May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 1

Fig. 1.

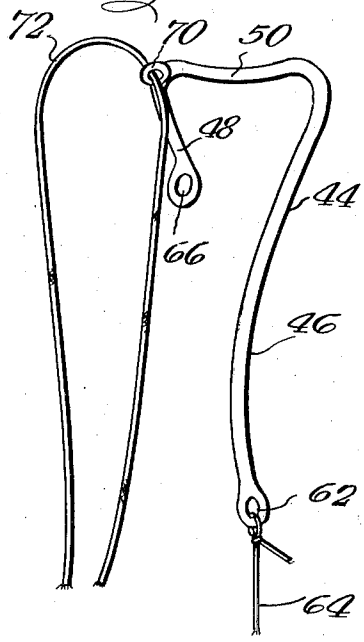


Fig. 2.

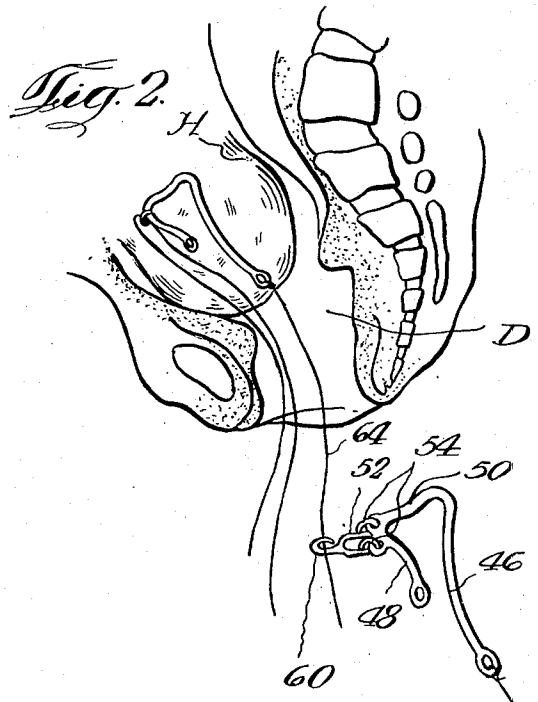


Fig. 3.

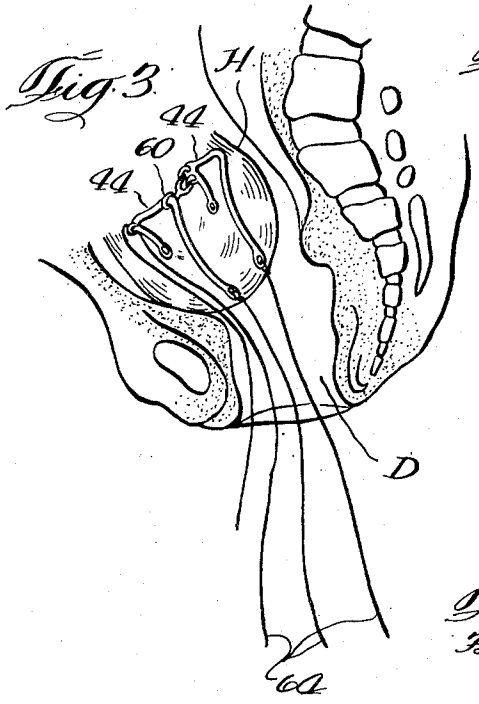
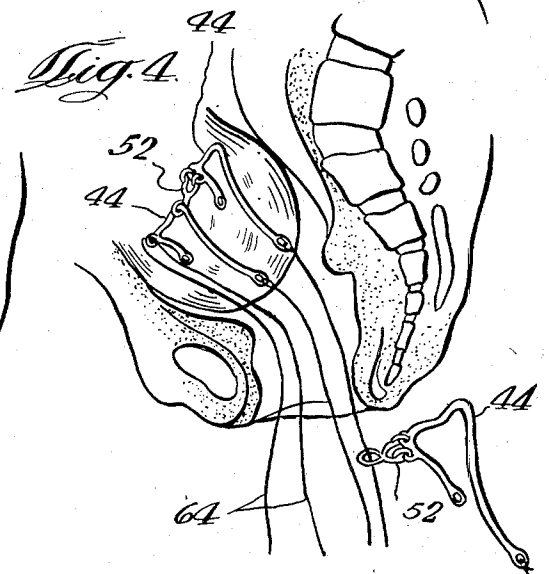


Fig. 4.



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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 2

Fig. 5.

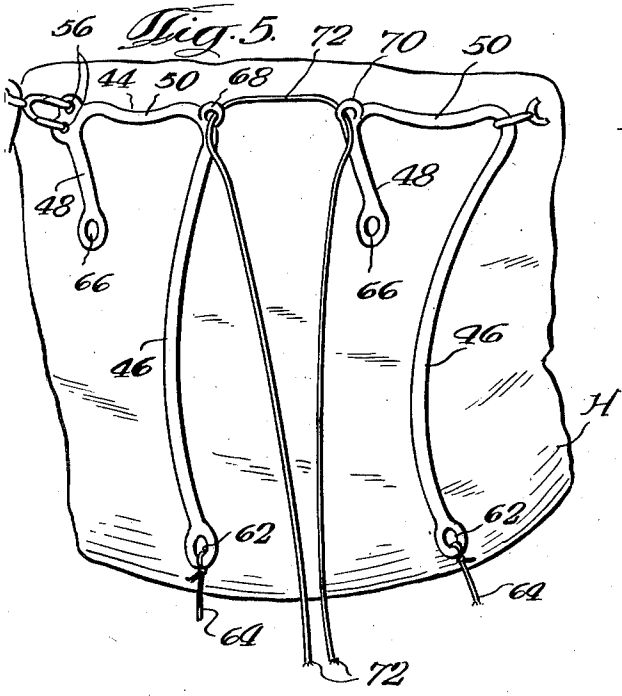


Fig. 7.

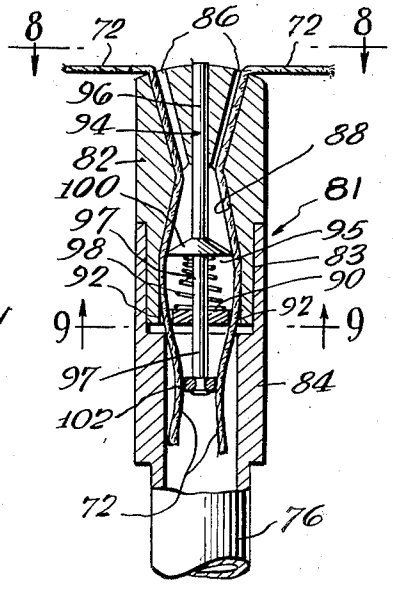


Fig. 6.

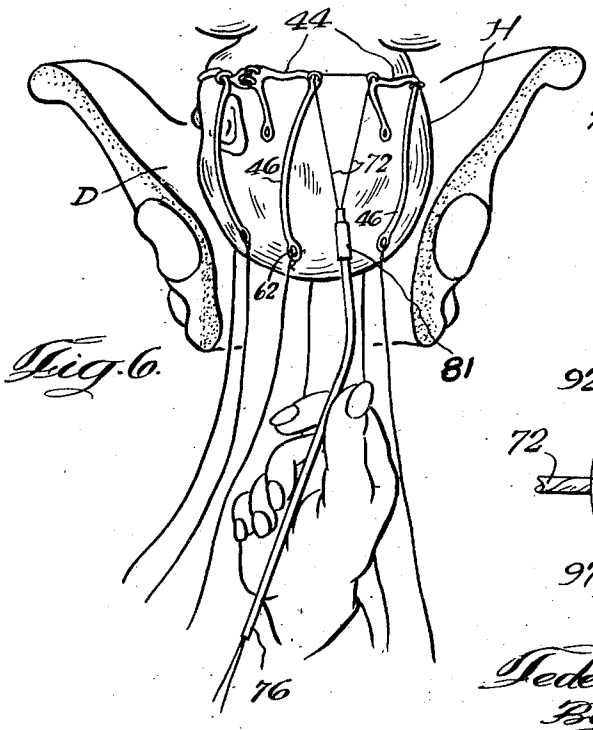


Fig. 8.

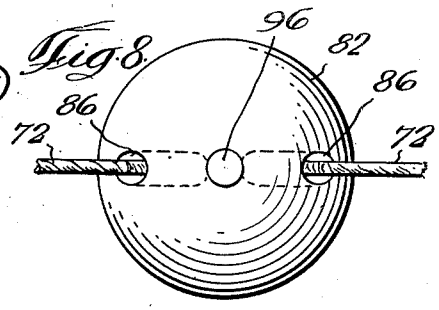
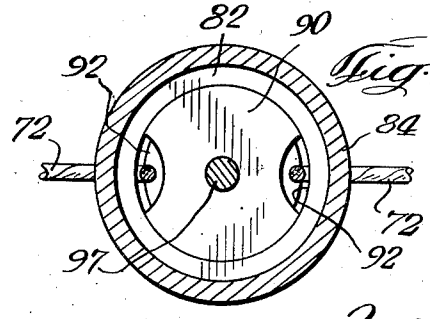


Fig. 9.



