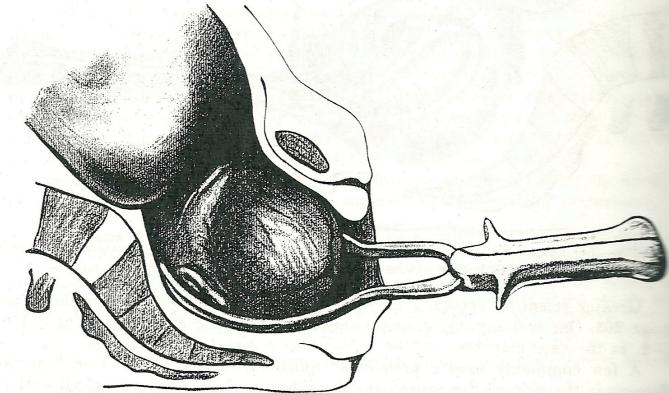


FIG. 735.—FORCEPS IN R.O.A. (R.O. 45°). ("IDEAL APPLICATION.")

The forceps lie in the right oblique diameter of pelvis.

A rule of the forceps operation, to which there are no exceptions, is that the front of the forceps should point in the direction of the point of direction. If the occiput lies on the right side of the pelvis, the front of the forceps points to the right, and as the occiput rotates to the front, the front of the forceps should point more and more forward.

Of the two blades, the left is, with rare exceptions, passed first; it is grasped in the left hand and laid in the left side of the mother (Fig. 738). The right blade is held by the right hand, and comes to lie in the right side of the pelvis (Figs. 739 and 740).

Every forceps operation consists of four acts: Application of the blades; adaptation or locking; extraction of the head; removal of the instrument.

**First Act.—Application of Blades to Head.**—Having reassured himself that his diagnosis is correct by a careful bimanual examination after the patient is asleep, paying particular attention to the station of the fetal head, the operator seats himself on a chair of convenient height and rehearses the intended opera-

tion in the air before he begins. Two fingers of the right hand are passed into the vagina, and if the cervix can be reached, inside the cervix and within the membranes. Nothing must lie between the forceps and the head, and, to be certain of this, the fingers must feel the head all the way and be passed up as high as possible, guarding the tip of the forceps blade until it goes beyond reach. In higher forceps operations the half hand should be inserted. Now the left blade of the forceps is taken in the left hand, poised vertically in the introitus (Fig. 738), and passed with the delicacy of a urethral sound. As the blade glides

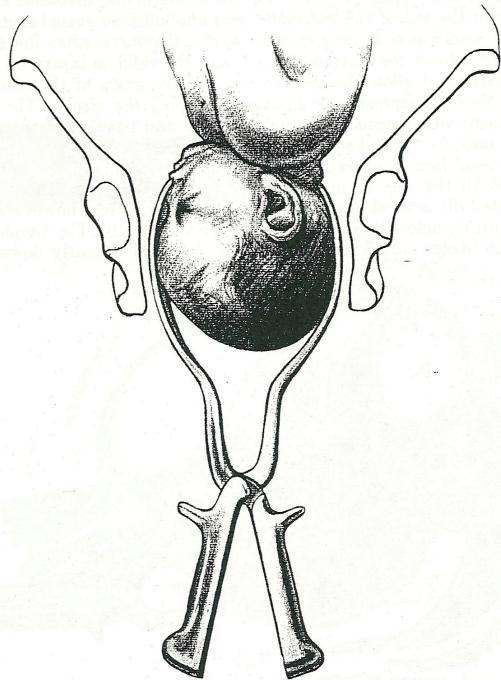


FIG. 736.—FORCEPS GRASPING HEAD IN AN UNFAVORABLE DIAMETER.

There is a strong tendency to slip. This application is to be avoided because it causes tentorium tears, and other damage.

along the fingers in the vagina, the tip is held closely to the head, so as to get under the cord or the membranes if they should fall in the way. The thumb of the right hand is used to guide and press the blade into place. As the fenestrum disappears inside the vulva, the time has come to sink the handle, and when the lock rests near the perineum, the first half of this act is completed. In most forceps operations the blades, if properly applied, will fall into the right position of their own weight. As the handle sinks down, the operating hand glides over the top and now grasps it like a scalpel (Fig. 740). Lubrication of the blade facilitates its passage.

The right blade is passed in like manner, the two fingers of the left hand being inserted and acting as guide and protectors of the maternal tissues. The lock being on the top of the left blade, this one must be passed first, otherwise the handles would have to be recrossed outside the vulva, after the application, which would subject the maternal tissues and the child to injury by the tips of the instrument and allow the cord to fall into the grasp of the blades.

**SECOND ACT.—Adaptation or Locking; Grasping the Head.**—The technic of this movement will depend on the presentation and position of the head, since the blades must be applied so as to fit it in the best way.

In the usual forceps operation the head is low down, and the small fontanel has rotated all the way or nearly all the way to the front. The blades, after being inserted, fit naturally to the sides of the head. Often, however, they need a little adjusting before it is possible to fit the lock neatly. The simplest method to bring the blades into position is to press the handles gently downward onto

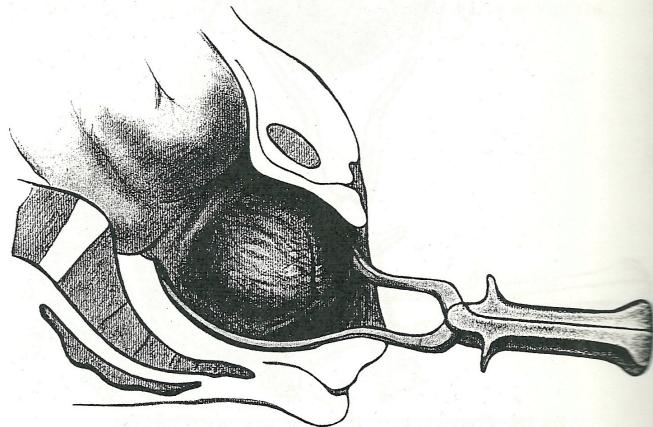


FIG. 737.—FORCEPS IN R.O.T. (R.O. 90°).  
The head lies in the transverse, the forceps lie in the right oblique. The front of the forceps points to the right anterior.

the perineum. If this is not successful, they are depressed, and at the same time twisted lightly by means of the hooks on the handles, and if this does not do, a triplex motion is given the instrument. The handles are pressed downward, pushed upward into the pelvis, and twisted slightly, all in one movement, but *without much force*. If this maneuver is not successful, the forceps must be removed and reapplied, because there is some obstacle to locking, which must be recognized and relieved. To force locking is bad practice, and always results in fetal or maternal injury. Usually, the physician will find he has made an error in diagnosis of position, or that the child has hydrocephalus. As a rule the occiput if not fully rotated, turns forward while the forceps are being locked. Should this not occur, one must adjust the blades smoothly to the sides of the head by making one blade "wander" a little anteriorly, the other a little posteriorly (Fig. 766). The forceps will now lie as in Fig. 735 or Fig. 737.

After locking, the heart tones should be auscultated. First listen and note their frequency and strength, then close the blades and listen again. If the tones

at once become faint or slow, the cord is in the grasp of the forceps—the slowing of the heart is due to the carotid sinus reflex resulting from blocking the cord circulation; if the slowing occurs only when the handles are kept tightly closed, it is due to cerebral compression. By pushing one or two fingers up along the back of the child's neck, behind the pubis, it is possible to feel the cord if it encircles the neck. Should there be a suspicion that the tip of the forceps squeezes the cord, the instrument must be removed and reapplied. If compression of the cord is unavoidable, the delivery must be quickly effected. An internal examination is also made, to find if the cord or cervix or an arm is caught in the grasp of the instrument.

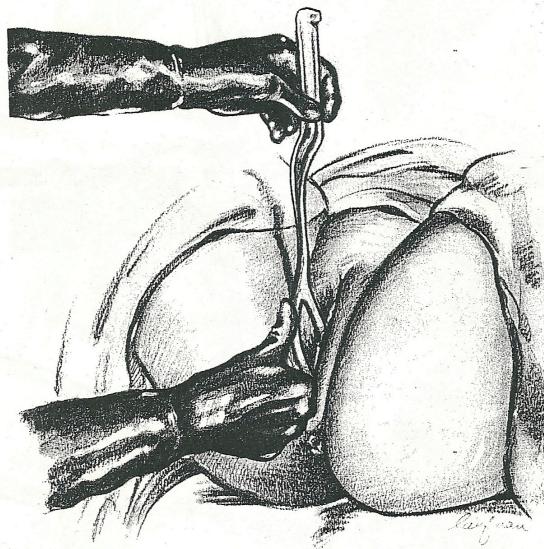


FIG. 738.—INSERTION OF FIRST BLADE (LEFT) OF FORCEPS. BLADE IS HELD GENTLY.

THIRD ACT.—*Extraction*.—After locking the forceps one gentle pull is made on them to see if the blades lie properly and fit well, also to give the physician an idea of the amount of resistance likely to be met. This is called the *trial traction*, and after it is done the heart tones should again be listened to. Four points must be borne in mind with each traction: (1) Each traction is made with the uterine pains, and if these are absent, the pain is imitated, that is, the pull is gradual at first, slowly reaches an acme, is held for a moment, and then slowly relaxed. (2) As little power is used as possible, regulating the amount by the advance of the head. With the elbows at the side and the arms flexed, the strength of the biceps alone should suffice, and more than 60 pounds will almost never be required—usually much less. Time should be disregarded, but the fetal heart tones carefully watched. (3) When rotation is complete the traction

should be simple, not combined with pendulum, corkscrew, nor twisting motions. These are reserved for heads not yet rotated. (4) We do not pull straight out, but down and out, following the curve of the pelvic canal (Fig. 775).

