July 25, 1950 F. J. WALLACE 2,516,494

ENDOSCOPE

Filed Jan. 31, 1946 2 Sheets-Sheet 1

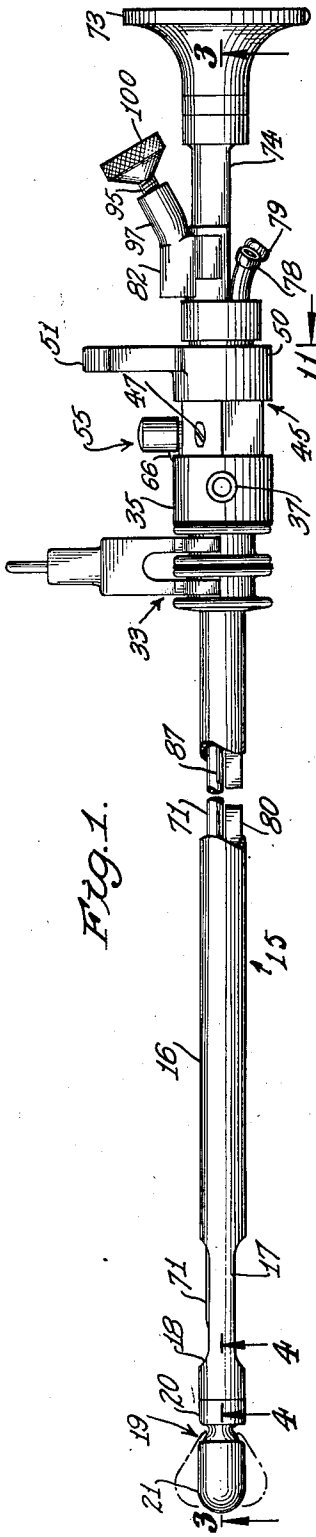


Fig. 1.

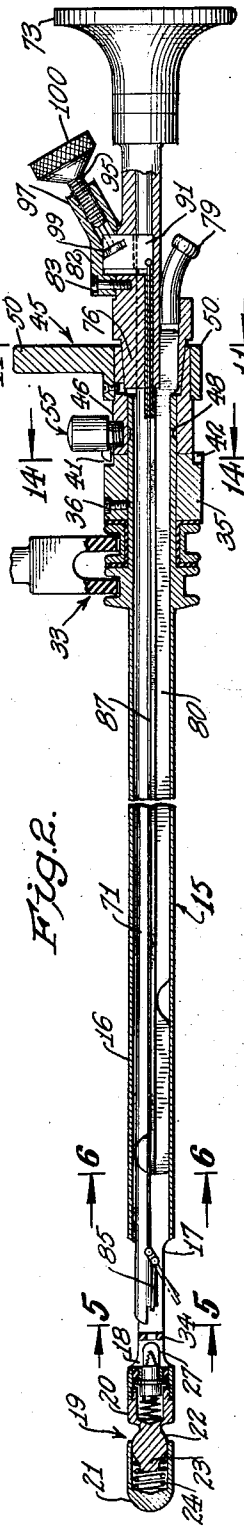


Fig. 2.

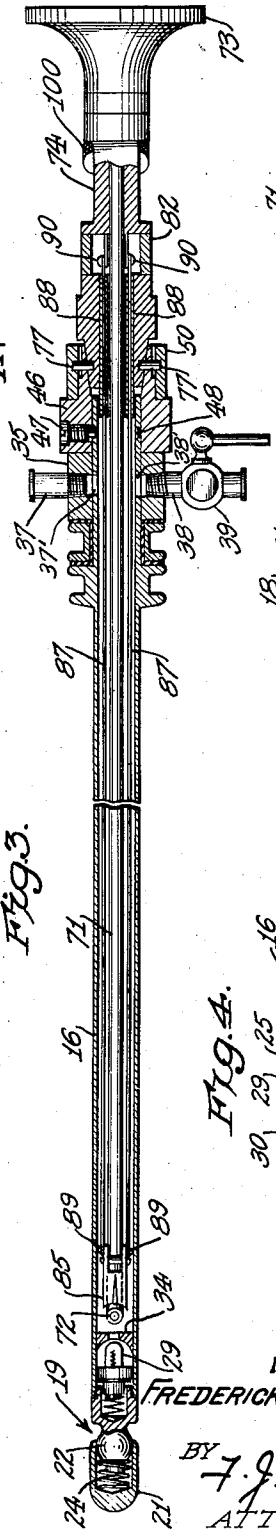


Fig. 3.

