

tion for small stones, the lateral for large. But small stones in the adult are preferably dealt with by lithotrity; hence the application of the median method is rarely advisable, except under two circumstances, namely, where there are many stones, all small, and where, with a single small stone (less than one inch in diameter), the patient's irritability is such that chill or constitutional disturbance follows every attempt to use instruments in the bladder.

Where the stone is small or large, but the bladder more than ordinarily irritable and inflamed, the lateral operation, with free incision of the prostate and vesical neck, is to be preferred.

In the case of very large stones, and indeed as a matter of prudence for all stones over one and one-half inch diameter, a modification of the lateral operation is called for, namely, bilateral section of the prostate to make more room for extraction; or, if the stone shows exceptional proportions, the combination of crushing with cutting (perineal lithotrity) and extraction of the stone in fragments, or the supra-pubic operation.

The medio-bilateral operation of Civiale does not afford so good an external opening for the extraction of the stone as the lateral, with bilateral section of the prostate, and, according to Thompson, is attended by as great hæmorrhage. Bilateral external incisions present no advantages over the single lateral cut. Recto-vesical external incisions, though greatly facilitating the extraction of large stones, are nevertheless very likely to be followed by recto-vesical fistulæ. The recto-vesical operation, performed by opening the bladder through the rectum behind the prostate, leaving the perinæum untouched, and sewing up the incision afterward with Sims's silver suture, although it has been practised with success, is difficult of execution, and only applicable to stones which can usually be more safely dealt with by lithotrity.¹

THE LATERAL OPERATION.

The lateral operation dates back to Pierre Franco, of Provence, about the middle of the sixteenth century, and claims the names of Jacques in the seventeenth century, and Rau, his pupil, in the eighteenth. It was popularized and practised with great success in England, by Cheselden, in the last century, and it is his operation which is still performed.

Instruments employed.—The instruments necessary for this operation are the searcher (Fig. 70), a staff of proper size with a long curve deeply grooved on its convexity (Fig. 100), the groove encroaching on the right lateral aspect of the staff toward the point. The handle of the staff should be broad, heavy, and marked with deep, crossed lines, so that it may be held firmly with greater ease. The groove should not

¹ In the female, the vagino-vesical section is a good one. According to Emmet (oral communication), the wound, if kept clean by irrigation, heals promptly without suture; or, failing, it might be brought together subsequently with silver ligatures.

run off at the beak, but stop abruptly, leaving the last quarter of an inch blunt and round. The scalpel should be firm, seven or eight inches long, with a stout shank, and solid back, the blade about three inches long (Fig. 101), the cutting edge about one and a quarter inch.

Blizard's probe-pointed knife (Fig. 102—A, English pattern), long, straight, with a stiff back, and (Fig. 102—B, American) a ribbed handle.