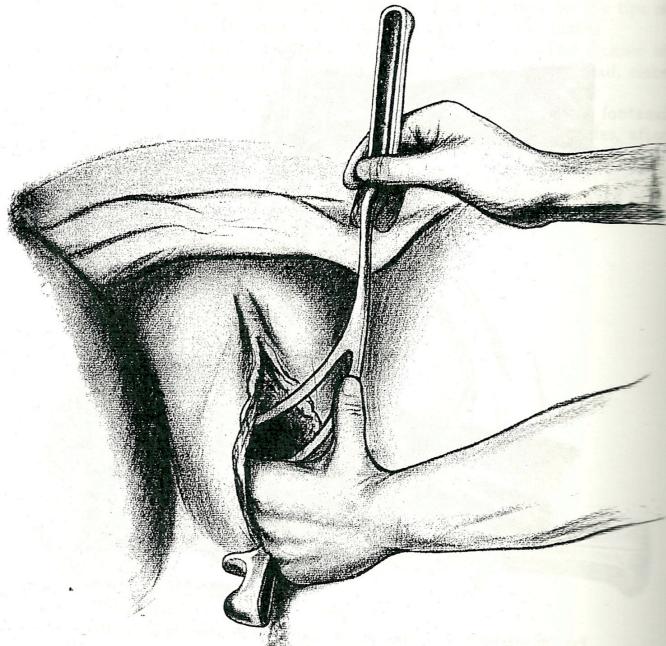


FIG. 739.—INSERTION OF SECOND (RIGHT) BLADE.

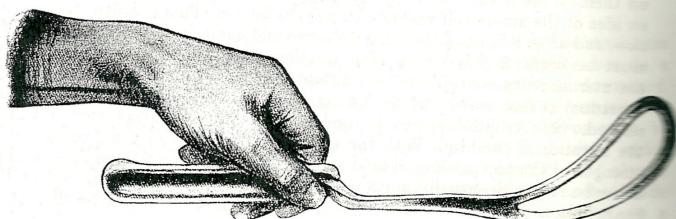


FIG. 740.—GRASPING FORCEPS BLADE LIKE A SCALPEL. SECOND MOTION OF INSERTION.

After the trial traction the forceps are grasped, as shown in Figs. 741-744, the right hand on one shank with the index finger in the crotch, the thumb underneath the handle. The left hand steadies the forceps, keeps the blades applied to the head, but does not make traction unless great force is necessary.

in which event the fingers are applied to the handles from above. One slow, even pull is made, at first in the horizontal plane or downward, or somewhat upward, depending on the station of the head and the curve of the parturient canal at that particular point. Carefully note the amount of progress of the head, and allow the head to recede very slowly; then listen to the heart tones, loosen the forceps after each traction, but do not separate the handles too far because the cord might slip under the blades. After one full minute by

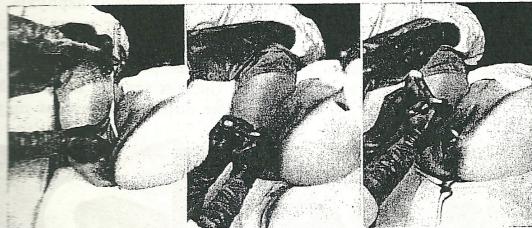


Fig. 741.



Fig. 742.



Fig. 743.

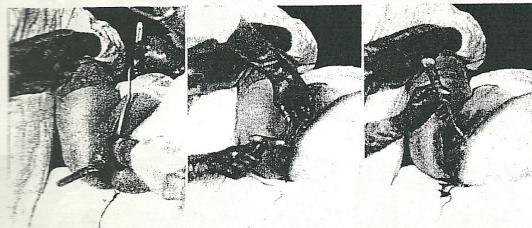


Fig. 744.



Fig. 745.



Fig. 746.

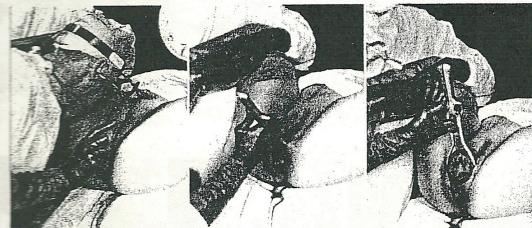


Fig. 747.

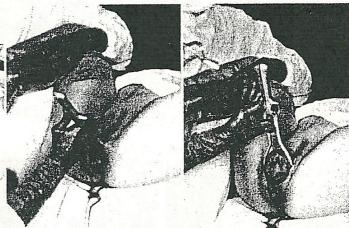


Fig. 748.



Fig. 749.

FIGS. 741-749.—STRIPS FROM DELEE'S MOTION PICTURE OF THE FORCEPS OPERATION.

a clock placed directly in front of the operator, another traction is made—if necessary, a little stronger than the first. The descent and rotation of the head are determined by frequent examinations, the fingers searching for the location of the small fontanel. As the head bulges the perineum traction is more upward, and the usual precautions to save the pelvic floor are to be observed, such as slow delivery, bringing the head through with its most favorable diameters, and episiotomy. In our own practice we seldom deliver a primipara with forceps

without first doing an episiotomy. This saves the child's head from prolonged compression, shortens the time of operation, forestalls fetal asphyxia, and prevents a ragged laceration, which is almost inevitable. After every traction listen to the fetal heart tones. The exaggerated lithotomy position by widening the bony outlet facilitates the exit of the head through this pelvic region. After the parietal bosses have passed the tuberosities, the legs are put back as they were. When the head is well engaged in the vulvar outlet, the forceps may, if pre-

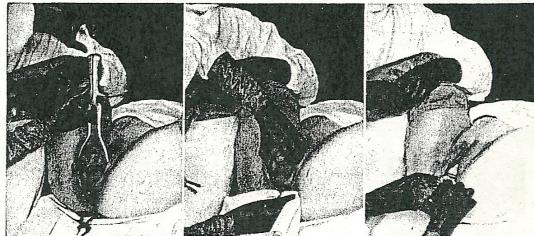


Fig. 750.

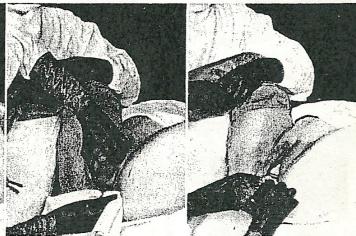


Fig. 751.

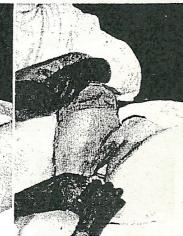


Fig. 752.

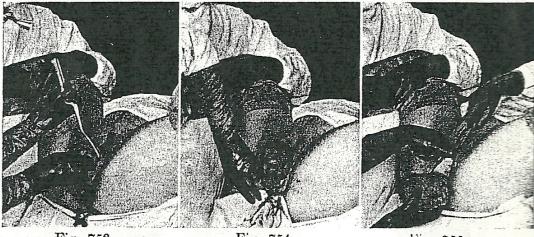


Fig. 753.

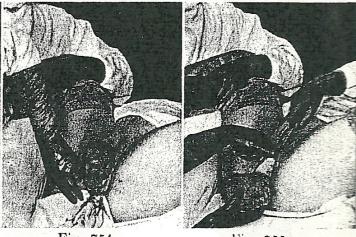


Fig. 754.

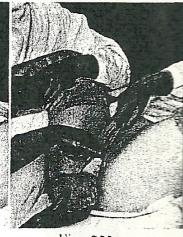


Fig. 755.

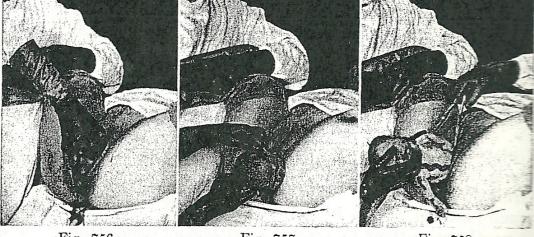


Fig. 756.

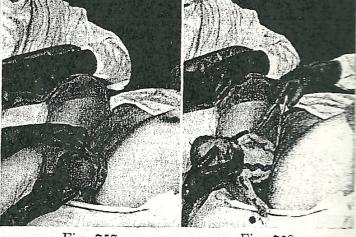


Fig. 757.



Fig. 758.

Figs. 750-758.—NOTE LIGHT TRACTION WITHOUT COMPRESSION, AND BLADES REMOVED TO SAVE PERINEUM.

ferred, be removed, and the delivery completed by pressure on the head from behind the anus by Ritgen's maneuver. If the operator is right handed, he stands off at the left side of the patient, and if he uses his left hand, he stands to her right (Figs. 750-758). He grasps the forceps at the lock with the right (or left) hand, with the little finger between the shanks, and gently, slowly advancing he turns the head out, the handles of the forceps pointing toward

the abdomen. At the same time the head is pulled up vertically somewhat to keep the nucha applied snugly to the subpubic ligament. From fifteen to thirty minutes are required for an ordinary forceps delivery, most of which time is spent in bringing the head to the perineum. If the operator wishes to deliver without episiotomy and tries to "save the perineum," he must bring the head through the pelvic floor very slowly, taking as much time as a natural delivery would take (Fig. 759).

