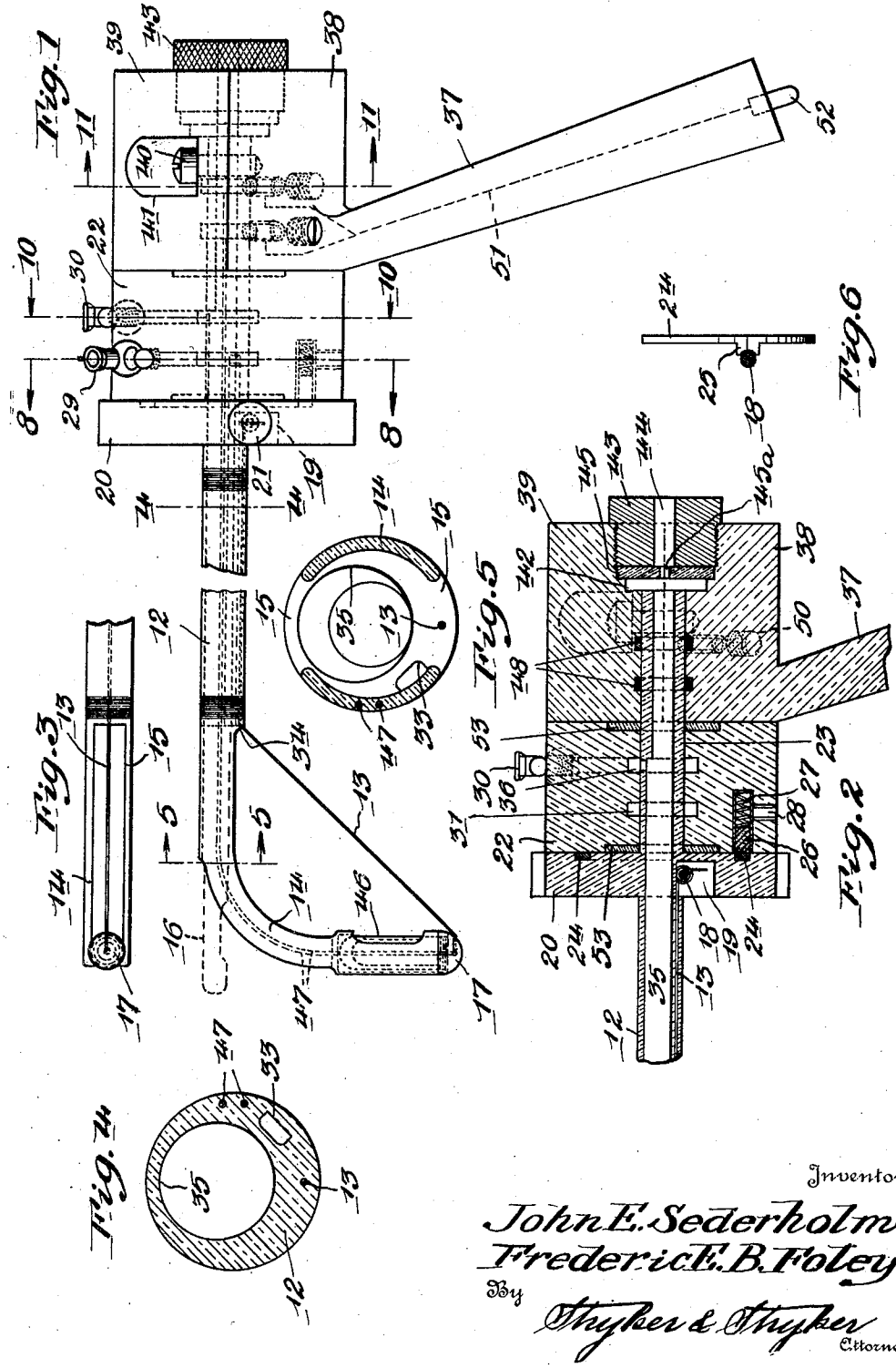
Dec. 31, 1929. J. E. SEDERHOLM ET AL 1,741,740