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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 3

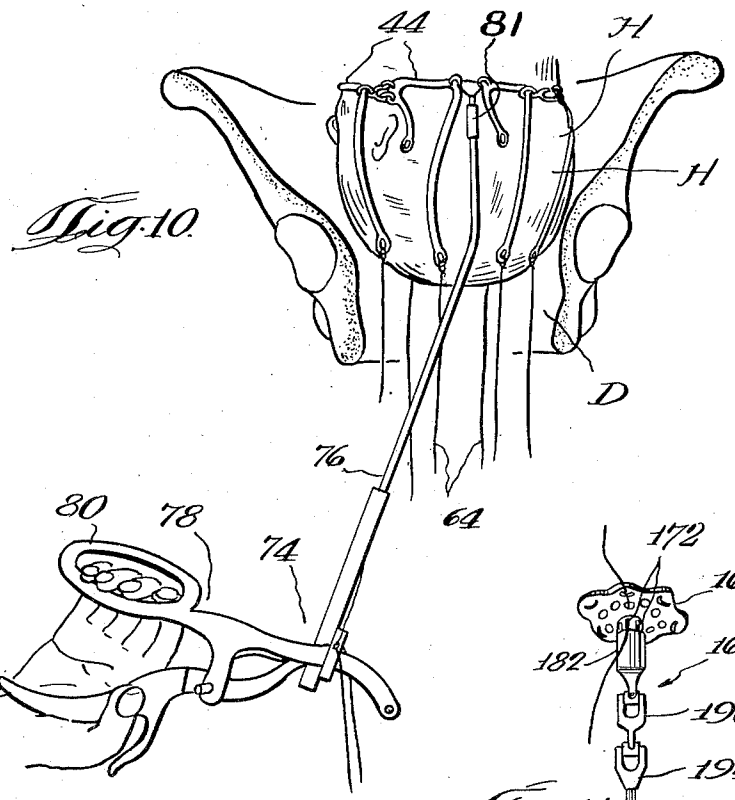

Fig. 10.

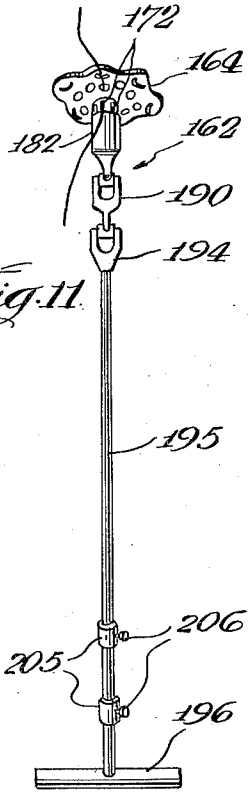

Fig. 11.

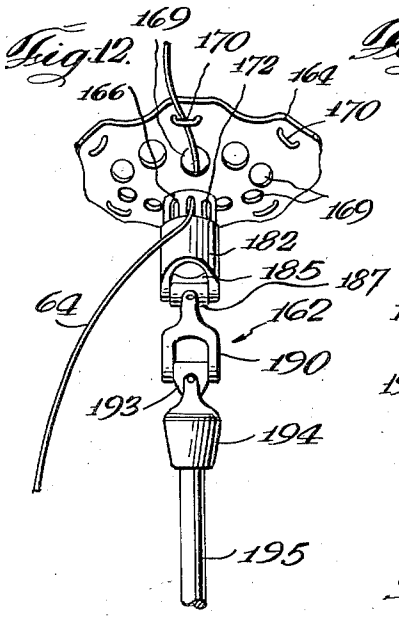

Fig. 12.

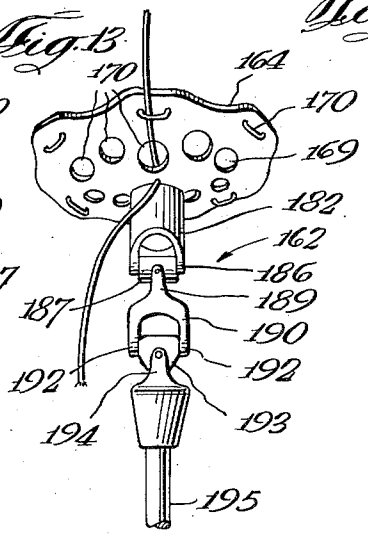

Fig. 13.

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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 4

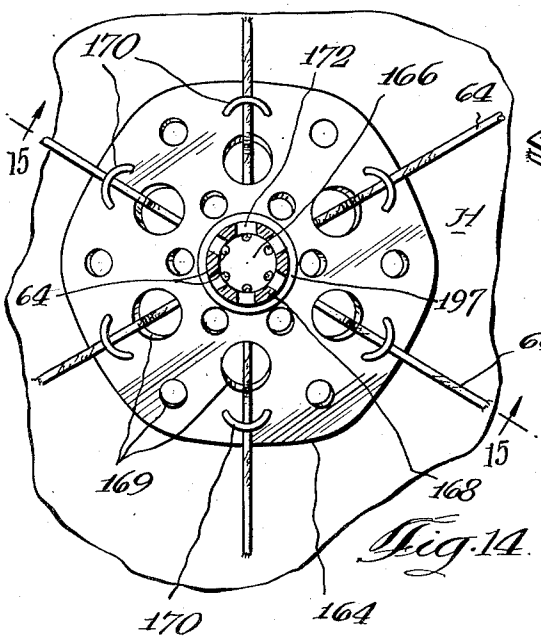


Fig. 14.

Fig. 15.

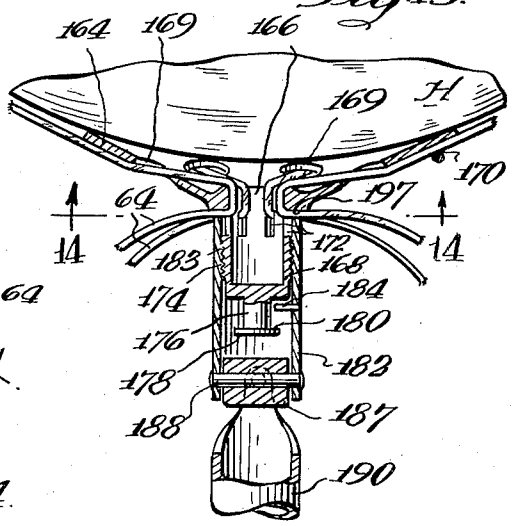


Fig. 16.

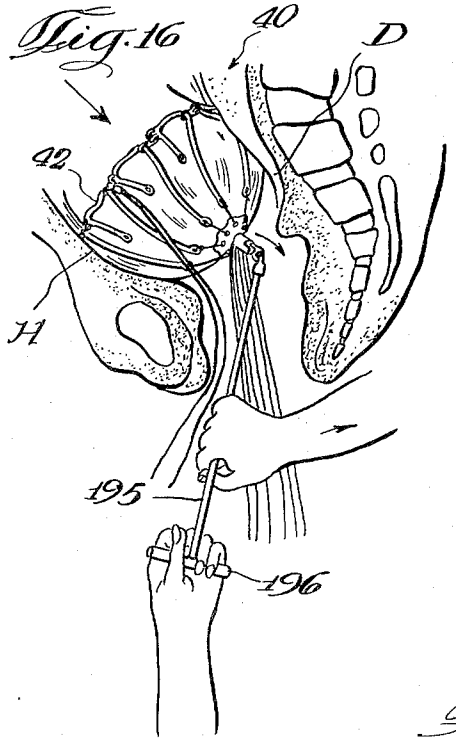
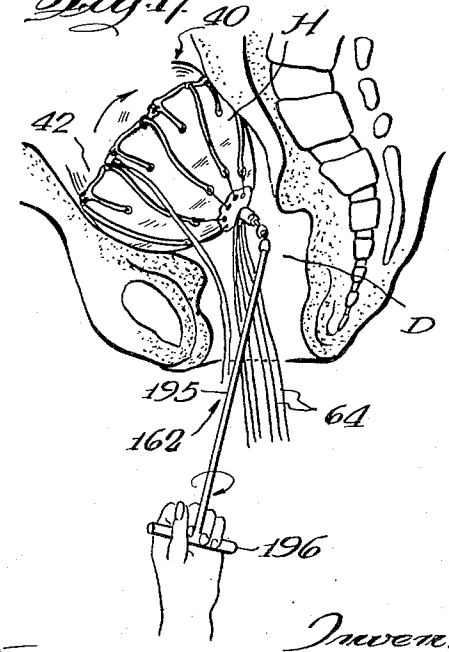


Fig. 17.