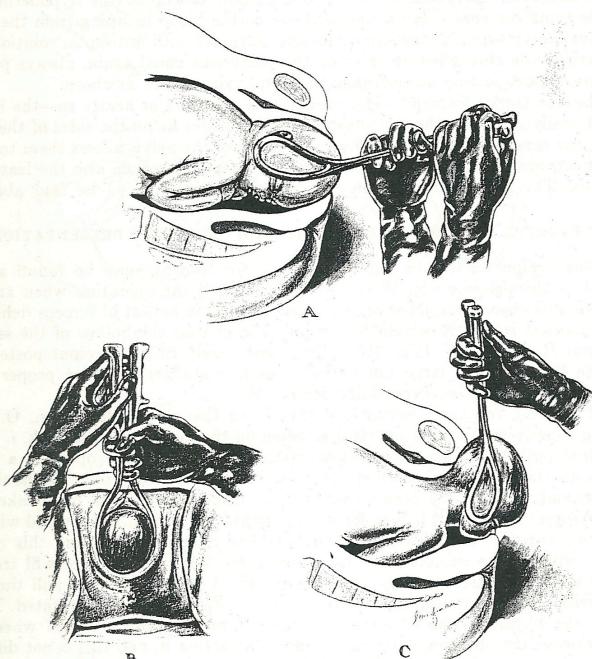


FIG. 759.—THREE STEPS IN A LOW FORCEPS DELIVERY.

(A) Traction. Note separation of handles by left index finger and thumb. The pull is forward and slightly downward. (B) Continued traction but with partial extension of head. Handles separated as before to avoid compression of baby's head. (C) Head delivered by further extension.

**FOURTH ACT.—*Removal.***—When the head is about ready to pass the vulvar ring we usually remove the forceps, as the slight lessening of the circumference ( $\frac{1}{2}$  to  $\frac{3}{4}$  cm.) may be just enough to save the sphincter from damage.

The action is the reverse of that of the application, taking care not to tear the baby's scalp, or ear, or the soft parts of the mother. A few points in technic: Watch for feces issuing from the anus; wipe from above downward; do not let the baby's chin glide over the perineal region; cleanse the baby's mouth and throat before it makes the first gasp; have an assistant "follow down" the uterus as the child escapes and apprise you at once if it balloons out or does not contract firmly; as the shoulders appear give 10 units of pituitary extract into the del-

toid, and after the placenta is out, one ampule of ergonovine hypodermically, while tying the cord, keep a watchful eye on the blood escaping from the vulva—save blood!—drench the externalia and introitus with antiseptic solution, and resterilize the gloves before entering the parturient canal again; always prepare to treat post-partum hemorrhage and asphyxia of the newborn.

**Low or Outlet Forceps.**—Here rotation is complete or nearly so—the head is most easily seized by the instrument, and the blades lie on the sides of the head, over the ears. Applying the blades to the sides of the pelvis allows them to grasp the head properly. This is the commonest forceps operation, also the least dangerous. The general description just given is all that need be said about it.

#### FORCEPS IN UNUSUAL MECHANISMS OF OCCIPITAL PRESENTATION

The occiput, when an indication arises for forceps, may be found at any point of the pelvic circle. We have just described the operation when anterior rotation has been completed or nearly so. This is the easiest of forceps deliveries. The hardest is that in which the occiput is in or near the hollow of the sacrum, occiput R. or L. 180° (Fig. 768). These are tersely called "occiput posteriors." While they cause a large number of operative stillbirths, under proper management they can be successfully dealt with.

The small fontanel seldom lies directly in the median line, *i. e.*, O. 180°, being usually to the right or left depending on the location of the back, *i. e.*, the original position before labor began, nature thus giving the operator a useful hint. In the subsequent maneuvers he should follow the proper mechanism of labor, and not turn the head away from the direction the back must take.

Without question it is best for both patients if the child is delivered with the occiput anterior, *i. e.*, after rotation has been effected—providing this can be done without the exhibition of too much force. Art and patience will triumph here when raw strength fails. Only rarely will it be necessary to pull the head out with the small fontanel over the perineum (Fig. 768), *i. e.*, unrotated. Therefore, the physician should learn the methods and acquire the skill wherewith to improve the position of the head before extracting it, and this is not difficult. Since the arrest of rotation of the occiput may occur in any sector of the pelvic circle, the operator, in order to bring the small fontanel to the front, under the pubes, may have to turn it from 1° to 180°. Naturally the more nature has accomplished, the less he will have to do, but the principles of the operation are the same at all points in which the occiput happens to be. If the head lies posteriorly in an android or anthropoid pelvis it is best to deliver the occiput as it lies. First let us take the complete occipitosacral, O. 180°, then R.O.P.—R.O. 135°, then R.O.T., R.O. 90°, or "deep transverse arrest."

**Forceps in Occipitosacral Position and R.O.P. or L.O.P.**—The reader will find the details of the treatment of unrotated occiput positions on page 605, under the title "Persistent Occiput Posterior Position." Nature usually brings the occiput to the front—at least it usually is found well out of the hollow of the sacrum. If progress in labor ceases at this point three courses are open—correction and expediency, podalic version, and forceps. To avoid repetition, the reader is referred to page 945 for a discussion of the first two. Having failed with them our only alternative is forceps (Fig. 760). Cesarean section for the single indication, occiput posterior is out of the question.

**Technic.**—Four objects must be accomplished to complete the operation, flexion, synclitization, rotation, and extraction. Disregard of the first two may render the others difficult or impossible. It is understood that the cervix is retracted and out of the way, the pelvic floor is prepared by manual stretching and later by episiotomy, and the uterus is relaxed by an anesthetic. First a correct

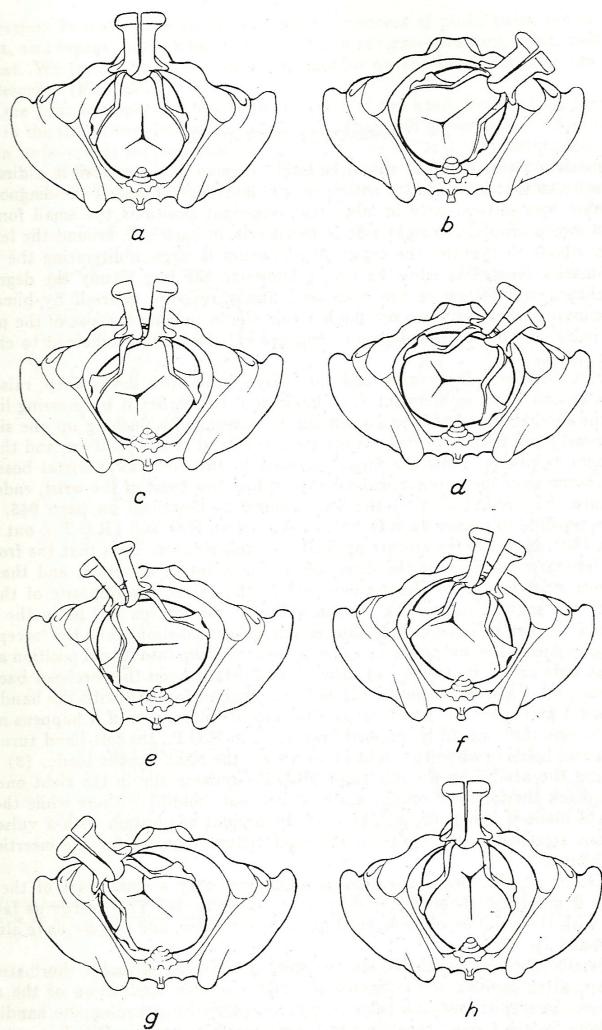


FIG. 760.—PROCURING ROTATION WITH FORCEPS. KEY-IN-LOCK MANEUVER.

a, Occiput in hollow of sacrum, R.O. 180°. Forceps applied with front toward forehead and pubis. b, Forceps are locked, pushed up in axis of pelvis and handles swept over an arc of 45°, in sections of 5°, *not all at once*; now R.O. 135°. c, Holding what was gained, the forceps are readjusted, in the transverse; head grasped obliquely; repeat key-in-lock maneuver; push up, sweep handles through an arc of 45°, in sectors of 5° each, bringing occiput to position d, i.e., R.O. 90°. e, Pre-

diagnosis must be made. It would be fatal to try to turn the head in a direction opposite to that intended by nature. It will help a great deal if the diagnosis of position was settled early in labor. In back-right positions the small fontanel must sweep around the right side of the pelvis, in back left, around the left. When about to operate, the caput succedaneum is large, obliterating the usual landmarks, *locate the ear*—the tragus points to the face. Study the degree of synclitism and flexion of the head, and finally reassure yourself by bimanual examination that you have not made a mistake in judging the size of the pelvis, the baby's head, and the degree of engagement. Do not be ashamed to change your mind.