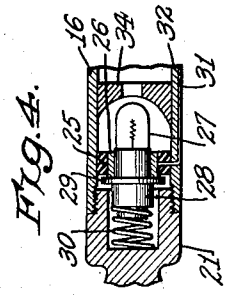


Fig. 4.

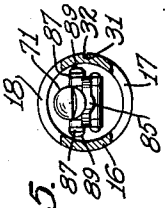


Fig. 5.

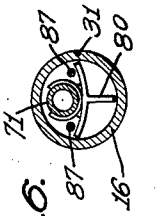


Fig. 6.

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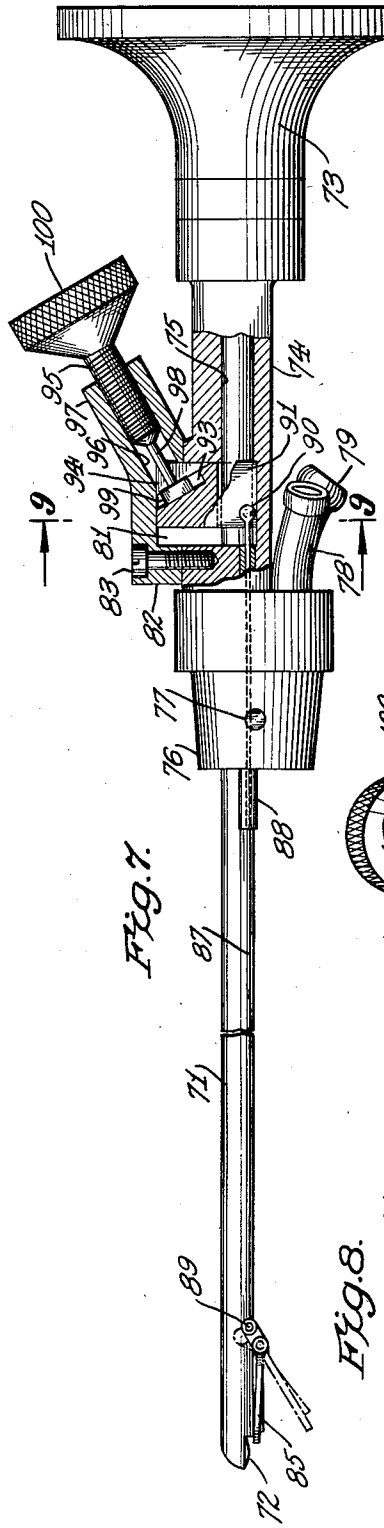


Fig. 1.

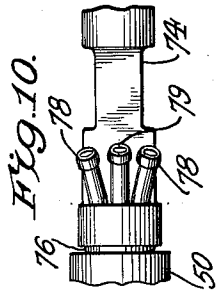


Fig. 10.

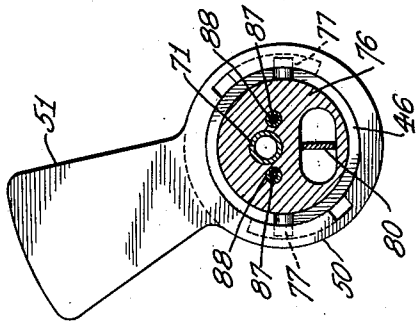


Fig. 11.

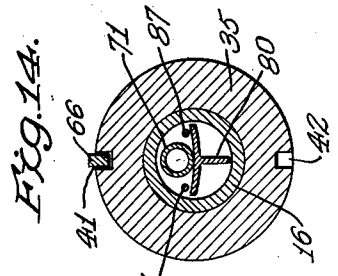


Fig. 14.