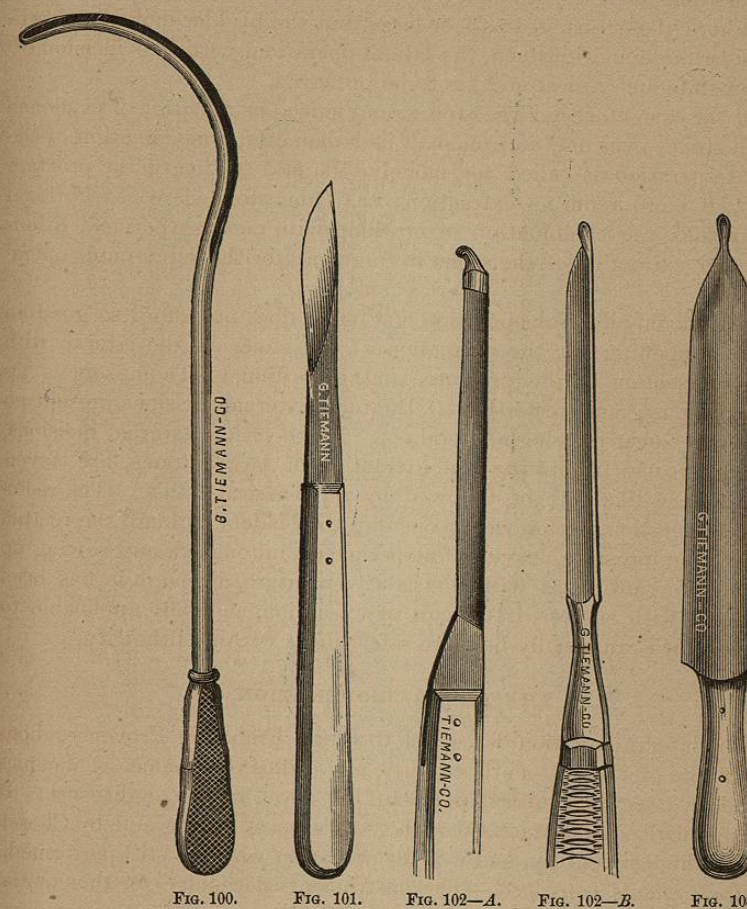


Fig. 100.

Fig. 101.

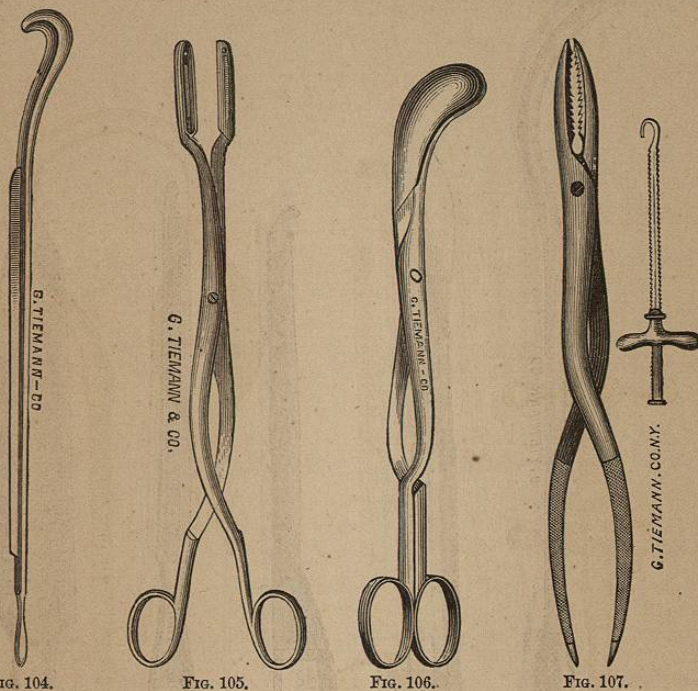
Fig. 102—A.

Fig. 102—B.

Fig. 103.