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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 5

Fig. 18.

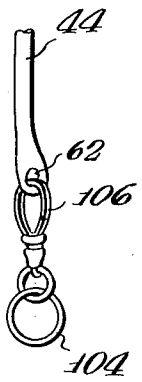


Fig. 19.

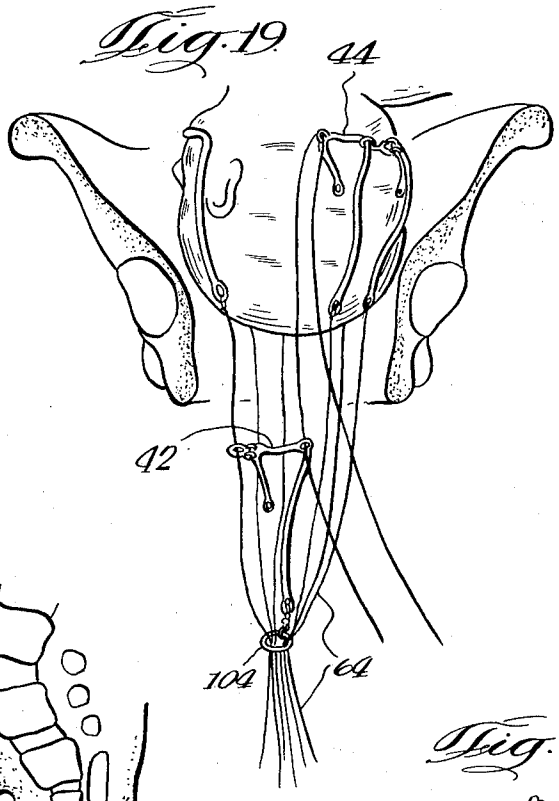


Fig. 20.

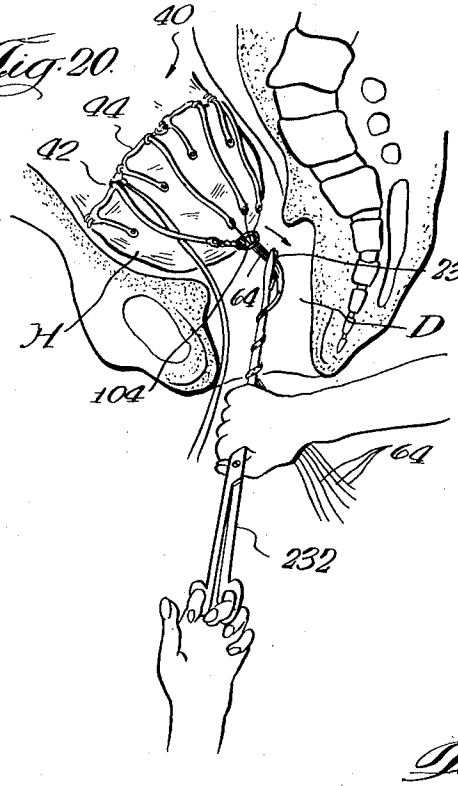
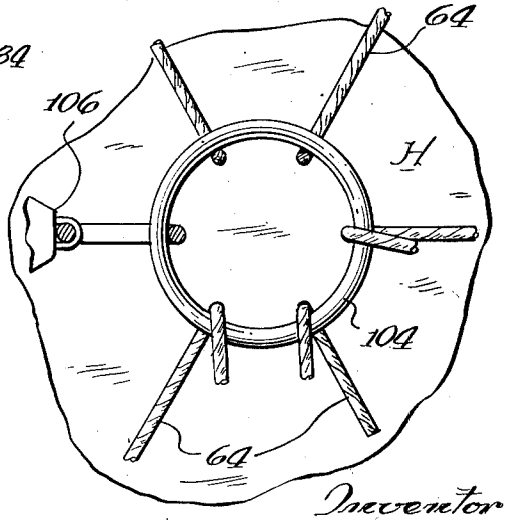


Fig. 21.



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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 6

Fig. 22.

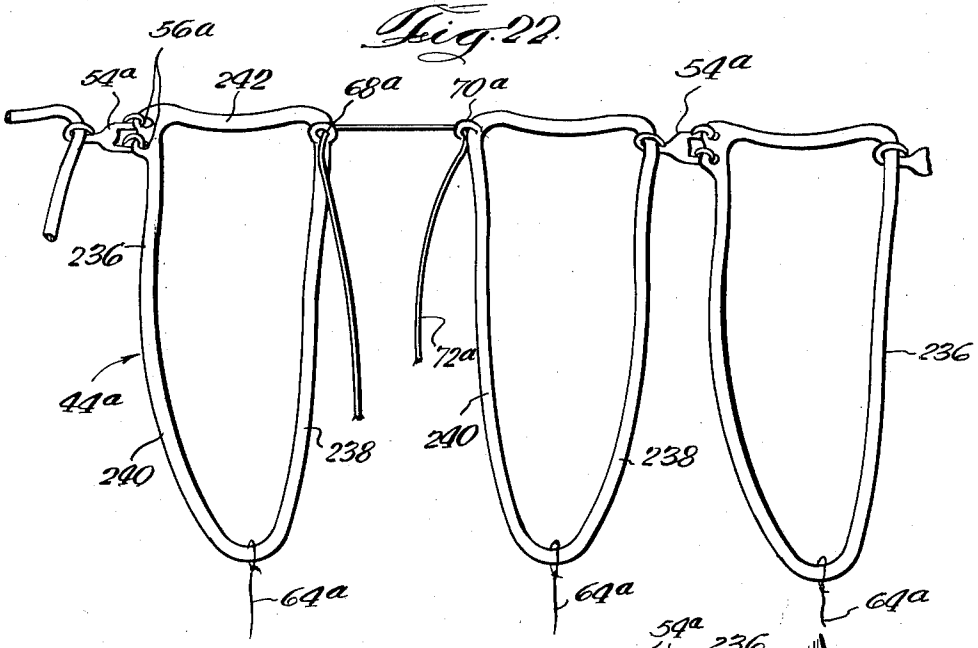
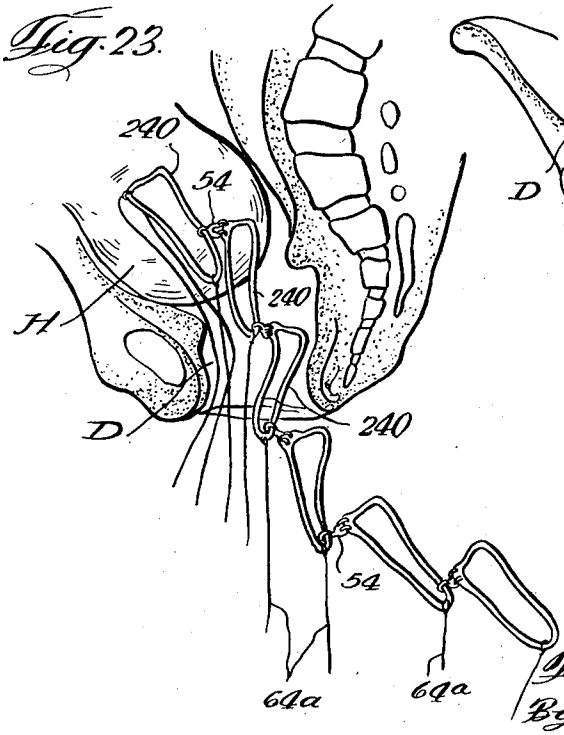


Fig. 23.



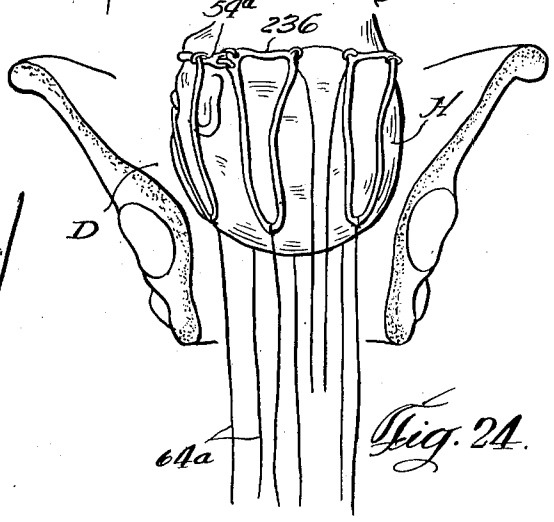


Fig. 24.

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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 7

Fig. 26.