Now lubricate the vagina and the baby's head with liquid soap, raise the head up out of its embedment, *i.e.*, mobilize it freely, flex it by pressing lightly on the forehead, and reduce asynclitism if necessary by pushing up one side of the head more than the other. Insert the right hand in left positions and the left in right positions. With the fingers applied to the posterior parietal boss and the thumb over the anterior malar bone, with a slow twist of the wrist, endeavor to turn the occiput part of the way around as described on page 945. It is often possible to obtain an R.O.  $75^\circ$ , or at least an R.O.  $90^\circ$  (R.O.T.), out of an R.O.  $180^\circ$ . Now the forceps are applied, remembering the rules that the front of the forceps must face in the direction of the point of direction, and that the forceps must lie in the oblique diameter of the pelvis, the opposite of that in which the sagittal suture lies, *i.e.*, in R.O.  $75^\circ$  the forceps will lie in the right oblique. It may be hard to hold the head in its new position while the forceps are being applied—the occiput has a great tendency to slip into its old position again. These aids are to be tried: (1) Have the assistant keep the forehead back by pressing on it above the pubis; (2) hold the occiput forward with the hand that turned it and insert the first forceps blade into its place, even if it happens not to be the one that should be applied first, *e.g.*, in R.O.P., the left hand turns the head and holds it while the right hand inserts the right forceps blade; (3) after turning the head with the left hand (R.O.P.) quickly slip in the right one and press back the forehead on the mother's left side, holding it there while the left forceps blade is being put in; (4) hold the occiput in position with a vulsellum forceps attached to the scalp for the brief instant required for the insertion of the blades.

Let us say the occiput can be brought over only a small part of the half circle it must travel—to about R.O.  $135^\circ$ —what to do? This brings us face to face with the question of using the forceps as a rotator, and this we have already discussed (p. 978).

Smellie delivered such babies by twisting the head with his short straight forceps after pushing it up. Scanzoni made a double application of the usual forceps. Tarnier turned the head within the pelvis by sweeping the handles of the long French forceps through a wide arc outside the pelvis, Bill does not push the head up but does as Tarnier did, and Kielland applies his forceps to the sides of the head and simply rolls it around.

DeLee devised a method of rotation of the head which combines several of these maneuvers, and for want of a better term he named it the "key-in-lock"

venting the head from twisting back, with the fingers, the forceps are made to "wander" into the left oblique, front to the occiput. Repeat, push up, sweep handles through arc of  $45^\circ$ , in sections of  $25^\circ$ , *i.e.*, coax the occiput around to *f*, taking time and avoiding brisk motions. Now R.O.  $45^\circ$ . At the beginning of this stage an expert operator may apply the forceps in the anteroposterior diameter of the pelvis, in the ideal prehension and proceed as usual (Fig. 764). *g*, Holding the head at Bill  $45^\circ$ , with a vulsellum, if it persists in rotating back, the forceps are reapplied, at last in the normal or ideal prehension and the rest of the rotation is accomplished by the push up, twist, and pull method, remembering that extreme gentleness will accomplish more with less damage than force. *Now on sete*; not with force but with skill.

operation. It really tries to imitate nature's process of push, twist, retract, untwist, and repeat, but we have to do them in reverse—push up, twist, pull, and repeat. We try to impress a wriggling motion on the head, which is not easy to describe (Fig. 760).

One tries to apply the blades to the sides of the head. Failing this, they are laid in the transverse diameter of the pelvis. They will grasp the head diagonally, in an unfavorable manner, and are, therefore, to be held very delicately. Now, under the slightest possible compression, the head is pushed up about 2 cm. in the axis of the birth canal and gently twisted, the small fontanel being brought

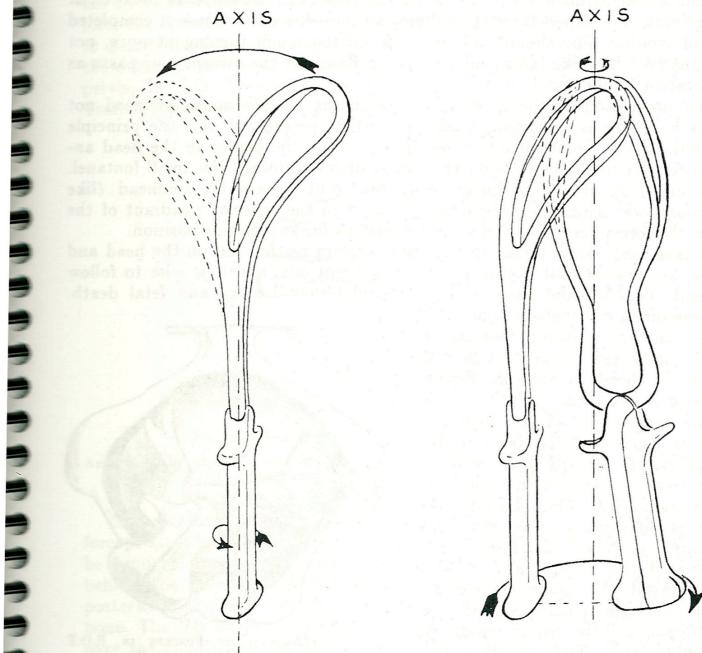


FIG. 761.

If the handles are twisted, the blades tend to describe an arc in the pelvis, tearing the vagina from its attachments.

FIG. 762.

If we wish to give a rotary movement to the blades, the handles should be made to describe a large arc.

forward not more than 5°. This is done by sweeping the handles of the forceps through an arc of about 10° outside the pelvis by the Tarnier method (Figs. 761–763). Then the head is pulled down a little in the axis of the pelvis, *but less than it was pushed up*. Repeat this maneuver two or three times, pushing the head up only as much as you pull it down, and when the sagittal suture is transverse, *i.e.*, R.O.T. or R.O. 90°, the front of the forceps will now point to the left, and they will lie in the left oblique. Readjust them so that they will come to lie in the right oblique, grasping the head in a more favorable diameter, that is, the ideal manner. Indeed, sometimes the head slips around the rest of the

way itself within the blades. By pushing up a little, twisting a little, and levering a very little (to overcome asynclitism), imparting a wriggling motion to the head not unlike fitting a key to a stubborn lock, one can usually coax the occiput to the front, whereupon the rest of the operation—the extraction—is completed without trouble. One should not hurry or do too much turning at once, not more than  $5^{\circ}$ ; it is like taking mincing steps. Readjust the forceps pari passu as the rotation is effected.

The prehension of the head at the beginning of this operation need not always be made as described. Variants must be recognized, but the principle does not change. Sometimes it is possible to apply the blades to the head anteroposteriorly in the pelvis with their front directed toward the small fontanel. Again one may apply the forceps with the front toward the forehead (like Scanzoni), and when the occiput is brought into the anterior quadrant of the pelvis, the forceps are removed and reapplied as for an anterior position.

In rare cases while trying to impress a certain mechanism on the head and failing, we observe that nature prefers a different one, and it is wise to follow her lead. To force the issue might entail maternal damage and fetal death. For example in transversely contracted pelvis, an occipitosacral mechanism may be indicated. Then it is best to deliver the head in extreme flexion, as shown in Fig. 554.

The application of the blades is made as usual, but the front of the forceps points toward the forehead, which, from now on, becomes the point of direction (Fig. 768). Locking the blades is the same as usual, but after they are locked and the head gently compressed the handles are raised a little toward the pubis to increase flexion. Traction is made on the parietal bosses, a little upward from the horizontal plane. The occiput is first delivered over the perineum, the forehead resting behind the pubis; then the brow and face come from under the pubis. Much power is often necessary, and it is advisable to perform episiotomy in primiparas, as a rule, and almost always in multiparas, to avoid extensive lacerations of the pelvic floor and sphincter. If conditions are favorable one might deflex the head and deliver as a face presentation. Some obstetricians prefer the axis-traction forceps since the mobility they confer on the head allows the latter to adapt itself somewhat to the parturient passage, but for the man who knows the mechanism of labor and is willing to be guided by the action of the natural powers they are unnecessary, and in the hands of a man ignorant of the principles of the science of obstetrics the instrument is too dangerous. (See p. 1005, "Failure with Forceps.")

**Forceps in Deep Transverse Arrest.**—R.O.T., R.O.  $90^{\circ}$ , and L.O.T., L.O.  $90^{\circ}$ . In some cases where a delay in labor has been manifest for some time, an examination reveals the head well down in the pelvis, the sagittal suture in the transverse diameter, the small fontanel to one side, generally the right, the large fontanel to the other side, and both on the same level. This condition is called "deep transverse arrest"—sometimes "impaction," the head being wedged in between the ischial tuberosities. (See Deflexion Attitudes, p. 608.) Lack of flexion and weak pains are usually causative, but often we find persistent asyn-

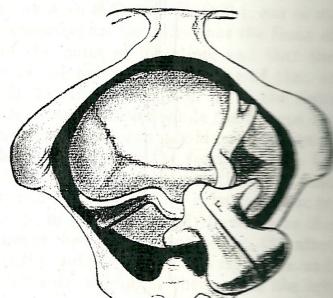


FIG. 768.—DIAGRAM OF FORCEPS IN R.O.  $90^{\circ}$ . (R.O.  $90^{\circ}$ .) USUAL APPLICATION (Oblique). F indicates front of forceps.

clitism as well. The principles of treatment are similar to those of occiput posterior in general; we must favor flexion, complete the rotation and extract the baby. If manual correction fails, the forceps must be relied upon.