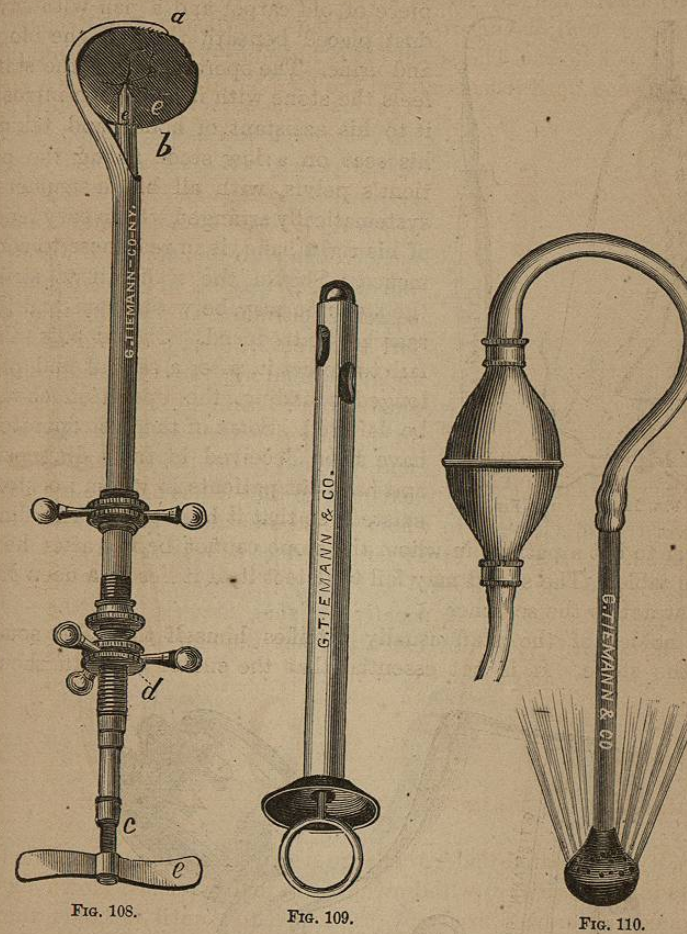
The blunt gorget, possibly useful where the patient is fat, and the perinæum deep (Fig. 103). The scoop (Fig. 104), several forceps of different sizes, with extremities roughened in the inside to hold the stone firmly, one with crossed handles (Fig. 105), so as to be opened sufficiently in a deep perinæum without stretching the wound unduly; another with its blades sharply curved (Fig. 106), so as to catch stones behind the

pubes, or in the "bas-fond." A heavy pair of forceps, with a central raised ridge of heavy teeth pointing backward (Fig. 107) in each blade, to catch and break stones which are found to be too large to extract safely, with an extra screw for attaching the blades, and drawing the jaws together. For the same purpose an instrument known as Maison-neuve's (Fig. 108), having its female blade terminate in a deep scoop. It is used as follows: The scoop (*a*) is introduced carefully through the perineal wound until it has entered the bladder, after which, by a lateral



motion, it is insinuated under the large stone. Now the male blade (*c b*), with its inner shaft (*ee*) withdrawn, is gradually pushed down against the stone, and screwed firmly by the wheel (*d*) until it holds the calculus fixed. Finally, the inner sharp "bit" at the end of the central shaft (*e*) is, by rotating the handle, driven through the stone (*e*), thus perforating it, and, by the assistance of the wheel (*d*), splitting it into fragments. A metallic tube, one-third inch diameter (Fig. 109), with an open end, and a large eye—furnished with an obturator for easy introduction—through which to wash out *débris*. Another tube, one-sixth inch diameter, provided with a globular head, about a half-inch diameter, having large holes in the globular head pointing backward (Fig. 110), and piece of rubber tubing on its proximal extremity—this to be used with

a Davidson's syringe to wash out *débris*. A shirted canula for hæmorrhage (Fig. 111), and a tenaculum which unscrews at the handle (Fig. 112, Keith's tenaculum), for the same purpose. Prichard's anklets and wristlets (Fig. 113). A soft French olivary catheter, brandy, hot and cold



water, sponges, towels, ligatures, ether, etc. These make up the necessary list of instruments. At least five assistants are necessary: one for the ether; one to steady each knee of the patient; one—the post of honor—to hold the staff; one to sponge and act as general assistant.

The Operation.—The patient is prepared beforehand as for any other capital operation, and in addition has the perinæum shaved and receives a full enema about two hours before the operation, to clear the rectum, after which he abstains, if possible, from again passing water.

He should be etherized in bed, and then carried to a small, firm table, and comfortably arranged on an old blanket. The anklets and wristlets are adjusted (or the hands and feet bound together with bandage). The pelvis is now drawn to the lower edge of the table, facing the light, a

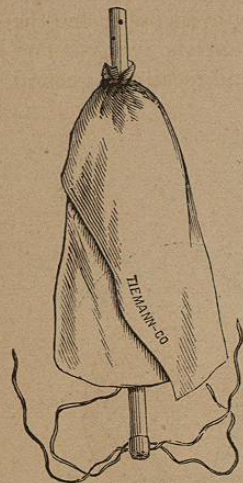


Fig. 111.