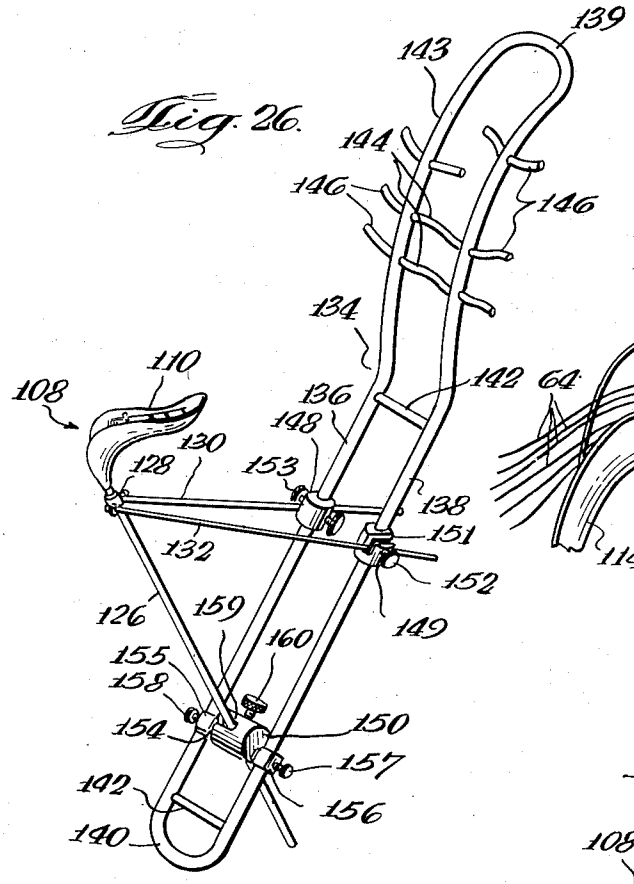


Fig. 25.

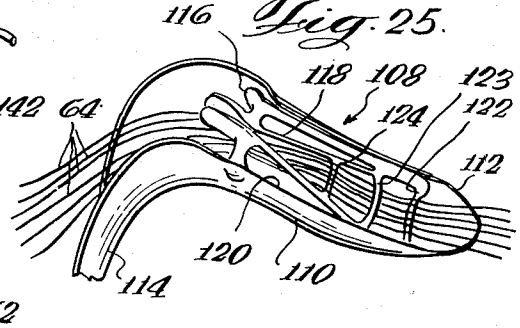


Fig. 27.

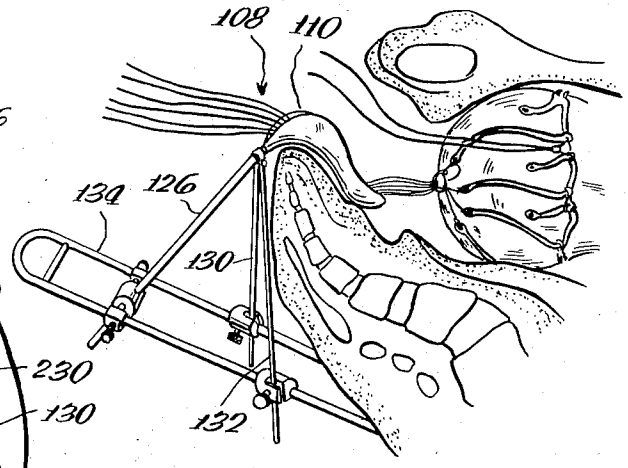
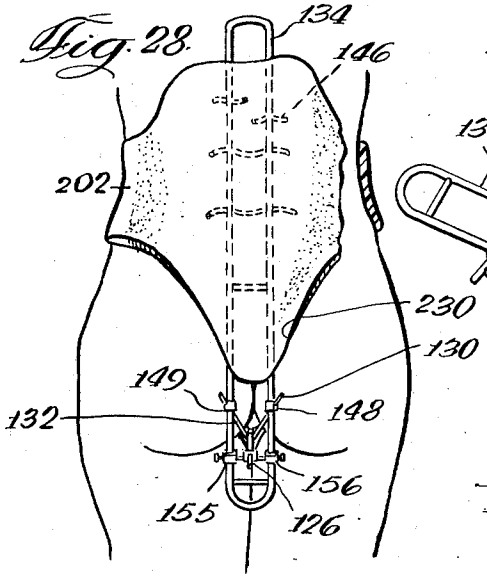


Fig. 28.



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May 21, 1957 F. D. C. GUERRIERO 2,792,838

OBSTETRICAL INSTRUMENT

Filed July 1, 1953 8 Sheets-Sheet 8

Fig. 29.

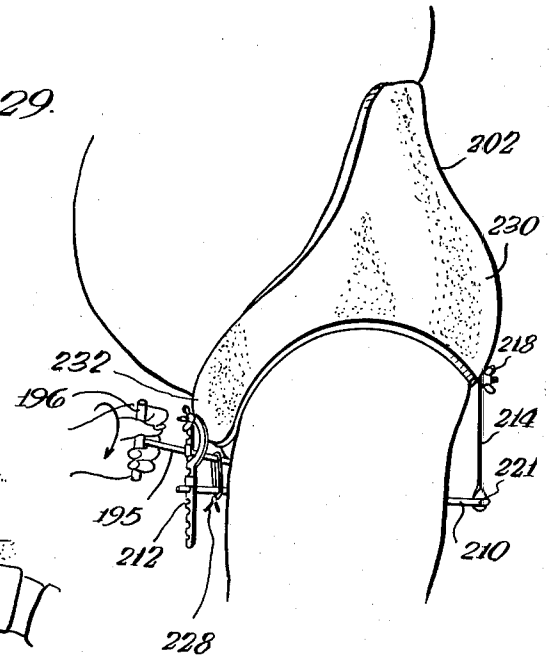
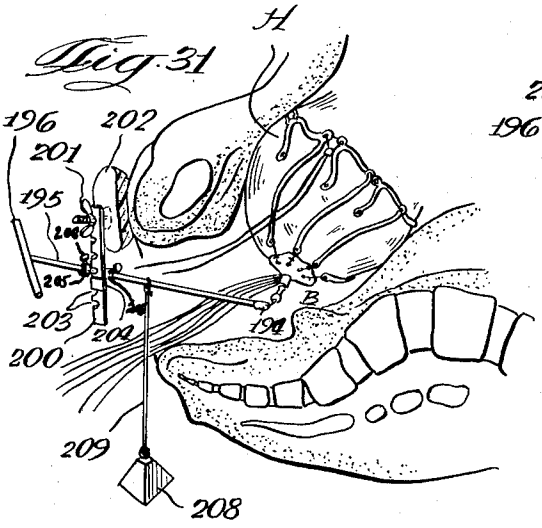


Fig. 31



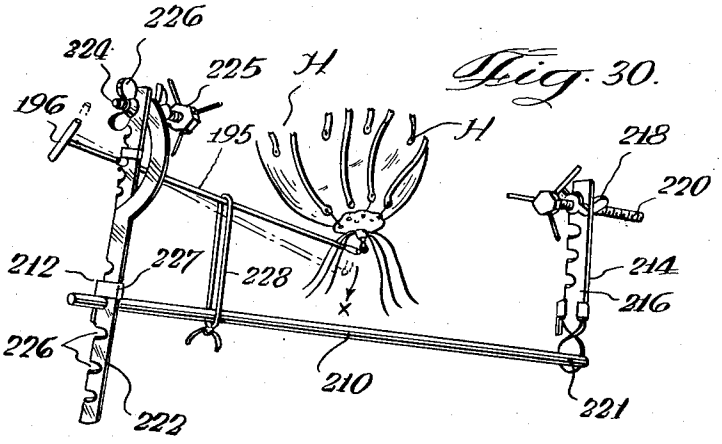


Fig. 30.

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United States Patent Office 2,792,838 Patented May 21, 1957

2,792,838

OBSTETRICAL INSTRUMENT

Federico D. C. Guerriero, Chicago, Ill., assignor to Arcangela Guerriero, Chicago, Ill.

Application July 1, 1953, Serial No. 365,322

17 Claims. (Cl. 128—361)

This invention relates to obstetrical instruments and more particularly to those instruments which are used during delivery particularly for applying traction to the foetal head and for guiding and assisting the passage of the foetus through the delivery canal. Specifically this invention affords a group of such instruments based on a new and novel mechanical principle, capable of achieving functions heretofore considered unattainable with standard instruments and opening up vistas and avenues leading to entirely new methods and techniques. In fact, it is the opinion of the inventor that further study and application of the new instruments will doubtless result in the revision, and even discarding, of present day methods, techniques, principles, and medical rules heretofore considered basic and unchangeable.

For centuries forceps have been considered the prototype instrument in the obstetrical armamentarium. Variations and modifications of the original Chamberlain forceps have produced more than six hundred different types of forceps. Modifications and variations in the blades, shape of the fenestrae, handles, locks, pelvic curvature, cephalic curvature and the like in innumerable shapes and sizes have been made and utilized. However, each and every one of these instruments were based on the same mechanical principle, namely that of the scissors or tongs. Common to each of them was a long and rigid shaft ending in blades fulcrumed or pivoted together so that the application of force to the handles or shafts resulted in movement of the blades toward or away from each other, but always in but a single plane.