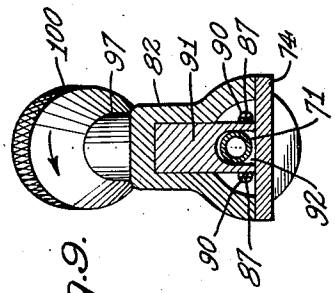


Fig. 9.

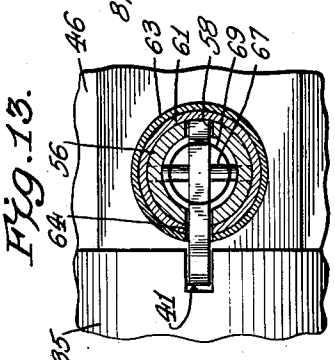


Fig. 13.

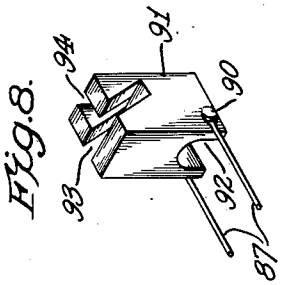


Fig. 8.

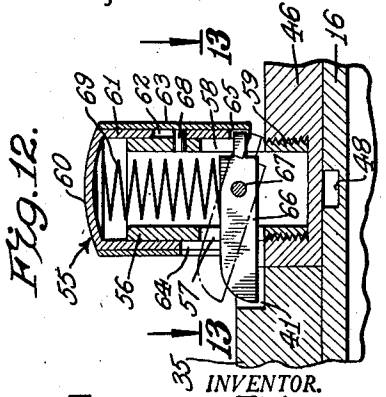


Fig. 12.

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UNITED STATES PATENT OFFICE

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ENDOSCOPE

Frederick J. Wallace, New York, N. Y., assignor to American Cystoscope Makers, Inc., New York, N. Y., a corporation of New York

Application January 31, 1946, Serial No. 644,478

9 Claims. (Cl. 128—4)

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This invention relates to endoscopic instruments, and more particularly to such instruments adapted to be introduced into and operated in body cavities with greater facility, and having improved characteristics whereby discomfort to the patient is minimized.

It is an important object of this invention to provide an endoscopic instrument having certain parts so arranged as to facilitate its introduction and withdrawal into and out of body passages, and to materially reduce the possibility of the instrument's being inserted in passages other than those intended by the operating surgeon.

Another object of the invention is to provide an instrument of the character indicated that is adapted to be moved through more or less tortuous body passages without tearing or otherwise injuring body tissue constituting part of the wall of the passage, such as in the region of the exterior vesical sphincter, in the course of manipulation.

Another object of the invention is to provide an endoscopic instrument having a plurality of fenestras formed in its sheath and an examining telescope rotatably mounted in the sheath in a manner to bring each fenestra successively in the field of vision of the telescope without disturbing the sheath after it has been disposed in a body passage, to thereby effectively reduce trauma and discomfort to the patient.

A further object of the invention is to provide an instrument of the character indicated with an improved arrangement of devices for readily effecting and positively maintaining deflection of a catheter or operating instrument, as required.

To the end that these objects may be attained, an instrument constructed in accordance with this invention may include a first device comprising an endoscopic tube having a plurality of lateral fenestras formed therein and spaced thereabout; a second device comprising an examining telescope having a portion thereof in the first device and capable of including any one of the fenestras in its field of vision, depending upon its relative angular position with respect to the first device; and a third device rotatably coupled to the first device and removably secured to the second device in a manner to respectively permit relative angular movement and prevent axial movement between the first and second devices.

The endoscopic tube is provided with a beak or forward extension forming a universal connection therewith, preferably in the nature of a ball and socket joint, to permit free movement of the forward end part of the first device, and to

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facilitate its passage into and out of body cavities without injury to the walls of such cavities. By this arrangement, the instrument of this invention readily accommodates itself to bends in body passages and may be used in place of conventional instruments having either fixed concave or convex beaks. As will be readily apparent to persons versed in the art, the present instrument is capable of being advantageously employed as either a cystoscope or a urethroscope.