Fig. 112.

piece of old carpet and a pan with sawdust placed beneath to catch the blood and urine. The operator passes the staff, feels the stone with it, and then intrusts it to his assistant of honor, and, taking his seat on a low stool, facing the patient's pelvis, with all his instruments systematically arranged within easy reach of his right hand, is in readiness to commence. Should the staff fail to strike the stone, it may be withdrawn and the searcher introduced. Should this also fail to detect it, after a careful and prolonged sounding, the operation should be deferred. Some of the best operators have been deceived in their diagnosis, and have cut patients in whom no stone existed; so that it has become a cardinal

rule never to cut a patient in whom the stone cannot be felt after he is upon the table. The sound may fail to detect it, if it lies in a deep *bas-fond*, but not so the searcher.

The holder of the staff usually satisfies himself that the sound strikes the stone. It is not essential that the end of the staff should

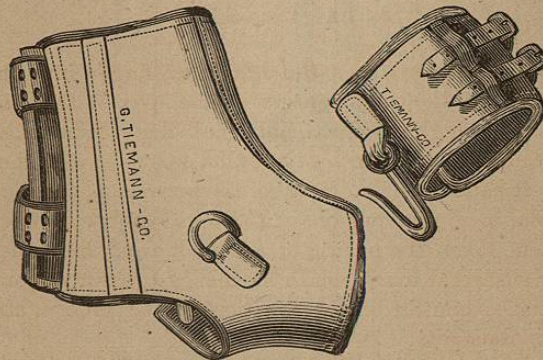


Fig. 113.

rest against the stone. As long as it is certainly in the bladder, nothing more is required. The chief assistant stands at the patient's left, holds the staff vertically, steadily, and firmly hooked up under the symphysis, with its long curve a little bellied out in the median line of the

perinæum, and keeps the integument of the latter taut by pulling the scrotum up around the staff. The assistants steady the knees, while the operator impresses his mind finally with the shape and size of the long outlet of the pelvis by running his fingers down the rami of the ischium, touching their tuberosities, feeling the symphysis pubis, and the coccyx. The surgeon should picture to himself a pelvis lying before him, in position, denuded of soft parts (Fig. 114), and recall the general inverted heart-shape of its outlet (Fig. 115).

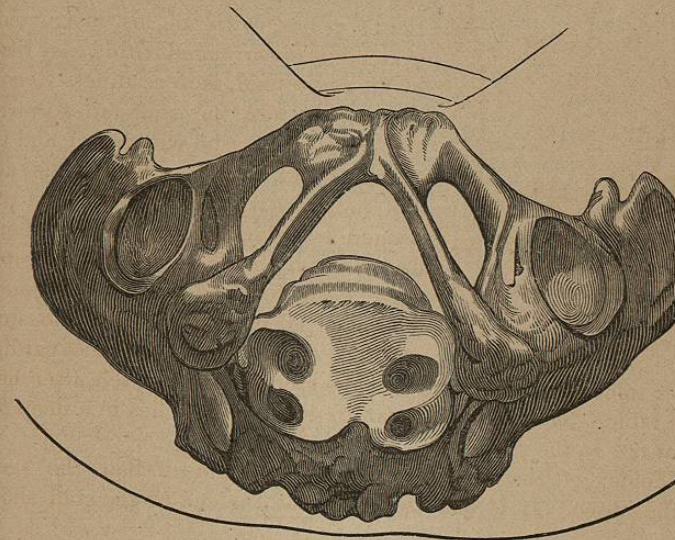


Fig. 114.—(Thompson.)

The operator now introduces the left index-finger into the rectum, assures himself that the sound enters at the apex of the prostate, and passes centrally through its canal, and that the rectum is empty and collapsed. Then, withdrawing his finger, he searches, with the thumb or finger of his left hand upon the raphe of the perinæum, for the groove in the staff, which, in a thin person, can always be obscurely felt. If he cannot feel it, he takes the handle of the staff from his assistant, and, by depressing it several times, while he makes pressure upon the perinæum, he satisfies himself of the position of the groove, and returns the staff to his assistant.