Due to its construction and the circumstances under which it was used, the limitations of the instrument were numerous and many of them obvious. The long rigid shaft by means of which the applied force was transmitted to the blades affording the desired traction, limited the use of the instrument as defined by such factors as the position of the foetus, the curvature of the canal, the pelvic bone structure, and similar such factors well known in medical science. So also the function of the forceps was further limited by the fact that only one type of actuating force could be applied. The application of such forces as gravity, tension, and similar slow-acting forces was not only impractical but as a matter of fact, impossible with the forceps heretofore known.

Another serious objectionable feature of the forceps was the inherent localization of the traction forces applied by the blades to the foetus head. This often resulted in permanent marking or disfigurement. Hence, it was obvious that the need for improved obstetrical instruments has been great and long felt.

It is therefore an important object of this invention to provide obstetrical instruments to overcome all of the disadvantages set forth hereinabove.

Another object is to afford an instrument capable of performing the functions of obstetrical forceps but in which the limitations imposed on the use of the instrument by the rigid shaft construction are completely eliminated. An object relating thereto is to construct such an

instrument in which the rigid shaft is completely eliminated.

As was mentioned hereinabove, in the standard forceps the construction invariably included two opposed blades by means of which traction was communicated to the foetal head. The limitations and objections of such a blade construction have likewise been set forth hereinabove. Hence it is an important object of this invention to provide an obstetrical instrument in which the two-blade principle is dispensed with entirely. Traction is applied by means of a plurality of traction elements which completely encircle the foetal head and which are capable of adapting themselves to conform to each individual shape and size as required.

Yet a further object is to provide an obstetrical delivery instrument in which force is transmitted to the traction elements by flexible rather than rigid means.

Still another object is to afford an instrument the use of which is unaffected by the usual limiting factors such as the curvature of the canal, position of the foetus, bone structure and the like.

Still a further object is to provide an obstetrical instrument in which many types of forces may be used, such as, for example, slow-acting gravitational forces, tension, compression as well as direct traction forces as heretofore employed.

And yet another object is to afford an obstetrical instrument through the use of which normal delivery is made possible in cases which have heretofore required abnormal techniques and methods such as Caesarean section, and the like.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of my invention, I have illustrated in the accompanying drawings preferred embodiments thereof, from an inspection of which, when considered in connection with the following description, my invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawings in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings:

Fig. 1 is a view in elevation of one of the elements of the obstetrical instrument;

Fig. 2 is a view of the elements of the instrument during the process of assembling the same in operational position about the foetal head as here illustrated in the delivery canal;

Fig. 3 is a view similar to Fig. 2 but showing the instrument after further assembly;

Fig. 4 is a similar view with the operation advanced still further along;

Fig. 5 is a view in elevation showing certain of the elements and the method in which they may be connected one with the other;

Fig. 6 illustrates a step still more further advanced in the delivery and illustrates also another element of the instrument and the method in which it is used during delivery;

Fig. 7 is an elevational view in cross-section of another of the elements of the instrument;

Fig. 8 is an end view of the elements illustrated in Fig. 7 taken on the plane of line 8—8 and viewed in the direction indicated;

Fig. 9 is a transverse sectional view taken on the plane of line 9—9 of Fig. 7 and viewed in the direction indicated;

Fig. 10 is a view in elevation showing yet a further step in the delivery and also another element of the instrument in operational position in connection with a foetal head still positioned in the delivery canal;

Fig. 11 is an elevational view of yet another element of the instrument;

Fig. 12 is an enlarged fragmentary view of the element illustrated in Fig. 11 and illustrating certain constructional details thereof;

Fig. 13 is a view similar to Fig. 12 but showing the elements in a different operational position;

Fig. 14 is a top plan view of a portion of the element shown in Fig. 11 taken on the plane of line 14—14 in Fig. 15 of the drawings and viewed in the direction indicated;

Fig. 15 is an enlarged fragmentary elevational view in section illustrating certain details of construction of a portion of the element illustrated in Fig. 11 of the drawings;

Fig. 16 is a view in perspective showing the application of the element of Fig. 11 during the delivery;

Fig. 17 is a view similar to that of Fig. 16 but showing the element of Fig. 11 being used in another phase of the delivery;

Fig. 18 is an elevational view of yet another element of the instrument;

Fig. 19 is a view showing another step in the delivery and likewise showing the use of the element of Fig. 18 during the delivery;

Fig. 20 is another view taken during the delivery and illustrating the use of yet another element of the instrument;

Fig. 21 is an enlarged fragmentary top plan view illustrating the element of Fig. 18 in operational position;

Fig. 22 is an elevational view illustrating another embodiment of certain elements of the invention;

Fig. 23 is a view showing the application of the elements of Fig. 22 as being applied during the delivery;

Fig. 24 is a view of the foetal head with the elements of Fig. 22 positioned in operational position within the delivery canal;

Fig. 25 is a perspective view of yet another element of the instrument;

Fig. 26 is a view in perspective of the element of Fig. 25 assembled with still other elements of the instrument;

Fig. 27 is a view showing the assembly of elements of Fig. 26 in operational position during the delivery;

Fig. 28 is a fragmentary view of a patient showing the assembly of elements of Fig. 26 mounted in operational position;

Fig. 29 is a side view of the patient illustrating still other elements of the instrument in operational position;

Fig. 30 is a view in perspective of an assembly of the elements of the instrument in operational position in connection with the foetal head; and

Fig. 31 is a view in perspective of an assembly of elements of the instrument in operational position during the delivery.

Directing attention now to the various figures of the drawings, it will be noted that the obstetrical instrument designated generally by reference numeral 40 shown in operational position in several of the figures including Figs. 16, 17, and 20 comprises a traction assembly 42 which is designed to encircle and grasp the head H of the foetus in the delivery canal D. For convenience the traction assembly 42 will be designated as the cephalic assembly or by the coined name "Irpill" assembly. It in turn comprises a number of individual grasping (Irpill) elements 44 which may be formed in various shapes. In the embodiment illustrated in Figs. 1 through 4, 5, 6, 10, 16, 17, 19 and 20 the shape is of modified question-mark form with a long curved leg 46, and a shorter inclined leg 48. Both legs are integrally formed with a horizontal bar member 50 which is both laterally and vertically curved for a purpose which will become apparent as the description proceeds.

Primarily the grasping elements 44 are made of a durable material such as steel shaped to accommodate the contour of the foetal head with the head or bar member 50 positionable about the base of the head as shown in the several figures of the drawings. As a matter of fact, the elements should be designed to approximate as close as possible the contour of the foetal head at a point or line drawn about the base of the skull. In this connection, however, it should be noted that a flexible, semi-rigid material or construction may be used. Furthermore, the maximum length of each element 44 should be such that the leg 46 is shorter than the distance from the base of the skull to the vertex. The reason for these dimensions will likewise become apparent as the description proceeds.

These individual grasping elements 44 are connected by means of connecting elements 52 so that they form a ring encircling the head as shown in several of the figures of the drawings.

This connecting element 52 may comprise a pair of hook members such as 54 adapted to be positioned within a pair of rings or eyelets 56 formed at the point where the short leg 48 is joined at a less than 90° angle to the horizontal bar 50. By such a connection it will be noted that the connecting element is hinged so that it may be freely moved about a vertical axis. The hooks 54 are integrally formed at the ends of a yoke number 58 and terminate in an outwardly protruding hook 60. This hook 60 is in turn adapted to hook on to the adjacent grasping element 44 as shown in Figs. 3, 4 and additional figures of the drawings.

The manner in which the assembly of the individual grasping elements 44 is accomplished to form the traction or cephalic assembly 42 will be subsequently described. Suffice it to say at this point that when they are so linked together, the elements form a chain linked one to the other about the base of the head and flexible enough to intimately grasp in contour-accommodating relationship the foetal head. From each element of this chain, the leg 46 protrudes along the various meridians of the head pointing to the vertex of the skull. The legs 46 are likewise curved to accommodate the contours of the skull as shown in Figs. 16, 17 and 20 of the drawings.

It will be noted that at the end of the long leg 46 an eyelet opening 62 is formed to which may be tied a thread 64. A similar eyelet opening 66 may be formed in the outer end of the short leg 48.

In assembling the elements to form the traction assembly 42 the hook 60 of the connecting member 52 encircles the thread 64 of the adjacent element so that the hook may slide along this thread down over the long leg 46 until it reaches the juncture point of the leg with the horizontal bar 50. This is repeated for each element until a chain of sufficient length to accommodate the foetal head H has been formed.