It is obvious that, in transverse arrest, if the forceps were applied to the sides of the head, the blades would have to lie in the conjugate diameter of the pelvis (Fig. 764), which is mechanically a bad principle, the pelvic curve of the forceps being then directly opposed to the curve of the pelvis, and there being danger of injury to the bladder by the anterior blade. If the instrument were laid transversely, it would seize the head over the face and occiput (Fig. 736), injuring the eyes, deflexing the head, and inviting a tendency to slipping. When, therefore, the operator cannot rotate the occiput to the front manually, he will have to grasp the head obliquely (Fig. 763), one blade lying on the parietal bone, the other on the malar. The forceps then will lie in an oblique diameter of the pelvis. In R.O. Transverse, the forceps will lie in the right oblique, in O.L. Transverse, in the left.

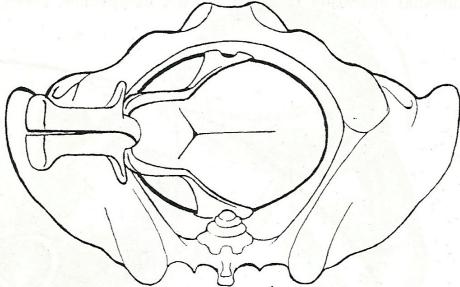


FIG. 764.—FORCEPS IN R.O.T.; R.O. 90°. EXCEPTIONAL APPLICATION.

Application by expert in anteroposterior diameter of pelvis. Ideal prehension but some avoidable danger to soft parts because pelvic curve of forceps does not correspond to pelvic axis.

**Technic for Transverse Arrest R.O. 90° (R.O.T.).**—Since the front of the forceps must face the point of direction, in this case the occiput, the blades must be brought to lie in the right oblique diameter of the pelvis, one anteriorly behind the iliopubic tubercle, lying over the anterior malar bone, the other posteriorly, opposite the right sacro-iliac joint, lying on the posterior parietal bone. The left blade, therefore, has to be guided around the side of the pelvis over the child's face, to come into position. This is called "wandering" (Figs. 765 and 766). The right blade does not have to "wander" at all, but may be laid directly opposite the sacro-iliac joint. While the blade is being pushed in by the outside hand, the fingers inside pull it around the pelvis. Locking is not easy in these cases, and the operator, knowing that the head is grasped in one of its long diameters, will not bring the handles too close together.

A good way for the physician to assure himself that the child's head does not suffer injurious pressure is for him to put the index finger of his left hand between the handles while making traction. The details of the rotation and extraction are identical with those given for an occipitonasal position—in fact delivery in deep transverse is the latter half of this maneuver—and the "key-in-lock" method is very successful. A clever operator might place the forceps blades in the anteroposterior diameter of the pelvis, *i. e.*, on the sides of the head, obtaining at once the normal or ideal grasp (Fig. 764), and thus when the small

fontanel has been brought to  $0^\circ$  he will have the forceps in position for extraction without adjustments.

Many authors recommend the turbinal movement for deep transverse arrest, *i. e.*, the downward pull is accompanied by a slight and gentle rotation, the two motions being absolutely synchronous, thus effecting spiral progress of the head, rotating  $5^\circ$  and advancing 5 mm. with each traction (Fig. 767). There is danger in this method of abrupting the vagina and bladder from their attachments, and for this reason, the new method of key and lock is preferred, and the turbinal operation reserved for the exceptional case.

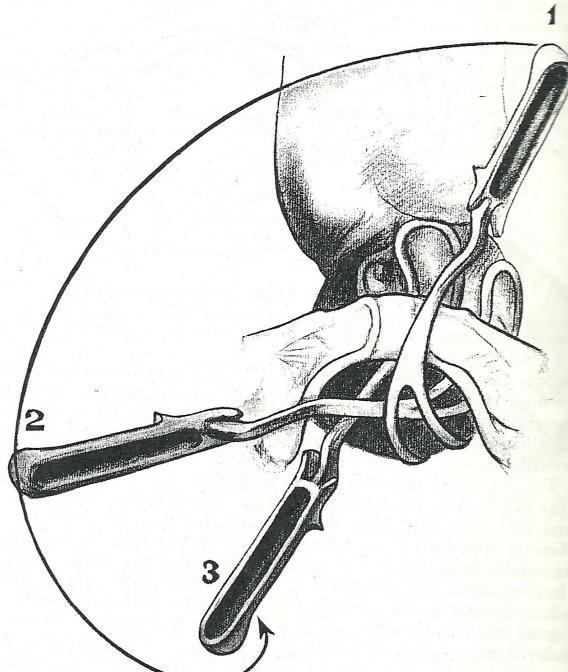


FIG. 765.—ROTATING LEFT BLADE AROUND HEAD IN R.O.  $90^\circ$ . "WANDERING."

After rotation is complete the forceps may be removed and the birth left to nature if the heart tones are good. This may be desirable in primiparas with contracted outlets or large babies. In a few hours the pains will have molded the head so as to permit spontaneous delivery after episiotomy or a very easy low forceps operation. The benefits may outweigh the manifest objections to such a two-stage procedure.

**Scanzoni-Fritsch Operation.**—This is a method of turning the head by means of the forceps. It is entirely dispensable and, in our opinion, is fraught with too great dangers to the maternal soft parts, and with too much risk of Erb's paralysis to be practiced by others than experts. The forceps are applied with the front

pointing toward the forehead. By rotating the instrument, the forehead is brought to the rear, which of course inverts the forceps. They are removed and reapplied, with the front toward the occiput, which has come to the pubis, and the operation is completed as usual after rotation has occurred. We have better means for correcting occiput posterior positions. By modifying the pelvic curve and inserting a movable, adjustable joint between each blade and shank, Bay Jacobs produced a pair of forceps which enables performance of the Scanzoni maneuver with a single application.

**Forceps in Face Presentation.**—*Per se* face presentation is not an indication for forceps, but labor is often delayed and help frequently required with all the deflexion attitudes. In face presentation, to the conditions demanded for forceps in general, one new one must be added—the chin must not be behind the transverse diameter of the pelvis—that is, anterior rotation of the chin, at least to the transverse diameter, must have occurred.

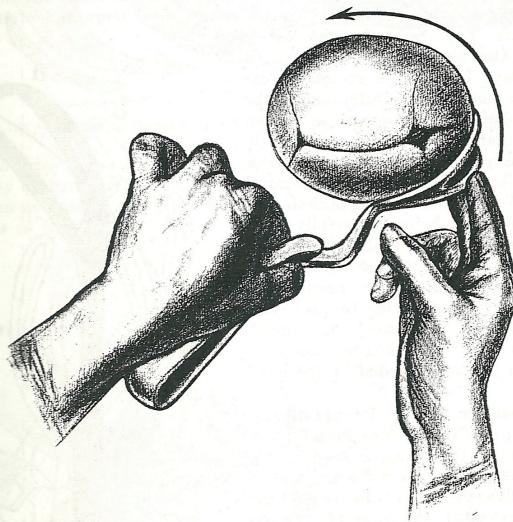


FIG. 766.—SHOWING HOW TO TURN FORCEPS BLADE. "WANDERING."

*Application of the blades after the chin has rotated* is easy, although care is required not to injure the baby's eyes. Adaptation or locking is different. Instead of first depressing the handles, it is necessary to raise them well. This sinks the blades toward the hollow of the sacrum, and thus a firmer hold over the parietal bosses is obtained. If the blades are placed and locked in the usual manner, they will slip off the narrow brow and face. They are, therefore, locked with the handles raised, and then they are lowered. This maneuver increases extension (Fig. 769). Traction is first downward, to increase deflexion, then in the horizontal plane, until the chin is well out from under the pubis, then upward, but not as acutely as in occiput presentations, because the delicate larynx is between the spine of the child and the pubic bone. Episiotomy is the rule in primiparas.

*Forceps in Arrested Rotation of the Chin.*—To deliver with forceps when the chin is directed toward the hollow of the sacrum is possible only when the child is small, and then only at the expense of extensive lacerations. To try to rotate the chin anteriorly by means of forceps from a posterior quadrant of the pelvis is equivalent to a craniotomy, and much more damaging to the mother's tissues. It is, however, possible to deliver safely a face presentation arrested in rotation after the chin has reached or passed the transverse diameter, but the operation is very delicate, very difficult, usually causes deep tears and often costs the child's life. The reason for the last is obvious. One blade compresses the neck and always injures the structures exposed by the extreme extension of the cervical spine. The forceps lie in an oblique diameter the front pointing in the direction of the point of direction. In R.M.T. the forceps lie in the right, in L.M.T. in the left, oblique diameter. Extraction must be most carefully done, loosening the forceps frequently and readapting them at the earliest possible moment to the sides of the head. Rotation is effected by giving the forceps a slight turbinal movement, but much may also be accomplished by manipulation with the fingers aided by the hand outside.

*Forceps in Brow Presentation.*—What was said under Face Presentation applies here. The brow, instead of the chin, must come to the pubis and appear in the vulva, the face resting behind the symphysis until the occiput can be brought over the perineum, after which the face comes down from behind the pubis. Episiotomy is the rule in primiparas and in multiparás, too, if the child is large.