The scalpel is now entered a little to the (patient's) left of the raphe, from one and a quarter to one and a half inch in front of the anus, the point of the knife, guided by the nail, being made to enter the groove of the sound and open the urethra at the first cut. If the point enters the groove, it is to be pushed along for a quarter to half an inch—if it fails to strike the groove, it is made to pierce more or less

deeply—and then, with a single bold stroke, the first incision is made laterally to the right, about three and a half inches long, terminating exactly midway between the tuber ischii and the anus. The scalpel is again entered into the groove, and the urethra amply opened. The practised lithotomist sometimes uses the same knife to complete the operation, but, as a rule, it is better, at this stage, to change the scalpel for Blizard's knife. The probed point of the latter, following the guiding index-finger, is passed into the groove, and the surgeon takes the handle of the staff, depresses it somewhat, and, following the groove, pushes his knife along until its point is arrested by the abrupt termination of the groove at the end of the staff. He now increases the angle between his knife and the staff by depressing the handle of the former, and, remembering the position and shape of the prostate, he cuts his way out, his incision through the prostate being at about an angle of 30° with the horizon, his external incision at an angle of about 50° . A glance at Fig. 115 shows at once the relation between the incisions and their relation to the prostate and anus.

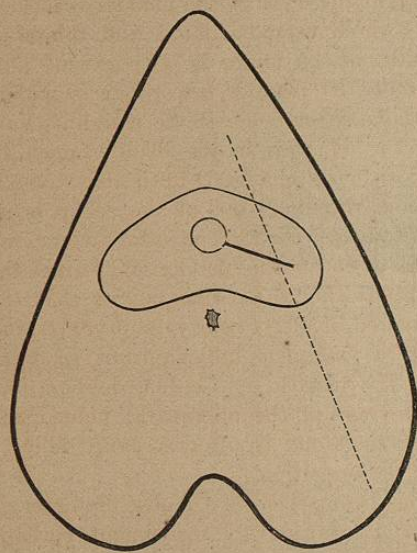


FIG. 115.—(Thompson.)

A gush of urine usually follows this incision. If the external incision has not been bold enough, it may now be enlarged with a few strokes of the scalpel.

If the above directions are followed, there is little danger of that disagreeable accident, cutting into the rectum.

Instead of dividing the prostate with the knife, numerous ingenious lithotomes have been devised, which incise to a greater or less distance, according to a previously-arranged gauge, or can only cut to a limited extent, as in the bisector of Wood, and that of Post, of

New York. The single-cutting "lithotome caché," of Frère Côme, and the double instrument of Dupuytren, with their many modifications, of which that of Briggs, of Nashville, is simple and efficient, all of these are undoubtedly good; but the surgeon should learn early to depend as much as possible upon his brains and his fingers, and as little as possible upon instruments, if he would acquire self-confidence, without which any operation for stone is unsurgical. Hence it is advisable for

the young surgeon to familiarize himself with the use of the scalpel and Blizard's knife, and to do all his cutting with these instruments, or even with the scalpel alone, remembering that the greatest average lateral dimensions of the adult prostate are only one and a half inch, and that a depth of incision one-half, or at most five-eighths of an inch, into one side of the prostate should be a limit never surpassed—dilatation will do the rest.