URETHRO CYSTOSCOPIC INSTRUMENT

Filed March 19, 1928 2 Sheets-Sheet 1



Inventors
John E. Sederholm
Frederic E. B. Foley
By Thyken & Thyken
Attorneys

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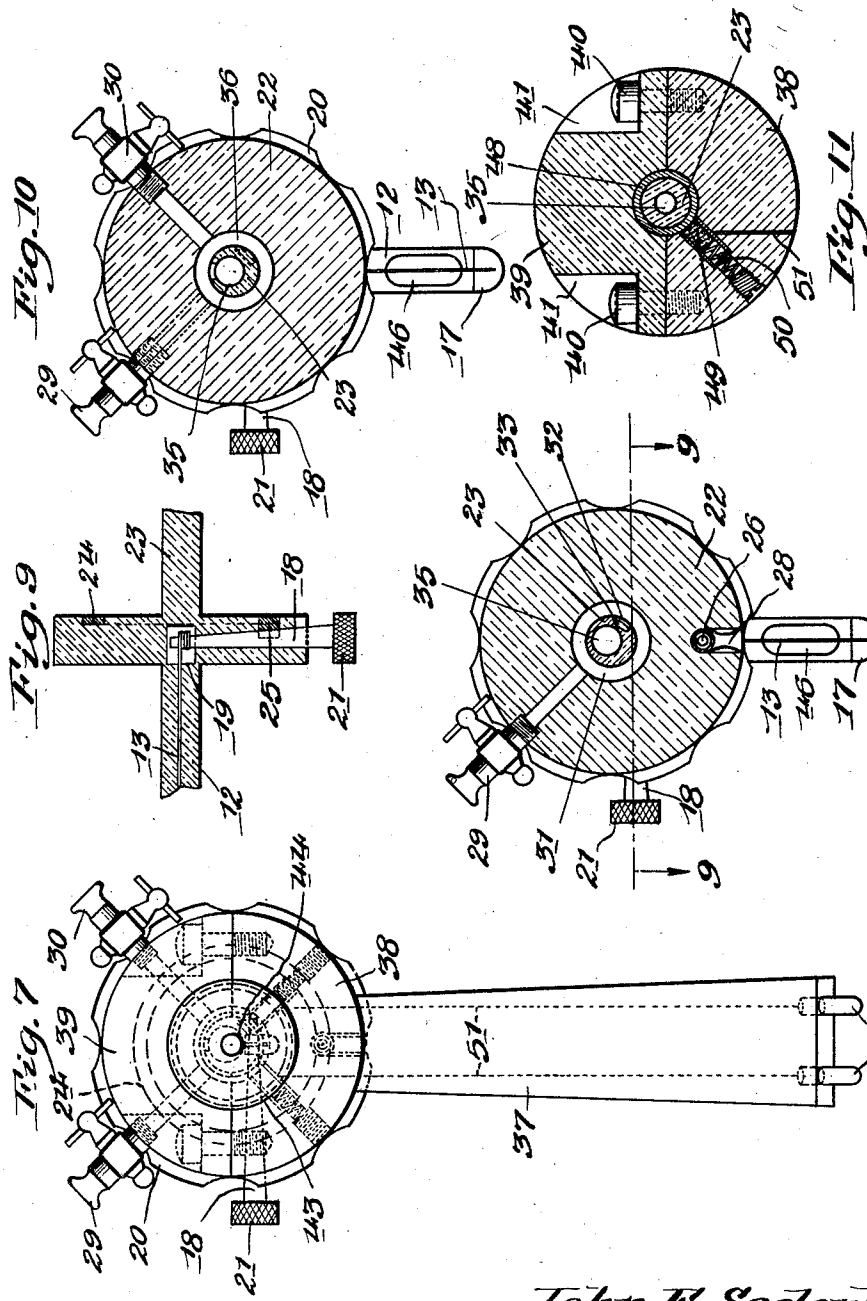

Fig. 10

Fig. 11

Fig. 9

Fig. 8

Fig. 7

Inventors
John E. Sederholm
Frederic E. B. Foley
By Stryker & Stryker
Attorneys

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UNITED STATES PATENT OFFICE

JOHN E. SEDERHOLM AND FREDERIC E. B. FOLEY, OF ST. PAUL, MINNESOTA

URETHRO-CYSTOSCOPIC INSTRUMENT

Application filed March 19, 1928. Serial No. 262,711.

This invention relates to a urethro-cystoscopic instrument designed for use by those skilled in urology and particularly in the manipulation of such instruments.

It is our object to provide a novel instrument of this kind adapted for use in excising obstructing portions of the prostate gland without requiring a surgical incision to gain access to the gland.