One of the features of this invention resides in the provision of an improved arrangement of elements for imparting deflection to a catheter or the like at the will of the operator. This includes a pivoted deflector that is adapted to be positively maintained in desired position, thereby obviating the possibility of its being accidentally moved during use.

The above enumerated objects, as well as other objects, together with the advantages of this invention, will be readily apparent to persons skilled in the art by reference to the following detailed description, taken in conjunction with the annexed drawings, which respectively describe and illustrate, by way of example, an instrument constructed in accordance with the invention.

In the drawings:

Figure 1 is a side elevation view of an endoscopic instrument embodying the devices of this invention;

Figure 2 corresponds to Figure 1, and depicts certain of the parts in central vetrical cross section;

Figure 3 is a cross-sectional view taken along line 3—3 of Figure 1;

Figure 4 is an enlarged cross-sectional view taken along line 4—4 of Figure 1;

Figures 5 and 6 are transverse cross-sectional views taken along lines 5—5 and 6—6, respectively, of Figure 2;

Figure 7 is an enlarged view of the instrument shown in Figure 1, with certain parts omitted, with parts broken away, and with other parts in central vertical cross section, to better illustrate the deflector and devices for actuating the same;

Figure 8 is an isometric view of certain parts that cooperate in actuating the deflector;

Figure 9 is a transverse cross-sectional view taken along line 9—9 of Figure 7;

Figure 10 is a bottom plan view of a portion of the instrument shown in Figure 9;

Figure 11 is an enlarged transverse cross-sectional view taken along line 11—11 of Figure 2;

Figure 12 is an enlarged vertical cross-sectional

view of a detent means employed in this invention;

Figure 13 is a cross-sectional view taken along line 13—13 of Figure 12; and

Figure 14 is an enlarged cross-sectional view taken along line 14—14 of Figure 2.

Referring now to the drawings, wherein like reference numerals are employed to denote corresponding parts throughout the several views, and more particularly to Figures 1–5, inclusive, the earlier referred to first device is identified by numeral 15 and includes a substantially rectilinear endoscopic tube or sheath 16 having a pair of fenestras 17 and 18 formed therein and spaced therearound. A forward extension 19 consists of hollow first and second units 20 and 21, respectively. Unit 20 is externally threaded at its rearward end to engage corresponding internal threads in the front end of tube 16 and is provided with a rounded or ball forward end 22 that has an integral forwardly projecting spring guide 23. The term "rounded," as used herein and in the appended claims, is intended to include any curved surface, whether in the nature of a portion of a spherical surface or otherwise. The open or rearward end of unit 21 embraces rounded forward end 22 of unit 20 and is peened over or rolled to obtain a freely movable ball and socket joint or universal connection between these units. A compression spring 24 is contained within unit 21 and normally urges that unit toward the left (Figures 2 and 3) to obtain intimate contact between the rounded end of unit 20 and the open end of unit 21. The free end of unit 21 is also rounded or blunted to permit its ready introduction into and movement through a body passage.

As is best shown in Figure 4, a ring 25 of electrical insulating material is positioned across the interior of tube 16 adjacent the forward extremity of each of the fenestras 17 and 18. Ring 25 carries a concentric inner ring 26 made of a material having good electrical conducting properties for the reception of an electrical lamp, including a translucent bulb 27 and a base 28 having a flange 29. The lamp is inserted in inner ring 26 from the left, as viewed in Figure 4, and is normally maintained in the illustrated position by the combined action of a compression spring 30 in unit 21 and flange 29 that abuts the forward end of inner ring 26. As will be noted from Figure 2, light rays emitted by the lamp pass through both fenestras 17 and 18 to the exterior of tube 16. An insulated electrical conductor 31 is positioned in a groove 32 or otherwise embedded in tube 16 and makes contact with inner ring 26 and an electrical terminal member 33 in a manner well known to the art. A perforate partition 34 is located across tube 16 to protect the lamp against damage by instruments that may be inserted in the tube from the rearward end thereof.