Having now completed the incisions, the index-finger of the left hand should be gently introduced into the bladder, and the sound withdrawn. The finger usually comes at once in contact with the stone. The bladder's neck is now to be dilated slowly but thoroughly with the finger—if the perinaeum be deep with fat, with the blunt gorget, carried in along the groove of the staff. If the stone has been previously measured, and is less than one inch in diameter, or if there are many small stones, the surgeon should proceed to extract at once. If, however, the stone is above one inch in diameter, Blizard's knife should be reintroduced on the finger, and the prostate cut on the (patient's) right side. After being satisfied that the neck of the bladder is nicked, the prostate sufficiently cut, the whole wound dilated and dilatable, the forceps is passed into the bladder as the finger is withdrawn. One blade is depressed into the floor of the bladder, the other is widely opened, and usually, on closing them, the stone will be caught. Failing in this, search laterally and further back in the bladder must be made, the direction of the blades being changed, until the stone is seized. In cases of deep perinaeum the small end of the scoop is introduced until it touches a stone, and then the forceps is followed along upon the scoop as a guide until it enters the bladder and strikes the stone. It should never be forgotten during these manœuvres that the bladder, usually already much inflamed, is often nearly empty, clasping the stone, and that any roughness or force may inflict serious (perhaps fatal) injury upon the patient. The utmost gentleness, deliberation, and care are necessary during this stage of the operation; indeed, the catching and skillful extraction of the stone is often a more delicate proceeding than any other part of the operation.

If it is found that the stone has been seized in a faulty diameter, it should be dropped or pushed out of the jaws of the instrument, perhaps rolled over with the finger, and another attempt made to catch it correctly. Extraction should be slow, the traction being made in the line of the external incision, downward and outward. Lateral motions should be given to the forceps during extraction, the force being about two-thirds lateral, one-third extractive. It must be remembered that the most fatal source of danger in lithotomy is bruising and lacerating the neck of the bladder in forcible efforts at removing the stone; and, if, after the exercise of a sufficient amount of force—the amount to be learned only by experience—the stone will not engage in the outlet of

the bladder, it is far more brilliant morally, and better surgery, to break the stone and carefully extract the pieces, than to remove by force a handsome specimen to show, with the risk of having to attach to its history, "Result fatal."

After one stone has been extracted, if it is found to be smoothly rounded and presenting no facets, there is probably no other present; if it has facets, the reverse is almost, if not quite, certain to be the case. Phosphatic calculi are often multiple, uric acid less commonly so, oxalate of lime often single. In any case after extracting one stone, careful search should be made for another with the searcher, and the small end of the scoop through the perineal wound. Should any stone break during extraction, and in those rare cases where a quantity of *débris* is found in the bladder, partly adherent to ulcerated patches of mucous membrane, the large end of the scoop is to be used to spoon out the earthy matter, and then copious injections of tepid water are to be thrown into the bladder with the Davidson's syringe through the large tube (Fig. 109), or the bulbous-headed irrigator (Fig. 110), until the bladder is clean.

When the stone is found to be encysted, or fixed in position by some faulty contraction of the bladder behind the pubis, or in the fundus, the dexterity of the operator may be taxed to seize it with the forceps, but intelligent efforts, gently and carefully prolonged, will usually overcome the difficulty. If the stone is deeply encysted, it may be impossible to liberate it. The neck of the cyst may be nicked in several places, efforts made to gnaw off any projecting portions of stone, and gradually to insinuate the narrow blades of a small curved forceps to extract it. Each case must be coolly studied out at the time; no definite rules, covering all contingencies, can be given.

VERY LARGE STONES.—Where the stone is found to be too large to extract safely, it must be broken, a procedure by no means modern, as it is referred to by Celsus. This is not an easy task in an irritated bladder, contracted about a large calculus. If the heavy-jawed forceps (Fig. 107) can be made to grasp the stone, it may be thus broken up. Should the large calculus slip from the bite of this instrument, the more formidable crusher (Fig. 108) may be resorted to, or an instrument devised by Civiale (Fig. 116), who employed it a score of times with extremely successful results.¹ The instrument is favorably mentioned by Thompson. Civiale employed it for stones weighing about one ounce and a half, and over. It is somewhat complicated, but serviceable. With one of these instruments the stone is to be carefully broken up, and the fragments removed with great circumspection, as their rough, broken angles are fertile sources of laceration and severe contusion. When practicable, any prominent sharp edge should be protected by the finger of the operator, on its way out through the soft parts. The *débris* is dealt

¹ "La Lithotritie et la Taille," Paris, 1870, p. 440, *et seq*

with by syringing through a tube, as already described. Crushing a large stone *in situ*, although a serious proceeding, and necessarily jeopardizing the success of the operation, is nevertheless countenanced by high authority, and has proved wonderfully serviceable. Mayo, of Winchester,¹ extracted successfully by this process a stone weighing fourteen and a half ounces, which certainly could not have been otherwise removed.