More particularly it is our object to provide an instrument which may be operated to remove in one piece a large conoidal or cone shaped part of the gland surrounding the commencement of the urethra and extending to include peripheral portions of the gland. Other objects will appear and be more fully pointed out in the following specification and claims.

Heretofore relief of prostatic obstructions has been accomplished by excision of the greater part of the obstructing gland after an incision in the abdominal wall continued through the wall of the bladder, or by an incision in the perineum. Such incisions have been considered necessary in all cases of prostatic obstruction of the type benign hypertrophy which require the excision of large portions of the gland about the vesical neck and extending to include peripheral portions of the gland. As far as we are aware, heretofore, such obstructions have never been removed by urethro-cystoscopic procedure and without a surgical incision. It is true that in recent years relief of contractures of the vesical neck and so-called prostate bars have been made possible by the "punch" operation but by this uretho-cystoscopic procedure the removal of only relatively small segmental portions of the gland is possible. We are also aware that an instrument has been recently devised for use through a "panendoscope" whereby a high frequency, cutting current of electricity is applied to an electrode adapted to excise small portions of the prostate gland, but this instrument is not adapted to remove any considerable portion of the obstructing gland. It cannot accomplish the removal in one piece of a conoidal or cone-shaped portion of the vesical neck or internal urethral meatus reaching peripheral portions of the gland.

The invention will be best understood by reference to the accompanying drawings in which Figure 1 is a side elevation of our improved instrument; Fig. 2 is a fragmentary, central vertical section through the proximal end of the same; Fig. 3 is a fragmentary plan view of the distal end of the instrument as viewed from the bottom of Fig. 1; Fig. 4 is a typical transverse section on a large scale through the shaft or support for the cutting element taken on the line 4—4 of Fig. 1; Fig. 5 is a section taken on the line 5—5 of Fig. 1; Fig. 6 is a detail side view of the conductor ring for the high frequency current, together with the adjacent portion of the tightening spindle for the cutting element; Fig. 7 is a rear end view of the instrument; Fig. 8 is a transverse section taken on the line 8—8 of Fig. 1; Fig. 9 is a fragmentary section taken on the line 9—9 of Fig. 8; Fig. 10 is a section taken on the line 10—10 of Fig. 1 and Fig. 11 is a section taken on the line 11—11 of Fig. 1.

Our device is provided with a tubular shaft or support 12 for a cutting element 13 preferably consisting of a fine, strong wire adapted to constitute an electrode of a high frequency cutting current. As illustrated, the distal end of the shaft 12 has the form of a urethral sound of a Van Buren curve. Obviously the shaft 12 may be constructed with ends of other approved or different curvatures if desired. The curved portion 14 is fenestrated, having openings 15 at opposite sides to afford a view of the cutting element 13 from a telescope 16 of a cystoscope of well known construction indicated in dotted lines in Fig. 1. The telescope 16 is inserted through an axial bore of the instrument as hereinafter described. The distal end of the cutting element or wire 13 is fixed in a porcelain tip 17 and said wire is passed freely through a small longitudinal passage in the shaft 12. Control of the tension of the wire 13 is provided for by securing its proximal end to a spindle 18 upon which it is wound in a recess 19. This spindle 18 is made of suitable conducting material such as brass and is tapered and rev-

oluble in a revoluble head 20. As best shown in Fig. 2 the recess 19 affords access to the spindle 18 through the face of the head 20. The spindle 18 projects from the periphery of the head 20 where a knob 21 of insulating material is fixed on the spindle to afford manually operable means for controlling the tension in the wire 13.

The head 20, which is integral with the shaft 12, is revoluble upon an end of a body 22. This body 22 is preferably of cylindrical form and has a tubular extension 23 of the shaft 12 extending axially through it. Mounted in the face of the head 20 adjacent to the body 22 is a conductor ring 24 having a projection 25 which makes contact with the spindle 18 as shown in Figs. 6 and 9. An electric contact brush 26 is mounted in a suitable recess in the body 22 and arranged to be held in contact with the ring 24 by a coiled spring 27. Electric connection of a high frequency current wire may be made with the brush 26 through a plug opening 28 extending to the periphery of the body 22.