*Inlet Forceps Operations—“High Forceps.”*—In most of the cases of forceps operations just described the head occupies the excavation of the pelvis, and we might speak of “midplane forceps,” as was already mentioned. The term “high forceps” is best limited to those cases where the biparietal diameter is in the region of the superior strait, but has not yet passed lower, or has not even as yet entered the inlet, but is arrested just above it. Some operators permit the use of forceps on the “floating head.” Version is preferable. In some cases the head is so well fixed that it may be impossible to move it away to do version, and yet it is not quite engaged so as to fulfil the condition for forceps. Under these circumstances the forceps is an instrument of trial, or, as Carl Braun said, “an instrument of diagnosis.” We want to see if the head will come into the pelvis. If, after suitable trial, the head will not come in, we must do a craniotomy, even if the child is alive, or, if both pa-

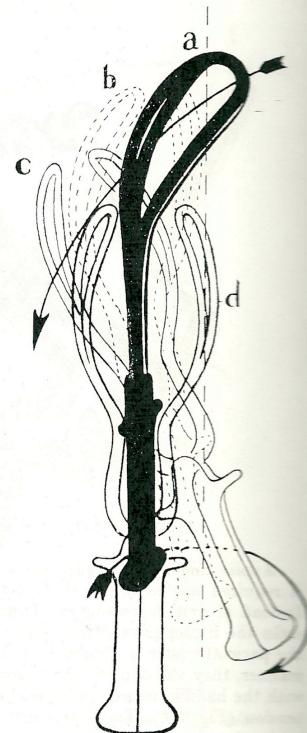


FIG. 767.—TURBINAL MOTION OF THE FORCEPS  
(Not recommended.) This is as applied to a head in L.O.T. (L.O. 90°).

tients are in prime condition, some form of cesarean section. (See Treatment of Contracted Pelvis, and p. 727.)

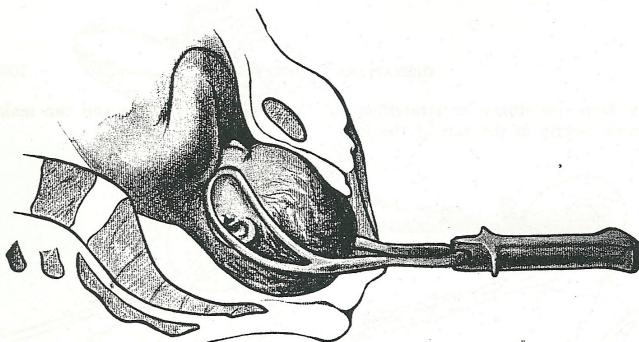


FIG. 768.—FORCEPS IN OCCIPUT SACRAL POSITION ON PELVIC FLOOR (R.O. 180°).

For deliveries begun when the head is above the level of the spines of the ischia many authors recommend a special instrument—the axis-traction forceps—that is an instrument which will enable us to apply force to the head parallel to the axis of the pelvis.

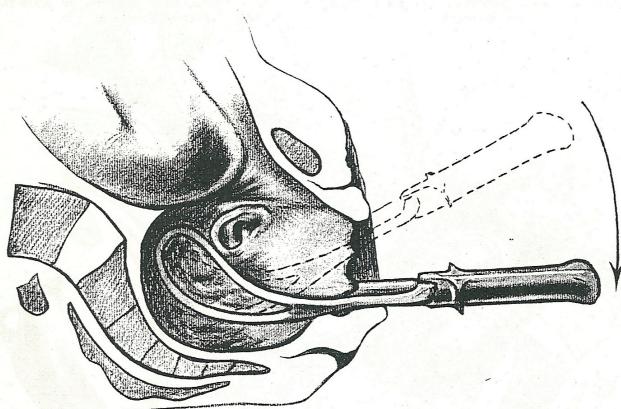


FIG. 769.—FORCEPS IN FACE PRESENTATION.

Dotted line shows forceps as first applied. Traction is applied after handles are lowered.

The head, when high up, has a curve to traverse. Owing to the forward projection of the sacrum and perineum, traction cannot easily be applied in the axis of the inlet. If applied in any other line, the problem is like trying to pull an object around a corner—both the corner and the object suffer. However, if we

do a deep episiotomy we straighten out the lower pelvic curve and can make traction nearly in the axis of the inlet.

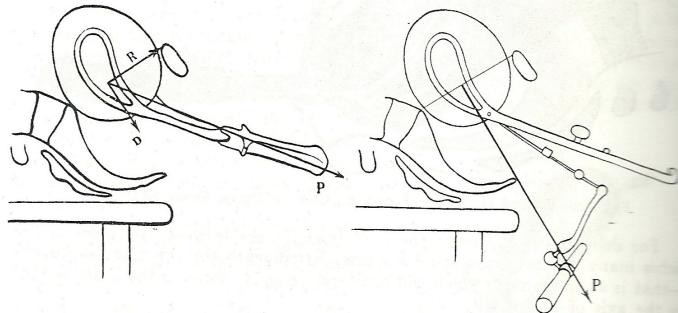


FIG. 770.—DIAGRAM SHOWING TRACTION WITH USUAL FORCEPS.

FIG. 771.—DIAGRAM OF ACTION OF AXIS-TRACTION FORCEPS.

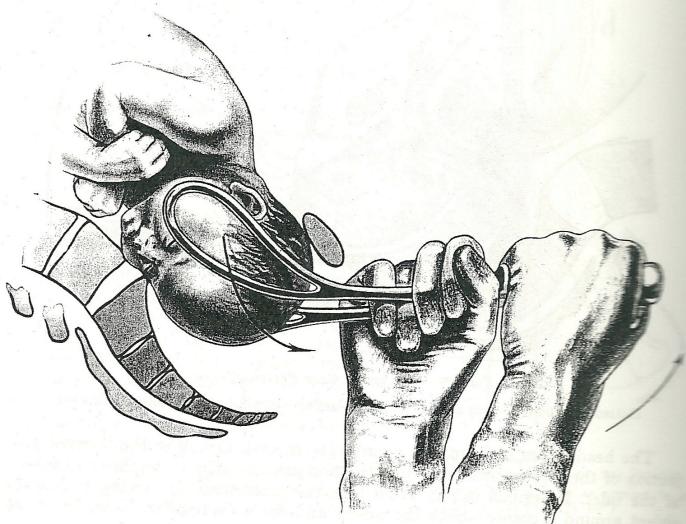


FIG. 772.—SAXTROPH-PAJOT'S MANEUVER WITH FORCEPS.

By this method axis traction is obtained. It looks a little rough on the baby, and it is. Therefore be careful!

Figure 770 shows the effect of the ordinary forceps when applied on the high head; if traction is made in the usual way, a large part, estimated by Tarnier as almost half, of the force will be exerted against the symphysis. Saxtroph (1772) advised to pull downward toward the floor with one hand over the lock, while the other pulled the forceps straight out—a maneuver which is generally known as Pajot's (Fig. 772). In 1877, Tarnier invented a forceps (Fig. 774) which he believed per-

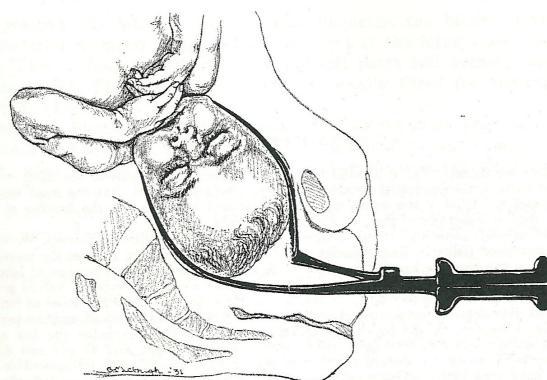


FIG. 773.—BARTON'S FORCEPS.

Useful only to pull a high transverse head into the excavation. Then finish with a Simpson.

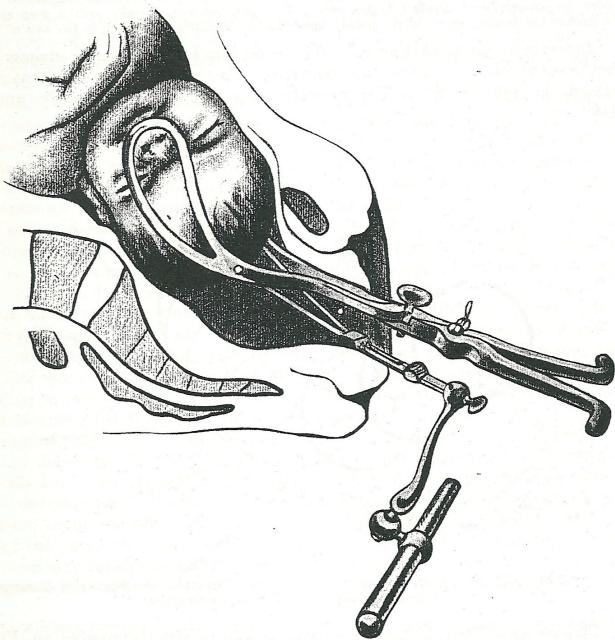


FIG. 774.—TARNIER'S AXIS-TRACTION FORCEPS APPLIED AT THE INLET.

Note unfavorable prehension. Fortunately, the head is often more flexed, and there is some slight anterior rotation, wherefore the blade does not injure the face as much as would occur in the case illustrated. Traction should be made, according to Tarnier, in the direction indicated by the handles.

ssessed these advantages: (1) it allowed traction to be made in the axis of the inlet; (2) while the head was fixed in the forceps the traction apparatus was so jointed that the head was given free mobility and could follow the impulses of the mechanism of labor; (3) the handles of the forceps could be used as indicators of the lines the head was following.