Hæmorrhage during the operation is rarely profuse. The lower part of the bulb is generally cut into. Spurting-points should be tied as they occur, or twisted. When the bleeding-point is deep in the wound it is difficult to tie, and removing the tenaculum may loosen the ligature. To meet such an emergency, it is proper to tie in a tenaculum, and for this purpose Keith's idea (Fig. 112), of having a tenaculum from which the handle may be unscrewed, is a good one. Thompson² says, "I believe I have saved a life on one or two occasions by tying in a tenaculum." In one instance the instrument was left in ten days, when it came away spontaneously. Gross's artery-compressor (Fig. 117) is suitable for the same purpose; the artery is seized and compressed, the handle unscrewed, and the blades left in the wound.

Digital pressure for several hours of the pudic artery against the ischio-pubic ramus may serve to arrest arterial hæmorrhage, otherwise uncontrollable. Ice and iced-water irrigation is an adjuvant which may be resorted to. Even the pudic artery may be tied by taking a short, stout, curved needle with a holder, introducing it through the soft parts close to the anterior border of the bone, bringing it out about three-quarters of an inch deeper, and then firmly tying the ligature which it carried.

¹ "Med.-Chir. Trans.," vol. xi, 1821, p. 54.

² *Op. cit.*, p. 44.

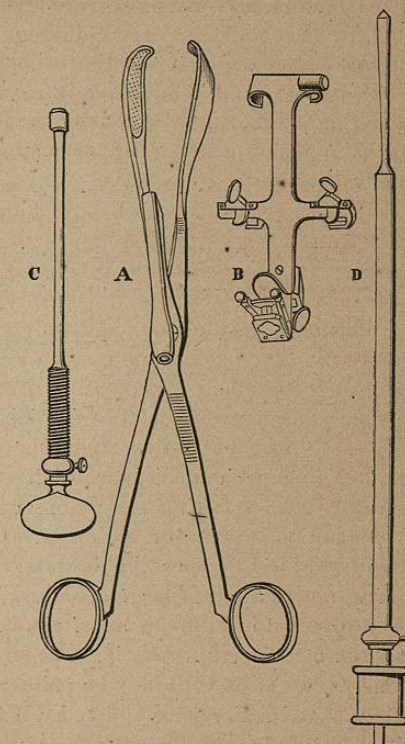


FIG. 116.—(Thompson.)
A, Forceps. B, Part to be fastened upon the forceps by screws. C, Part to be inserted through B. C steadies and fixes position of stone. D, Drill introduced through tube E is rotated to perforate and break up stone.

Venous hæmorrhage, unless profuse, may be disregarded; if severe, it calls for plugging of the wound. This is effected with the "shirted canula" (Fig. 111), or any female catheter will do, with a sufficiently large square piece of muslin having a hole in its centre, tied firmly around the tube, at about an inch from the extremity which enters the bladder—or even a soft sponge perforated by a female catheter. This is introduced deeply into the wound, and the flaring sack around the central tube is closely packed with small pellets of lint, sponge, or oakum, the whole kept in place with a snugly-applied T-bandage.

Generally all oozing may be arrested by simply bringing the thighs together, and bandaging the knees, thighs, and ankles. The mutual pressure of the two surfaces of the wound answers admirably well.