Connections for circulating a suitable fluid such as air or water into the bladder during the operation of the device are provided. Thus inlet and outlet cocks 29 and 30 respectively are mounted on the periphery of the body 22 for connection with suitable conduits or hoses. The cock 29, as shown in Fig. 8, communicates with an annular passage 31 around the extension 23 and this passage 31 connects through a port 32 with a longitudinal passage 33 formed in the extension 32 and shaft 12. The outlet of this passage 33 is preferably located at a point 34 adjacent to the proximal end of the cutting wire 13. Fluid admitted to the bladder at the point 34 is drawn or forced out (together with secretions from the bladder) around the periphery of the telescope 16 in an axial bore 35 extending through the shaft 12 and extension 23. The bore 35 communicates in turn with an annular recess 36 in the body 22 as shown in Fig. 10. The withdrawal cock 30 receives fluid from the recess 36.

At one side of the body 22 our instrument has a handle 37 and an integral, semi-cylindrical support 28 upon which is secured a semi-cylindrical cap 39. The parts 38 and 39 are thus disposed in continuation of the body 22. An axial bore in the parts 38 and 39 is provided for the extension 23 which is revoluble relative to the handle 37 and connected parts. Suitable bolts 40 are disposed with their heads in recesses 41 for securing the cap 39 upon the support 38.

To permit the insertion of the telescope 16 through the axial bore 35 an enlarged recess 42 is formed in the outer or rear end of the parts 38 and 39 and fitted with a nut 43 having an axial bore 44. A flexible washer 45, preferably of soft rubber, is held by the nut 43 against a suitable shoulder in the recess 42. This washer 45 has a small central perforation 45^a to permit the insertion of the telescope 16 and is adapted to be expanded by the telescope against the end of the extension 23 and thereby prevent the escape of fluid along the telescope and around the end of the extension.

We mount a small electric lamp 46 of well known construction adjacent to the tip 17 of the instrument for illuminating the interior of the bladder when the instrument is in use. Electric circuit wires 47 for the lamp 46 are embedded in suitable longitudinal passages in the shaft 12 and extension 23 and the proximal ends of these wires are severally connected to conductor rings 48 upon the periphery of the extension 23. As shown in Fig. 11 brushes 49 are severally held in contact with the rings 48 by springs 50 and said brushes are connected electrically with wires 51 extending through the handle 37 of the instrument. Projecting terminals 52 of the wires 51 are adapted to make contact with the wires of a lighting circuit in a well known manner. To prevent fluid from the annular recesses 31 and 36 from reaching the rings 24 and 48, we place packing rings 53 in suitable recesses in opposite ends of the body 22 and surrounding the extension 23. These rings fit snugly about the extension 23 and are held under compression between the body 22 and adjacent parts of the instrument. The several parts 22, 38 and 39 are held together by the bolts 40 and arrangement of the rings 48 which are securely fastened on the extension 23. The shaft or support 12, head 20, extension 23, body 22, handle 37, base 38 and cap 39 are all constructed from suitable electric insulating material such as asphaltic-fibrous composition, the material known commercially as "bakelite," hard rubber or the like.

Operation

In the operation of the instrument, one terminal of the circuit for the high frequency cutting current is in the form of a flat plate upon which the body of the patient rests, or which is secured to the patient in the usual manner, and the other terminal or electrode is formed by the wire 13. As will now be readily understood, the connection with this wire 13 is made through the plug opening 28 so that the current may be conducted through the brush 26, ring 24, projection 25 and spindle 18. To prepare the instrument for insertion through the urethra, the wire 13 is loosened, by turning the knob 21, so that its distal end or cutting part is free to follow the curvature of the shaft 12. The shaft 12 is now inserted through the urethra so that its distal end projects well into the bladder and the point 34 of egress of the cutting element is substantially above the bladder surface of the prostate gland. Now the cutting element

13 is drawn tight by manipulating the knob 21 and is held under the desired tension by frictional engagement of the tapered spindle 18 in the head 20. Thus the cutting element 13 is extended in such position that it projects laterally or obliquely at one side of the shaft 12 within the bladder.

Connections for the cocks 29 and 30 may be made with suitable air or water circulating hoses for expelling from the bladder obstructing fluids such as excretions, gases and smoke which are formed during the operation of the instrument. The interior of the bladder is illuminated with the lamp 46 by connecting suitable light circuit wires with the terminals 52. During the operation a suitable cystoscope may be inserted through the axial passages 44, 45a and 35 so that its telescope projects as at 16 in Fig. 1. The telescope with its reflector thus affords means for viewing the progress of the work through the openings 15 in the curved end of the shaft 12.