For the purpose of completing the chain, it will be noted that the first element 44 which is inserted into the canal is formed with an eyelet ring 68 positioned at the point of the juncture of the horizontal bar 50 and long leg 46. The last element to be inserted in the chain is likewise formed with a similar eyelet ring 70 but positioned at the juncture point of the short leg 48 with the horizontal bar 50. Thus it will be noted that these two eyelets 68 and 70, which for convenience will hereafter be designated as the closing eyelets, are adjacent each other. It will further be noted that before inserting the first grasping element 44 a tying thread 72 is looped

through the eyelet 68. When the last element is inserted, the end of one side of the thread loop 72 is threaded through the eyelet 70 so that the thread 72 serves as the closure member completing the ring. By drawing the ends of this loop of thread 72 together the traction assembly may be adjusted to either tighten or loosen the assembly and also to reduce or increase the circumference or length of the chain.

Attention is now directed to the means provided for effecting closure of the instrument around the foetal head. As has been previously stated, after the ring has been completed, it is necessary to exert force on the thread loop 72 in order to draw together the elements of the chain. For this purpose, a special instrument may be used, although it is possible under certain conditions to merely draw together the ends of the thread protruding from a tube out of the delivery canal by using the hands or more conventional pulling means such as hollow flexible shafting through which threads may be inserted, said shafting having thread-snubbing means. The instrument which I have provided is designated generally by reference numeral 74 and may be designated as the loop tightening instrument. It comprises a long tube 76 through which the ends of the loop thread 72 may be threaded, terminating in a hand grasping instrument 78 similar to an instrument known as the Tydings tonsil snare. The ends of the thread are connected to the snare 78 in such a way that when the handles 80 and 79 are compressed the loop is tightened.

The tube 76 must be of sufficient length so that it will reach from the foetal head out to the mouth of the delivery canal. The tube must also be flexible enough so that it can conform to the various shapes which are ordinarily encountered in delivery canals.

Although the tube 76 is shown in Fig. 10 as connected to a Tydings instrument 74 it should be apparent that the tightening may be accomplished by hand as shown in Fig. 6 of the drawings. In either case, however, a novel valve or thread-snubbing unit may be employed which will now be described in detail. This valve, designated generally by reference numeral 81, is positioned at the inner end of the tube 76. It may comprise a sleeve 82 positioned at the outermost end of the tube 76 and having the upper end thereof undercut to afford a portion 83 of reduced diameter adapted to fit into another sleeve 84 positioned just above the sleeve 82 at the end of tube 76.

The tube 82 may be formed with a pair of inwardly converging passageways 86 opening at their outer ends to the outer end of the sleeve 82 as shown in Fig. 7 of the drawings. The inner end of the passageways 86 terminate in an enlarged central cavity 88 whose walls diverge from the point of juncture with the passageways 86. The central cavity 88 may be closed by a disc 90 fitted into the mouth of the cavity within the reduced portion 83 of the sleeve 82. A pair of small openings 92 are formed in the disc 90 through which the ends of the closing thread 72 may be threaded.

The snubbing action is accomplished by means of a piston member 94 which in turn comprises an inner stem 96 and an outer stem 97 about which a spring 98 is coiled as shown in Fig. 7 of the drawings. This spring is normally under compression tending to push the piston 94 toward the end of the sleeve 82. As the piston is moved in the direction indicated, it draws with it a truncated cone enlargement 100 having a diameter sufficiently great so that it is larger than the narrowest point of the central cavity 88 but less than the widest diameter of the cavity. The reason therefor will become apparent as the description proceeds. The outer stem 97 may be formed with a knob 102 for ease in manually manipulating the stem. The spring 97 is coiled between the closure disc 90 and the surface 95 of the cone 100 so that its normal expansion pushes the cone and piston in the direction indicated.

In operation when it is desired to tighten the connecting loop 72, the ends of the threads are merely pulled outwardly. As the ends are pulled, the truncated cone 100 is moved back to a wider portion of the cavity 88 so that the threads move freely between the cone 100 and the walls of the cavity 88. When the tension is released on the ends of the threads 72, the spring 98 pushes the truncated cone 100 down toward the end of the sleeve 82 and hence toward the converging wall-portion of the cavity 88. By reason thereof the thread 72 is eventually frictionally held in place between the cone 100 and the converging walls of the cavity 88. Thus once drawn taut, the connecting thread 72 cannot be loosened until the operation is completed or the thread cut.

After the traction assembly has been positioned operationally and the connecting thread 72 has been tightened, thereby tightening and adapting the traction assembly 42 to the contour of the foetal head, the instrument is ready for the next step in the delivery procedure. It will be noted that the valve 80 is constructed as a separate unit so that it may be disconnected from the sleeve 84 and tube 76. These elements are then removed leaving the valve in place holding the connecting threads 72 in its tightened position. The instrument is now ready for the application of force to the traction assembly.

For this purpose one of several instruments may be used which are in turn associated with the individual pulling threads 64 tied through the eyelet openings 62 formed in the protruding ends of the long legs 46. As will be noted in the several figures of the drawings, these threads protrude and extend out of the delivery canal D. For convenience a thread assembling ring 104 may be provided through which all of the pulling threads 64 may be passed thereby assembling the same in convenient close proximity one to the other. This assembling ring 104 may be attached to the eyelet 62 of the last grasping element 44 by any convenient method but, as shown in the embodiment chosen for illustration in Figs. 18 and 20, comprises a universal watch-chain-type hook-member 106. This affords a ready means of attaching the ring to the traction assembly and at the same time affords the means for permitting universal rotation of the element in all directions. Thus all of the pulling threads 64 each connected to one of the grasping elements 44 extend from the head, out of the delivery canal and through the assembling ring with the ends thereof positioned ready for connection to the means through which force may be applied.

As was mentioned hereinabove any of several force transmitting means may be used. In Figures 25, 26 and 27 there is illustrated a device identified generally by reference numeral 108. For reasons of descriptiveness the nomenclature of pulley device has been selected to identify this device. Although the name pulley is given to this device it should be readily perceived that no pulley wheel forms a part of the apparatus. Actually the apparatus comprises a concave vaginal member 110 shaped to afford a protruding horizontally disposed lip member 112 integrally formed with a concave vertically disposed portion 114 at one end thereof. The pulling threads 64 are designed to converge and extend along the sides and bottom of the concave innerwalls of the vaginal member and are retained in position by means of a member identified as a drawer 116 which is designed to be positioned and retained within the concavity of the vaginal member 110.

The drawer may be formed with a pair of side members 118 and 120 connected by means of horizontal members such as 122, 123 and 124. The thread 64 may be interwoven around and about these members as shown in Fig. 25 of the drawings. The ends of the threads 64 are then passed down through the concavity of the vertically disposed portion 114 and may be connected to various force exerting means or may be manipulated manually.

It will be noted that the vertically disposed portion

114 is connected to a long rod-like handle 126. Slidably positioned on this handle 126 may be a clamping ring such as 128. To this ring may be attached a pair of rods 130 and 132 which together with the handle 126 afford a tripod support for the vaginal member 110.

As hereinabove described it is evident that the tripod support of the vaginal member 110 is such that the length of the support may be varied by merely extending or converging the tripod legs 126, 130 and 132. It should also be evident that the angular alignment of the legs as well as the length may be further varied by means of the slidable clamping-ring member 128. Hence, the vaginal member is adjustable at any desired position with respect to the delivery canal, thereby accommodating the apparatus to any shape, height or size as dictated by prevailing conditions.

Reviewing once more for the purpose of clarity the course of the all important pulling threads 64, it will be noted that the same originate from the vertex end of the grasping elements 44. They are then assembled through the assembling ring 104, protrude out of the mouth of the delivery canal D, are disposed about and through the pulley member 108 following the concavity of the vaginal member 110, and then fall vertically from the pulley member guided by the concavity of the vertical portion 114. It should be further noted that each of the threads 64 are maintained independently one of the other so that if desired force may be exerted to any individual grasping element. However, they are maintained in close proximity one to the other so that traction to the entire assembly 42 may be obtained by exerting force to all of the threads as a single unit. The force exerted may be by the operator himself or in one of several methods which will be described in a later portion of this specification.

To support the tripod legs 126, 130 and 132 a novel closed-frame member 134 is provided. This comprises a pair of straight side frame bars 136 and 138. These bars 136 and 138 may be connected by integrally formed end members 139 and 140, with a plurality of braces such as 142 likewise connecting the side bars 136 and 138. If desired a portion of the frame unit maybe arcuately formed as illustrated at 143 in Fig. 26 of the drawings. Additional cross members such as 144 and outwardly protruding finger members such as 146 are provided for a purpose which will be disclosed as the description proceeds.