After-Treatment.—If the patient seems to be sinking during or immediately after the operation, before he has emerged from his anæsthesia, and, consequently, when he cannot swallow, an excellent means of stimulating him consists in passing through one nostril a soft French olivary catheter (about size 8) past the pharynx into the œsophagus, and throw-

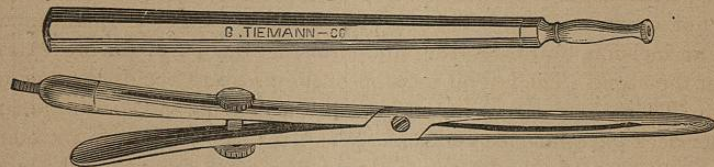


Fig. 117.

ing into his stomach small doses of brandy with a syringe. The catheter may be left in during the whole operation, and does not interfere with the administration of the ether. One caution is necessary: It is prudent, before injecting the brandy, to notice whether any air comes out of the catheter during expiration, as the instrument may possibly have passed into the trachea; if time allows the slower absorption, injection into the rectum may be substituted. The patient is placed upon a mattress, with the hips upon a rubber cloth and folded compress, and napkins placed under him, which, by being frequently changed, indicate the amount of hæmorrhage. Urine passes freely at first through the wound, always more or less tinged with blood. The wound swells so much sometimes, before suppuration is established, that part of the urine on the second day flows through the meatus, or, indeed, retention may come on. The latter is relieved by gently introducing a female catheter or a finger through the wound.

Opium may be given from the first to control pain, to be pushed judiciously on the appearance of any evidence of peritonitis. Diet should be light, but sustaining. If the patient has been addicted to stimulants,

he should not be deprived of them in moderation, and the same is true of opium.¹

The wound usually closes by granulation. As suppuration comes on, there is not infrequently a slight chill, with (surgical) fever, but the patient is, on the whole, comfortable, and delighted to be free from his old pain. Sometimes the wound becomes coated with urinary salts. This is prevented by frequent syringing with warm water, to which a few drops of dilute nitric acid have been added. (Certain complications are described after the median operation.)

LATERAL OPERATION IN CHILDREN.

In children the staff is smaller, with a shorter, sharper curve, as the bladder lies high; hence, the staff must be hooked well behind the symphysis. The incisions are made in the same manner as in the adult. The lower end of the rectum is often prolapsed in children with stone; this is reduced before the first incision, and kept in with the finger. There is little danger of cutting it, with the exercise of any ordinary care. The incision at the neck of the bladder usually, if not always, cuts entirely through the limits of the prostate, which is very minute before puberty, but it is a matter of no importance. Infiltration of urine does not occur after it. There is much more danger in making too small an incision, and lacerating and bruising the parts during extraction of the stone. The lateral incision of the prostate avoids the seminal ducts. There is danger in children, if the membranous urethra and bladder-neck have not been sufficiently cut, that an attempt to introduce the finger and dilate the latter may require so much force that the membranous urethra is torn across and the bladder pushed before the advancing finger. The mention of this accident will insure against its occurrence. Another caution must be given, namely, that the first opening into the urethra should be sufficiently ample to insure its easy discovery upon search, so as to avoid the necessity of making several openings at different angles in a small urethra—an accident which might be followed by stricture. All care is necessary in extracting the stone. Hæmorrhage in young subjects is very devitalizing. All the blood that is possible should be saved.

Children cut by the lateral operation rally with surprising rapidity. Every surgeon of large experience recounts cases where, on visiting the child twenty-four hours after the operation, he finds him up and playing

¹ A patient, past middle life, from whom I removed, by the lateral operation, eight phosphatic stones weighing collectively two ounces three hundred and twenty grains, had been so tortured by pain during a number of years by his malady, which had been unrecognized, that he acquired the habit of opium-eating. His daily dose was seventy grains of opium and two or three ounces of laudanum. After the operation his pain ceased, and his opium was rapidly cut down to a very small daily dose. But, although he did well in every other respect, his wound absolutely refused to granulate during several weeks. On this account he was allowed to resume his large doses of opium, and, when he reached nearly his habitual quantity, his wound rapidly granulated and went on to speedy union; after which his opium was again reduced.—KEYES.