Axis-traction forceps are not universally recommended by obstetric authorities. We cannot share the enthusiasm of Williams, Kerr, Murray, and others for axis-traction forceps. By means of Payot's maneuver we can give the head a direction which a knowledge of the mechanism of labor will indicate; by careful observance of the tendencies of movement which the forces of nature give the head we can determine in which way to apply traction, and we can aid one or the other as required. With the axis-traction device there are so many joints between the operating hand and the head that it is impossible to impress on the latter any specific motion. All the knowledge one has accumulated regarding normal and abnormal labor mechanisms goes for naught, and all one can do is to pull blindly on the cross bar. In actual practice, where we have applied both instruments on the same case, we have been better satisfied with the simple Simpson forceps and we seldom use any other. Deep injuries to the maternal tissues are just as frequent with the new forceps. The Tarnier instrument has a murderous cephalic curve, cognizance of which should be taken when screwing together the handles, otherwise a large number of dead and injured children will be the result. In all axis-traction instruments there is the possibility of the curved arms or the joints bending or breaking under the powerful force applied. DeLee witnessed 3 such accidents. Finally, with a deep episiotomy we remove the perineal curve of the pelvic canal enabling almost a direct pull in the axis of the inlet.

*Indications for High Forceps.*—These are the same as usual—danger to the mother or child—but in this case, occurring at a time when the head has not yet passed through the inlet. The indication for forceps here must be unusually strict.

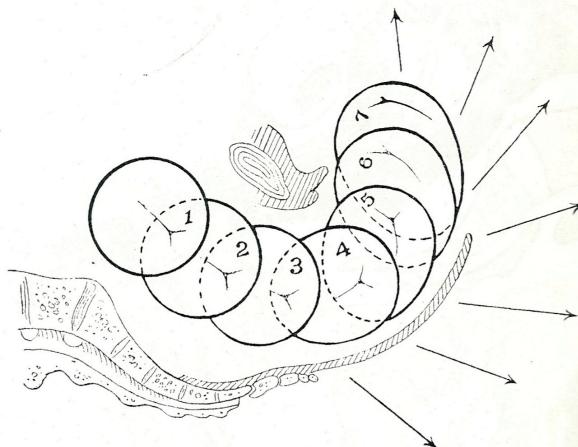


FIG. 775.—DIAGRAM TO SHOW DESCENT, FLEXION, AND ROTATION OF HEAD AND DIRECTION FOR FORCEPS TRACTION AT DIFFERENT STATIONS.

*Conditions.*—These also are as usual, and to be strictly insisted on. Engagement of the head must be so nearly accomplished that the physician feels certain a little pull from below will help the head into the pelvis, which means that molding of the head must be well advanced. The pelvis may not be too contracted—not less than  $8\frac{1}{2}$  cm. in flat, and 9 cm. in the justomimor types. Dilatation of the cervix and retraction of the pelvic organs above the inlet must be positively complete.

The high forceps operation has always been and still is a controversial subject. Aside from the question of the propriety of the use of the forceps at all upon the high head, and of the employment of axis traction, the difference of opinion has been upon the prehension of the head. Smellie, Baudelocque, and

others grasped the head in its biparietal diameter, the blades lying in the anteroposterior diameter of the pelvis, the front of the forceps pointing to the occiput. This is dangerous to the maternal soft parts and perhaps also to the bony structures. The Kielland forceps is especially fitted for anteroposterior application (Fig. 776).

If an x-ray picture of the inlet is available and we know the exact position of the head and how it is trying to enter the pelvis, it is easy to decide how to grasp it, what forceps to use, and what mechanism to favor or alter. A high transverse head in a round pelvis is best seized anteroposteriorly, and here Barton's or Kielland's forceps is useful, but the long Simpson forceps can be made to serve. If the pelvis is longer anteroposteriorly, place the forceps in its transverse diameter, grasping the head in an oblique. It may be possible to adjust even a high head to a position favorable to a proper application of forceps. Remember, art without science is like a ship without a rudder.

In applying the blades, the half or even the whole hand should be inserted as a guide, as the operation is much more complicated than usual. Locking the instrument is also attended with more difficulty. To prevent serious injury to the head, the handles must not be tightly screwed or forced together. Adaptation of the blades may be helped by the hand outside, since one can see and feel the tip of the instrument through the lower abdomen.

Since high forceps is an operation of trial, we must be guided by the effects of our efforts. It is allowable, indeed proper, to make two or three different prehensions of the head and moderate tractions following each one, the object being to discover the mechanism intended by nature, *i.e.*, the one best suited to the case.

With the long Simpson forceps we usually start with a pelvic application and make an unprejudiced traction using the Saxtorph-Pajot maneuver (Fig. 772). Occasionally the head enters the pelvis or makes enough progress to encourage one or two more pulls in the same manner. If the head shows any tendency of rotation whatever, this should be favored, even if the occiput goes posteriorly. The operator will feel instantly if he is on the right track.

If not, a second application of the forceps should be made, grasping the head anteroposteriorly, front of forceps pointing to the occiput. In a flat pelvis the head is to be brought through the inlet with the sagittal suture in its transverse diameter. In a normal pelvis one may try to bring it down in one of the oblique diameters, following nature's guidance as to whether the occiput is to go anteriorly or posteriorly, and it is necessary to take into account the degree of flexion and asynclitism and act accordingly. One tries to impart first one, then the other movement, following that which seems more favorable and which best conforms to our idea of the shape of the pelvis. The maneuver is like trying to pull a clenched fist through a knot hole in a board.

In extracting, it is to be remembered that the high forceps is an operation of trial—of diagnosis. If 6, or at most 8, well-directed tractions make no impression—do not bring the head lower—the instrument must be removed and we must confess failure. If the head does move a little with each traction, the operation should be gently completed, taking plenty of time. After the head has entered the pelvis the case comes into another classification. It may be delivered as an ordinary forceps case, or the delivery may be left to nature or to follow a subsequent indication.

**The Kielland Forceps.**—In 1915 Kielland introduced a new forceps. It bears slight resemblances to several ancient models, and its principles are not new. Kielland asserts that by discarding the pelvic curve of the forceps one can apply the instrument in the sagittal diameter of the pelvis, thus adapting the blades to the sides of the head when it lies with its long diameter in the transverse diameter of the pelvis. He also uses his forceps as a simple rotator after the head is engaged in

the excavation, claiming to master both high transverse arrest and occiput posteriors with ease and safety. For mentoposterior positions and brow presentations the forceps are said to be particularly successful.

We have used it sufficiently often to believe that it should have a place in the specialist's armamentarium. However, it is the man behind the forceps more than the instrument itself that accomplishes the results. In low operations the Simpson forceps cannot be superseded; in deep transverse arrest and engaged occiput posteriors almost always sufficient anterior rotation can be effected manually without the necessity of using the forceps as a rotator; in high arrest, version is usually the operation of choice if cesarean section is not selected—otherwise one makes a trial with the forceps. Here the Kielland instrument should score its greatest success, but in our hands the long

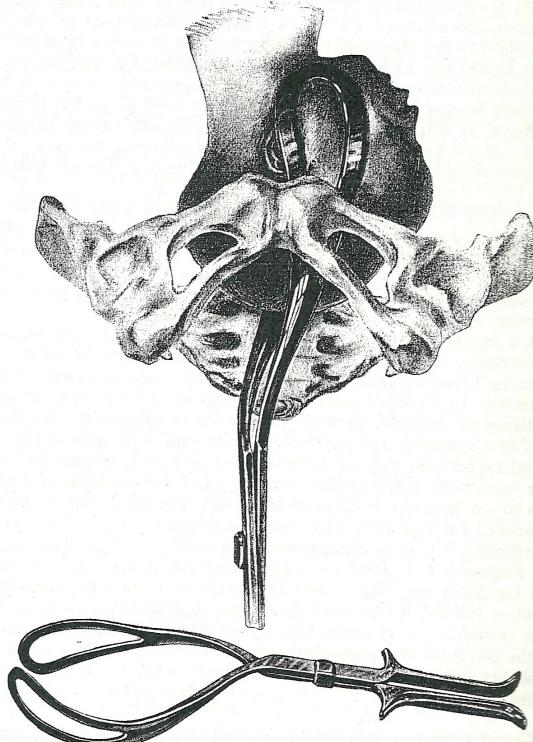


FIG. 776.—KIELLAND'S FORCEPS. APPLIED AT THE INLET.

Simpson and the Barton forceps have been equally efficient. In cases of asynclitism, the Kielland forceps is ideal. Because of the sliding and not fixed lock, the blades may easily be applied and locked and usually during the first traction, the head becomes synclitic. We differ with Kielland in the manner of inserting the anterior blade. Kielland inserts this blade behind the symphysis upside down and then rotates it into position inside the lower uterine segment. This may be dangerous and therefore, we insert the anterior blade by making it wander into place (Greenhill). An improvement of the Kielland forceps was made by Luikart who closed the fenestra and modified the left handle (Fig. 777).

**Failure of the Forceps.**—Suppose the instrument has been applied and several tractions made, but the head does not advance. What to do?

When an unexpected difficulty appears, the forceps are to be removed and the cause of the failure investigated. Errors in position (an unrecognized occiput posterior), insufficient preparation of the soft parts, constriction rings, and a greater disproportion between the head and the pelvis than was expected will be found to be the usual causes of the trouble. If the pelvis is found too small or the head too large, if the baby has not suffered from overzealous attempts at delivery, and if the chances of infection are slight, cesarean section may be performed, otherwise, embryotomy is the horrible alternative. Unprepared soft parts occasionally defeat a forceps operation, and if their resistance is overcome by force, frightful lacerations are the result and the baby is usually lost. Therefore, the operation had better be suspended and a large metreurynter inserted into the constricting zone. An unrecognized abnormal position of the head is the most frequent cause of failure with the forceps. When this is corrected the delivery is usually surprisingly easy.