The legs 130, 132 and 126 are adjustably connected with the frame 134 by means of movable clamps such as 148, 149 and 150. The clamps 148 and 149 are provided with slots such as 151 within which the legs 130 and 132 may be positioned and retained by means of threaded bolts such as 152 and 153. The clamps themselves are formed with central openings which slidably accommodate therein the slide bars 136 and 138. Hence it will be noted that the clamps 148 and 149 are slidable longitudinally along the side bar members 136 and 138 and furthermore are rotatable about the axis of the side bar members.

The clamp 150 may be mounted on a slidable cross member 154 having portions such as 155 and 156 slidably mounted on the cross bars 136 and 138 and clampable by means of threaded bolts 157 and 158. Again the clamp 150 is provided with a slot such as 159 and with a screw-threaded bolt 160 adapted to clamp the leg 126 within the slot. In Figure 27 the operational position of the entire pulley assembly is illustrated.

The second means provided for the transmission of force to the foetus comprises a universal joint member 162 as illustrated in Figs. 11 through 17 inclusive. This will now be described in some detail.

Starting with the component element which directly contacts the foetal head, a cup-shaped plate 164 having a concavity such as illustrated in Figure 15 adapted to conform to the vertex of the foetal head, is provided. This plate 164 is formed with a central opening 166 defined by an integrally formed stem 168.

The plate is formed with a plurality of openings such as 169 positioned between the edge of the plate and the central opening 166. Positioned near the outer edge of the plate are a number of upwardly protruding semicircular rings 170, which in number approximate the number of grasping elements 44. The functions of these rings will become apparent as the description proceeds.

Turning now to the novel stem 168 it will be noted that a plurality of longitudinal slots such as 172 are formed therein which again in number approximate both the rings 170 and the grasping elements 44.

Attention is now directed to the manner in which the traction assembly 42 is operationally joined to the universal joint force-transmitting member 162. The flexibility of the connection is maintained by means of the threads 64. The threads coming from the vertex end of the grasping elements 44 are threaded through the rings 170, then through one of the holes 169, then up through the central opening 166 of the stem and finally out through the slot 172.

After the thread has been so positioned in the plate 164 a mechanism is provided for clamping the thread in the desired position. This mechanism will now be described in greater detail.

Referring particularly to Fig. 15 of the drawings, it will be noted that the stem 168 is formed with the portion above the slots 172 screw threaded as at 174. The upper portion of the stem may be formed with a reduced cross-section solid member 176 and a flange 178 formed at the outermost end affording a shoulder 180, the function of which will become apparent as the description proceeds. A sleeve 182 is adapted to fit over the stem 168 and is provided with a complementary threaded portion 183 adapted to cooperate with the screw threads 174 of the stem.

The sleeve is provided with an inwardly protruding stop member 184 which limits the downward movement of the sleeve when the same is moved to abut the flange 180.

The sleeve 182 is formed at its bottom end with a pair of arcuate cutouts such as 185 thereby affording a pair of tongues such as 186, one on each side of the sleeve. Between these tongues is positioned a rotatable plug 187 mounted on a rivet bolt 188 which affords a pivot means about which the plug may rotate in the one direction. To the plug 187 is riveted the stem 189 of a yoke 190 affording a pair of tongues 192 between which is again positioned another rotatable plug 193 to which is attached a stem 194. The stem 194 in turn is either integrally formed or joined at the bottom to a long rod 195 which terminates in a cross-piece or handle 196 affixed to the outer end of the rod 195.

Thus there is provided a universal coupling which in addition to permitting rotation and movement in any direction is also flexible enough so that the device may adapt itself to any curvature of the delivery canal which might be encountered during the use of the obstetrical instrument.

The clamping function is achieved by merely rotating the sleeve 182. The screw-threaded portions 174 and 183 thereby cooperate to lower the sleeve until the tying threads 64 are clamped between the end of the sleeve and the shoulder 197 afforded by the base of the stem and plate, as shown at Fig. 15 of the drawings. After the thread has been clamped by this rotation further rotation of the device 162 transmits a rotary movement to the foetal head itself.

It will be noted that the above described universal joint member may be used only where rotation of the foetal head is required in one direction, that is clockwise. Should rotation be necessary in the other or counter-clockwise direction, then the same instrument may be used but with left-hand rather than right-hand screw

threads. Obviously the use of a right-hand screw thread where a left-hand rotation of the head becomes necessary would tend to loosen the clamping of the threads and hence would be impractical. Therefore, the obstetrician must determine beforehand in which direction rotation of the head will be required. In other words, he must first determine whether he is confronted with a right or left position of the head in the delivery canal. Once this is determined, he need only select a universal joint member having the necessary right or left hand threaded member.

With the double universal joints, the necessary force may be applied at almost any angle required. However, it should be understood that if the angle required is more acute, an instrument with more than two joints may be used, which will of course thereby increase the operational angle.

As has been previously stated, to transmit a movement of rotation to the foetal head, a mere twisting of the handle is all that is necessary. This twisting, transmitted at any necessary angle by the universal joint structure, rotates the plate which in turn transmits the motion to the pulling threads **64**. The motion is thereby conveyed to the grasping elements **42** and finally to the foetal head H.

The universal joint device **162** also transmits the tractional force required during the delivery at whatever angle is necessary. For this purpose, attention is directed to Figure 16 wherein it will be noted that the obstetrician grasps the handle **196** with one hand and uses the other hand to apply traction to the arm **195**. This force is applied in a direction perpendicular to the major axis of the rod **195**. Thus the rod **195** acts as a third degree lever with the external end, held by the hand, serving as a fulcrum. By the same token tortional force may be applied by applying both traction and rotation simultaneously.

The description of the instrument to this point has been concerned chiefly with the application of direct force by the operator. It has been mentioned briefly that other types of forces may be applied by means of this instrument which heretofore have proved impractical. The application of such forces such as gravity and elasticity opens up new and unexpected methods and techniques which it is felt in and of itself comprises a major contribution to the medical science of obstetrics. The means and method for accomplishing this will now be described in some detail.

For this purpose attention is directed to Figures 29 through 31 of the drawings. If the force of gravity is selected for the purpose of applying traction to the foetal head, it will be obvious that a support must be provided for the handle of the universal joint member or for any other member used for the transmission of force, such as for example the tripod pulley device illustrated in Figures 25 through 28. For this purpose, a device comprising a notched bar **200** may be provided which may be affixed by means of a bolt and wing nut assembly **201** to a base provided by means of a plaster cast **202** which has previously been applied to the body of the patient as shown in Figs. 28 and 29 of the drawings.

As will be noted, the notched bar **200** is provided with a plurality of notches **203** which are adapted to support therein the rod **195** of the universal joint member. A slide retainer **204** is provided which locks the rod within the preselected notch **203**.

In order to prevent lateral movement of the device once it is positioned in the bar **200**, a pair of clamping rings such as **205** may be positioned in sliding relationship on the rod **195** with set screws such as **206** provided for clamping the ring in any desired position. Thus, one of the clamping rings may be positioned one on each side of the bar **200** and clamped in position, thereby preventing any lateral movement in the direction of the major axis of the rod **195**. It should be further noted that with the mechanism described hereinabove, rotation of the foetus by means of the handle **196** is in no way limited by the structure described.

After the universal joint member has been positioned in the support bar **200**, a weight **208** may be hung by means of a line **209** at any position on the rod **195** between the support bar **200** and the universal joint **194**. By the abovedescribed means a slow acting gravitational force may be applied which it is believed will be of inestimable value in certain types of delivery.

In other types of deliveries, the application of a force of elasticity is sometimes required. This may be applied by supporting a bridge rod **210** in the manner illustrated in Figs. 29 and 30 of the drawings. To support the bridge, an anterior pillar **212** and a posterior pillar **214** may be provided between which the bridge rod **210** is supported.

The posterior pillar **214** may comprise a notched bar **216**, similar to the notched bar **200**, which in turn is supported by a wing nut **218** threaded on a supporting bolt **220**, the end of which may be imbedded in the plaster cast **202** as shown in Fig. 29 of the drawings. The end of the bridge **210** is supported from the end of the notched bar **216** in any convenient manner, but as shown in the embodiment selected for illustration is connected by means of a pivot point **221**. This pivot point, of course, permits adjustment (raising or lowering) of the bridge **210** as required during the delivery.

The anterior pillar **212** likewise comprises a notched bar **222** supported by means of a bolt **224**, the inner end **225** of which may be imbedded in the pubic part of the plaster cast **200**. A wing nut such as **226** may be utilized for retaining the notched bar **222** in position depending from the bolt **224**.

Again the bar **222** is provided with notches **226** and with a slide retainer **227** for retaining the end of the bridge rod **210** in the notch **226**. The elastic force is applied by merely tying a stretched rubber tube member such as **228** about the rod **195** of the universal joint member and the bridge rod **210**. This will tend to draw the foetal head H down out of the delivery canal.