A collar 35 embraces endoscopic tube 16 and is secured thereto by one or more set screws 36 (Figure 2). This collar carries a pair of diametrically opposed conduits 37 and 38 that communicate with corresponding ports 37' and 38' in tube 16. As shown in Figure 3, conduit 38 is provided with a petcock 39 to control the flow of irrigating fluid from a convenient source (not shown) through conduit 38, port 38' and tube 16 in the order named. Spent irrigating liquid is withdrawn by the instrument through the interior of tube 16, port 37' and conduit 37. Collar 35 has a plurality of circumferentially spaced apertures, a pair of

such apertures being represented by diametrically opposed notches 41 and 42 (Figures 2 and 14).

Concentrically and rotatably mounted on the rearward portion of tube 16 is a device 45, including a sleeve 46 carrying a stud 47 that rides in an annular groove or raceway 48 formed in tube 16. Secured to the rearward end of sleeve 46 and rotatable therewith is a locking unit 50 that has a laterally extending operating handle 51 and that is preferably the same as or similar to the locking mechanism disclosed in Reinhold H. Wappler Patent No. 1,880,551 granted October 4, 1932, to which reference may be had for details of construction.

Sleeve 46 carries a detent means 55 illustrated in detail in Figures 12 and 13, to which reference is now had. Detent means 55 includes an upstanding tubular post 56 having a pair of aligning slots 57 and 58 and being externally threaded at its lower end portion for reception in a tapped blind bore 59 in sleeve 46. Slidable along post 56 is a cap 60 having an inner tubular wall 61 slotted at 62, and a concentric outer tubular wall 63. As is shown in Figure 12, tubular walls 61 and 63 are notched at 64, and inner tubular wall 61 is additionally notched at 65 to freely accommodate the forward and rearward ends, respectively, of a latch element 66 that extends through and beyond slots 57 and 58, and that is pivotally mounted in post 56 on a pivot pin 67. A laterally projecting stop pin 68 affixed to post 56 terminates in slot 62 and serves the dual function of limiting axial movement of cap 60 in either direction along the post, and preventing rotational movement of the cap with respect to the post. A compression spring 69 is positioned within cap 60 and bears against the inner end surface of the cap and latch 66 to normally and yieldingly urge the latch in a clockwise direction, as viewed in Figure 12. When the parts are in the relative position shown in full lines in Figure 12, latch 66 is in its normal position and registers with aperture 41 in collar 35. Upon the application of downward pressure on the top of cap 60, the cap is moved downwardly against the action of spring 69, whereby inner tubular wall 61 bears against the right end of latch 66 to pivot the latch in a counter-clockwise direction to the position indicated by the dot-dash lines, thereby releasing the latch from notch 41. Subsequent removal of the force applied to cap 60 permits spring 69 to move cap 60 upwardly and return the parts to their normal relative position.

Another of the earlier referred to devices of the invention is shown in detail in Figures 7–10, inclusive. This device contemplates a telescope comprising a tubular stem 71, an objective lens 72 and a conventional eyepiece 73. Objective lens 72 constitutes one of the lenses of a system otherwise not shown, but which may be the same as or similar to the arrangement shown in Reinhold H. Wappler Patent No. 1,021,809 granted April 2, 1912, and adapted to command a field of vision generally at right angles to the axis of stem 71.

The telescope is adapted to be carried in a housing 74 having a longitudinal bore 75 for the reception of stem 71. The telescope is secured to the housing by a threaded connection (not shown) formed between eyepiece 73 and the rearward end of housing 74, or in any other desired manner. Housing 74 has an integral forwardly tapered frustro-conical end portion 76 insertable in locking unit 50, which engages a pair of oppositely arranged, laterally projecting lock pins

77 (Figures 3 and 7) to obtain a snug fluid-tight connection between housing 74 and both locking unit 50 and sleeve 46. The relationship of frustro-conical portion 76, pins 77 and locking unit 50 may be the same as is taught in the above mentioned Reinhold H. Wappler Patent No. 1,880,551.