With the cutting element 13 inserted and prepared as above described, the high frequency current is turned on in the circuit including the element 13 and then the whole instrument is drawn out until said element makes an incision into the gland of the desired depth. The head 20 is now grasped and rotated together with the shaft 12 and cutting element so that the element 13 describes a conical surface while excising an annular or conoidal portion of the gland about the axis of the vesical neck and prostatic urethra. Obviously peripheral portions of the gland may be reached by continuing the withdrawal of the instrument longitudinally the desired depth before rotating the shaft. It will thus be seen that a large part of the gland may be excised in a single piece. Upon the completion of a revolution the cutting current may be shut off from the wire 13 and said wire again loosened by unwinding it from the spindle 18. Finally the telescope 16 may be withdrawn from the bore 35 and the shaft 12 withdrawn from the urethra while the wire 13 extends loosely adjacent to the side of the shaft. As an alternate method of retracting the cutting wire 13 after an operation the tension may be increased by operating the knob 21 until the wire breaks.

The detached part of the gland is now removed by another cystoscopic procedure, the excised portion being cut up into sufficiently small pieces to permit their withdrawal through a cystoscope. The cutting into small pieces is accomplished by the use of a fine wire snare to which the high frequency cutting current is applied.

It will be understood that the angle of the cutting element 13 relative to the axis of the shaft 12 may be varied by changing the conformation of the curved, distal end of the instrument or by changing the point of connection of the cutting wire with the support at its distal or proximal ends.

Having described our invention what we claim is new and desire to protect by Letters Patent is:

1. A urethro-cystoscopic instrument comprising a support for a cutting element adapted to be inserted through the urethra of a patient, a cutting element disposed near the distal end of said support to project laterally therefrom within the bladder of a patient and means for rotating said element for excising in one piece a conoidal portion of the prostate gland.

2. A urethro-cystoscopic instrument comprising a tubular support for a cutting element adapted to be inserted through the urethra of a patient, a cutting element carried on said support, said element being arranged to be extended laterally from said support within the bladder of a patient and means for rotating said element about the axis of said support to describe a surface of rotation therewith for excising annular portions of the prostate gland surrounding the vesical neck and prostatic urethra.

3. A urethro-cystoscopic instrument comprising a tubular support formed to be inserted through the urethra of a patient, an electrode adapted for use as a cutting element disposed near the distal end of said support and arranged to project laterally from said support within the bladder of a patient, means for rotating said electrode to describe a surface of rotation and connections for passing a high frequency cutting current through said electrode.

4. A urethro-cystoscopic instrument comprising a shaft having a curved distal end adapted to be inserted through the urethra of a patient, an extensible and retractile cutting element mounted near said end, said element being adapted to be extended to project laterally from said shaft within the bladder of the patient, and to be retracted for insertion through the urethra, and means for rotating said element to describe a surface of rotation when extended whereby an annular portion of the prostate gland surrounding the vesical neck may be excised.

5. The instrument specified in claim 4 in which said shaft is of tubular form adapted to receive a cystoscopic telescope and said curved distal end is fenestrated to permit a view therethrough from said telescope.

6. The instrument specified in claim 4 in which said cutting element is supported at its distal and proximal ends on said shaft.

7. The instrument specified in claim 4, in which said cutting element is an electric conductor adapted to constitute an electrode in a circuit for a high frequency cutting current.

8. The instrument specified in claim 4, in which said cutting element is a flexible wire secured at its distal end near the distal

end of said tubular support or shaft, means secured to the proximal end of said wire for controlling the tension thereof and connections for placing said wire in circuit to receive a high frequency cutting current of electricity.

9. A urethro cystoscopic instrument comprising a shaft having a curved distal end adapted to be inserted through the urethra of a patient, a normally stationary support in which said shaft is revoluble, a cutting element mounted near said distal end, said element being adapted to be extended to project laterally from said shaft within the bladder of a patient and to be retracted for insertion through the urethra, connections on said support for placing said cutting element in a circuit for a high frequency current and a manually operable head revolubly secured to said support for rotating said element to describe a surface of rotation when extended.

In testimony whereof, we have hereunto signed our names to this specification.

FREDERIC E. B. FOLEY.
JOHN E. SEDERHOLM.