By variably adjusting the bridge **210** in relation to the rod **195** it is possible to apply an adjustable traction force pulling toward either side of the pelvis as desired. Just as in the case of the application of gravitational force so the application of the force of elasticity applies to the foetal head a slow gradual pull in the desired downward direction.

Turning now to the description of the plaster cast **202**, it will be noted that as shown in the drawings, the cast covers the entire lumbo-sacral region of the mother extending upwardly to the last two ribs and downward to the sacro-coccigeal juncture. Likewise the cast covers also the internal third of the gluteal region. Specifically however we are concerned here primarily with the sacral portion **230** and pubic portion **232**.

The sacral portion **230** not only may provide a support for the posterior pillar **214** of the bridge **210** used in connection with the universal joint member **162**, but may also be used as a support for the posterior portion of the frame **134** used in connection with the pulley device **108**. In Figure 28 of the drawings such a structure is illustrated showing the posterior portion or curved end of the frame **134** imbedded in the cast **202**; the outwardly protruding fingers **146** serving to more rigidly anchor the frame **134** in the cast **202**.

The structure described up to this point has been concerned primarily with the application of the more complex forces. When merely traction is required, rotation being accomplished by the normal mechanism of labor, this force may be applied by the use of any device affording leverage, such as a long surgical forceps **232**. This is best illustrated in Fig. 20 of the drawings wherein the forceps **232** are shown as grasping the ends of the pulling

thread 64 between its blades 234. The force may be applied directly by means of the hands of the obstetrician as shown in the drawings.

In Figures 22 to 24 inclusive of the drawings, there is illustrated another embodiment of the grasping elements 42. Similar parts are designated by like numerals with the added suffix "*a*."

In this embodiment, the individual grasping elements 44*a* comprise a closed member 236 in the form of an irregular triangle having sides 238 and 240 integrally formed with a base 242. The closed member 236 is arcuately shaped to conform with the shape of the foetal head in the same manner as the first embodiment 44*a*. Again eyelet rings 68*a* and 70*a* are provided at the corner of juncture between the sides and the base of the first and last element through which the tie string 72*a* may be threaded.

Ring eyelets 56*a* are also provided to accommodate the hook member 54*a* which is used to connect the links one with the other just as in the first embodiment. However, it will be noted that unlike the first embodiment the connecting hooks 54*a* may be attached to each element in the form of a chain such as shown in Fig. 23 of the drawings. Thus, the chain may be first assembled and then each link lowered into operational position one at a time.

The draw thread 64*a* may be affixed to the grasping element 238 by merely tying the end thereof to the vertex of the member as shown in the figures of the drawings. In all other respects this embodiment is utilized in the same manner as the first embodiment.

From the above description it should be evident that I have provided a new and basic obstetrical instrument having many and varied components but all useable in combination in effecting delivery in the practice of the medical science of obstetrics. The instrument avoids the use of a long, stiff arm such as present in a standard forceps but instead substitutes a pliable assembly so that the curvature of the delivery canal, the pelvic bone structure and all of the other limiting factors heretofore requiring prime consideration by the obstetrician, are avoided.

The application of a variety of forces including slow-acting gravity and elasticity may be effected by means of this instrument. Localization of the traction forces heretofore inherent in the two-bladed forceps is completely eliminated. Instead the traction is distributed evenly about the entire circumference of the foetal head. Notwithstanding this however if necessary localized traction may be applied at any point as desired.

It should also be evident that once the instrument is positioned and tightened, it requires no further application of force to maintain it in operational position as was the case, heretofore, in the use of conventional forceps. The only force that need be applied is solely for the purpose of applying traction, rotation or any other necessary maneuver to the foetal head.

It is believed that my invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while preferred embodiments of the invention have been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of my invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. In an obstetrical instrument for assisting in effecting delivery, a traction assembly for encircling and grasping a foetal head in the delivery canal, and means for transmitting force to said traction assembly, said traction assembly comprising a plurality of individual grasping elements, a connecting member hingedly joining said grasping elements one to the other with the exception of the first and last element, said first and last element connected one to the other by means of a flexible tying member threaded through eyelets formed on said elements.

2. The obstetrical instrument of claim 1 in which each of said grasping elements comprises a metallic member of modified question-mark form having a long curved leg, a shorter inclined leg and a horizontally disposed segment integrally formed and connecting the ends of said legs.

3. The obstetrical instrument of claim 1 in which each individual element has a pulling thread tied to one end thereof, the other end of each of said threads protruding outwardly.

4. The obstetrical instrument of claim 1 in which each of said grasping elements comprises an irregular triangular-shaped member arcuately formed to conform with the shape of the foetal head.

5. The obstetrical instrument of claim 3 in which means for assembling and operating said elements are provided, said means comprising a tube through which the ends of said flexible tying member are threaded and a fulcrumed hand grasping instrument adapted to draw the ends of said tying member whereby said grasping elements are drawn together about the foetal head.

6. The obstetrical instrument of claim 3 in which a thread assembling ring is provided through which said threads may be passed, said assembling ring connected by means of a universal watch-chain-type hook-member.

7. The obstetrical instrument of claim 3 in which said force transmitting means comprises a pulley instrument consisting of a concave vaginal member with a removable drawer member mounted therein, the free ends of said pulling threads being slidably interwoven around and about said members, and means for exerting force on the ends of said threads.

8. The obstetrical instrument of claim 7 in which said pulley instrument comprises a concave vaginal member having a protruding horizontally-disposed lip member at one end and a concave vertically disposed portion at the other end, and said drawer member comprises a pair of side bars joined together by means of a plurality of connecting bars.

9. The obstetrical instrument of claim 8 in which mounting means is provided for said pulley instrument, said mounting means comprising a rod-like handle connected to the end of said vertically disposed portion, and a pair of tripod legs slidably mounted on said handle by means of a clamping ring.

10. The obstetrical instrument of claim 9 in which means for positioning said tripod legs and handle is provided, said latter-mentioned means comprising a closed frame member having a pair of side members connected by integrally formed end members, slideable clamping members positioned on said side members and adapted to clamp said tripod legs, and a slideable cross member clamped to said side members and having a clamp for clamping said rod-like handle.

11. The obstetrical instrument of claim 1 in which said tying member comprises a loop of thread the ends of which are threaded through a valve, said valve comprising a sleeve and means positioned within said sleeve for preventing the loosening of said loop without interfering with the tightening of the same.

12. The obstetrical instrument of claim 11 in which said sleeve is formed with a pair of passageways converging inwardly from the outer end thereof and terminating in an enlarged central cavity having diverging walls, said cavity closed at its outer end by a perforated disc, a piston mounted in said cavity and having a truncated cone enlargement formed intermediate of the ends of said piston, and a spring coiled about said piston and designed to urge said piston toward the outer end of said sleeve, the ends of said pulling thread protruding through said perforated disc, movement of the threads towards said traction assembly being limited by snubbing of the

same between said truncated cone enlargement and the walls of said central cavity.

13. The obstetrical instrument of claim 3 in which said means for transmitting force comprises a universal joint member having a cup-shaped plate adapted to fit over the vertex of the foetal head, said plate formed with a screw-threaded hollow central stem, the ends of said pulling threads being threaded through openings formed in said plate and then through said hollow stem, a thread clamping device mounted on said stem and means for remotely controlling said clamping device and transmitting force to said threads.

14. The obstetrical instrument of claim 12 in which said clamping device comprises a threaded sleeve adapted to cooperate with said central stem, said sleeve mounted on a universal swivel member, said swivel member mounted on the end of a rod and a handle mounted on the other end of said rod.

15. In an obstetrical instrument for assisting in effecting delivery, grasping means for encircling a foetal head, a non-rigid means for transmitting force to said grasping means, said grasping means operationally connected to said non-rigid means, supporting means for said non-rigid means, said supporting means comprising a notched bar, the upper end of said bar adapted for mounting on a patient, said force-transmitting means having a handle, a portion of said handle clampable within the notches of said notched bar.

16. In an obstetrical instrument for assisting in effecting delivery, grasping means for encircling a foetal head, a non-rigid means for transmitting force to said grasping means, said grasping means operationally connected to said non-rigid means, supporting means for said non-rigid means, said force-transmitting means having a handle, and means for applying the force of elasticity, said latter-mentioned means comprising a notched anterior pillar and a notched posterior pillar depending from a plaster cast, said plaster cast adapted for positioning on a patient, a bridge rod supported between the bottom ends of said pillars, said handle clamped within the notches of said anterior pillar, and an elastic member stretched between said handle and said bridge rod.

17. An obstetrical instrument comprising in combination an assembly of at least three foetal head grasping elements, a flexible loop connecting the first and last of said grasping elements, means for drawing together the ends of said loop, threads connected to each of said grasping elements, means for gathering together the free ends of said threads and means for transmitting traction and rotating forces to said threads.

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