Curiously, and in contravention to all classic obstetric rules of conduct in such cases, one may sometimes perform podalic version and extraction, even after the head is engaged, and after attempts with the forceps have failed. Version and forceps are not complementary operations; rather, when version is indicated, the forceps are contraindicated (see the conditions for these two operations on pp. 954 and 980). Yet occasionally a case will occur when the circumstances detailed above exist, or a mistake in judgment has been made, or the cord prolapses, and one may depart from accepted dogma and secure a happy result by an unorthodox procedure.

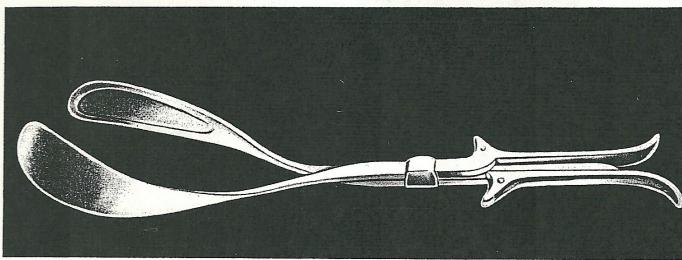


FIG. 777.—*LUIKART FORCEPS—NOTE STANDARD PELVIC AND CEPHALIC CURVES OF BLADES, CLOSED FENESTRA, SLIDING LOCK, AND MODIFIED LEFT HANDLE.*

**Prognosis of the Forceps Operation.**—For the mother the dangers are injury, hemorrhage, and infection. Some tearing of the soft part of the maternal pelvis is inevitable, and the number and severity of the lacerations increase the higher up the forceps are applied. High forceps show the most and the worst injuries, which may be atrocious if the dilatation of the cervix is not complete. If rotary motions with the forceps are made, the vagina may be twisted from its connective-tissue attachments, the cervix may be caught in the grasp of the forceps and be bruised or torn off bodily; or the operator, thinking the blade is inside the cervix, may use force, and as the tip of the instrument is in the fornix, he may punch through this up, under, or through the peritoneum.

The vagina itself may be torn or cut by the blades of the forceps and the vulva also, especially when the blades are bent upward in the delivery of the head. The edges of the forceps may cut the crura of the clitoris and cause severe hemorrhage, or pressure necrosis which may go to the bone. In severe forceps operations the symphysis pubis and the sacro-iliac articulations may be ruptured, and such women will have pain in the lower spine and back, with more or less invalidism all the rest of their lives. The bladder may be torn into, or may be pulled off its pelvic attachments and be permanently prolapsed. Scars

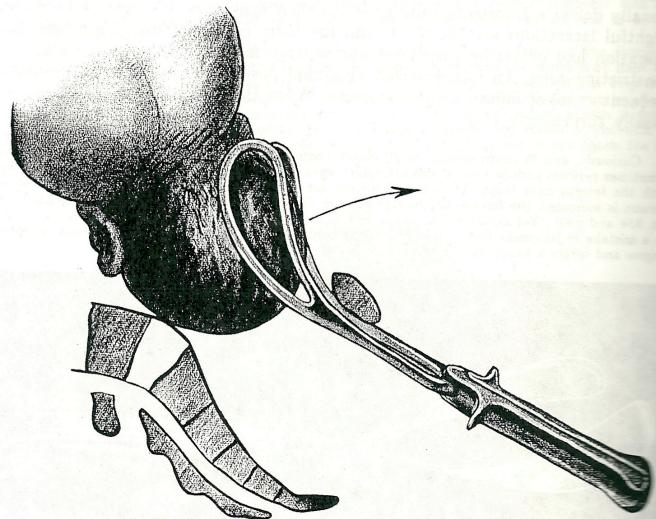


FIG. 778.—SLIPPING OF FORCEPS. HORIZONTAL SENSE. EXAXIAL.

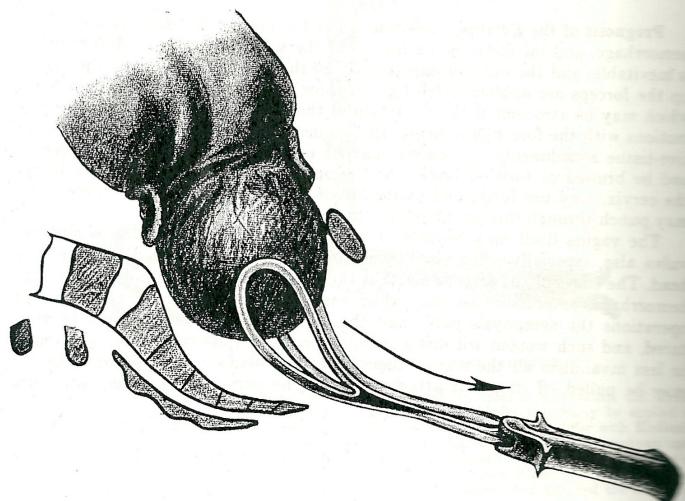


FIG. 779.—SLIPPING OF FORCEPS. VERTICAL SENSE. AXIAL.

in the vaginal wall may distort the bladder sphincter, causing incontinence-cystitis. Injury to the pelvic floor is a constant sequela to forceps delivery. Postpartum hemorrhage results from the tears and from uterine atony. This is common from lapses of asepsis and from the ease with which contaminated wounds are successfully attacked by bacteria.

Most dangerous to both mother and child is *slipping of the forceps*. This happens in two ways: in the vertical sense, that is, the forceps slide off the direction of the line of traction; and in the horizontal sense, that is, the forceps slip off in a line perpendicular to the line of traction, the patient being incompletely erect (Figs. 778 and 779). We believe the terms "axial" and "exaxial" slipping more clearly express the conditions.

The causes of slipping of the forceps are: Grasping the head too low; forceps not being inserted high enough, under a mistaken idea of the degree of engagement; the blades feathered too much—a poor instrument; the head too small or too large—hydrocephalus; the head is not grasped right; the handles are bent up too soon as the head nears the outlet.

The sensation of slipping of the forceps is unmistakable. The handles seem to separate, and if the direction is to the front or back of the pelvis, the blades seem to jump off the head with a snapping noise, and they are usually disengaged. If the forceps slip off in the line of traction, *i. e.*, axially, one can feel the instrument advance while the head seems not to follow. Slipping of the forceps is commonest at the inlet, because here the walls of the pelvis do not hold the blades to the sides of the head. It is highly essential to discover the tender point early, because the lacerations caused by it are frightful. Removal of the blades and reapplication is the treatment. If the head is small, a small forceps must be secured. If there is a hydrocephalus, the head must be punctured.

*Dangers to the Child from Forceps.*—(1) Compression of the brain or asphyxia. (2) Fracture of the skull, with or without subdural hemorrhage. (3) Hemorrhage from rupture of the sinuses at the base of the brain or rupture of the tentorium cerebelli. (4) Concussion of the brain. (5) Crushing of the orbital plates, with retrobulbar hematoma and injury to nerves and muscles causing squint and ptosis. (6) Injury to the eyes, traumatic cataract, avulsion of the choroid, corneal opacity, retinal hemorrhage and enucleation of the eye. (7) Facial paralysis, from compression of the nerve as it comes out in front of the mastoid—usually good prognosis. (8) Pressure necrosis of the scalp, which adheres to the bone. (9) It is said that idiocy is more frequent after forceps delivery than after natural birth. (10) Cephalhematoma. (11) Compression or cutting of the umbilical cord with asphyxia. (12) It is possible that deafness may be due to injury or hemorrhage into the organs of hearing. (13) Erb's paralysis. (14) Indeed, no injury, however slight, has been observed, and, in general, forceps babies are more liable to infection, pneumonia and atelectasis.

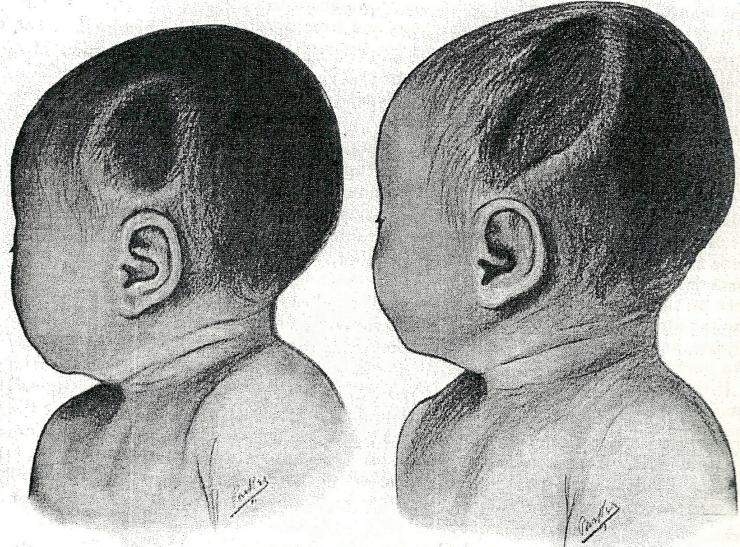


FIG. 558.—SPOON-SHAPED DEPRESSION, EXTRAC-  
TION BY BREECH.

Three successive children had the same injury.

FIG. 559.—GROOVE DEPRESSION, FORCEPS CASE.

This is a photo of Carol Landsberg taken a few days after she was born with forceps.