Secured to housing 74 is a pair of spaced catheter guide conduits 78 (Figure 10), each of which communicates with the interior of endoscopic tube 16 when the instrument is fully assembled, as is depicted in Figure 2. Intermediate conduits 78 is a third conduit 79 that is also adapted to communicate with the interior of tube 16, and that serves as a guide for an operating instrument (not shown). When the instrument is to be used for catheterizing purposes, it is advantageous to employ a removable longitudinal fin 80 to guide the catheters during their movement along the interior of tube 16 and to prevent the catheters from becoming entangled with each other or with other devices disposed in the endoscopic tube. Removable fin 80 snaps on the forward portion of telescope tube 71 and may be of the same general character as the corresponding fin disclosed in Reinhold H. Wappler Patent No. 1,303,135 granted May 6, 1919.

Within housing 74 is a compartment or chamber 81 (Figures 7 and 9). Housing 74 includes a cover member 82 that is maintained in position by a screw 83. As will be noted by reference to Figure 7, access may be had to compartment 81 by withdrawing screw 83 and removing cover member 82.

A deflector plate 85 for directing catheters or operating instruments through a fenestra is pivoted intermediate its ends to telescope tube 71, as at 86, and is disposed in the field of vision of the telescope. Reference is now had to Figures 7, 8 and 9 which illustrate details of construction of the elements that cooperate to actuate deflector plate 85 and positively maintain the same in desired position at the will of the operator. In this connection, I provide a pair of shafts or rods 87 slidable through guide tubes 88 welded or otherwise secured to telescope tube 71. Shafts 87 are parallel to each other and to the axis of telescope tube 71, and are pivoted at their forward ends 89 to deflector plate 85 and secured at their rearward ends 90 to opposite sides of a block 91 reciprocable in compartment 81. Block 91 has a longitudinal bottom groove 92 to permit its free movement along telescope tube 71. As is best shown in Figure 8, block 91 is also provided with a transverse through slot 93 that merges with a longitudinal partial top slot 94. When the block 91 is at its rearward-most position, as shown in Figure 7, it cooperates with shafts 87 to maintain deflector plate 85 in retracted position, as shown in full lines in that figure and in Figure 2. As block 91 is moved forwardly or toward the left (Figure 7), it cooperates with shafts 87 and pivot connections 89 and 86 to tilt deflector plate 85 in a counterclockwise direction, the fully protracted position of the deflector plate being indicated by the dot-dash lines in Figures 2 and 7.

The position of block 91 within compartment 81 and, therefore, the position of deflector plate 85 with respect to telescope tube 91 are determined by a threaded control rod 95. Control rod 95 engages a tapped bore 96 formed in a lug 97 integral with cover member 82 and extending obliquely and rearwardly of the axis of telescope tube 71. Preferably integral with control rod

95 is a forward stem 98 that is movable through slot 94, and that carries a head or disc 99 which registers with slot 93. Control rod 95 is also provided with a knurled actuating knob 100 operable from the exterior of the instrument. With the parts in the relative position shown in Figures 7 and 9, and upon manipulation of knob 100 in a clockwise direction (Figure 9), control rod 95, stem 98 and head 99 are rotated and move forwardly and downwardly, thereby moving block 91 forwardly along telescope tube 71, and initiating protracting movement of deflector plate 85 about pivot 86. It will be apparent from an examination of Figure 7 that with the arrangement just described, deflector plate 85 may be disposed in any desired position between fully protracted and fully retracted position in response to corresponding increments of rotation of control rod 95 in opposite directions.

As illustrated, fenestras 17 and 18 are formed 180° apart in endoscopic tube 16. Apertures or notches 41 and 42 are likewise disposed 180° from each other. With the parts assembled as shown in Figures 1 and 2, fenestra 17 alone is in the field of vision of the telescope, while latch 66 of detent means 55 is in registration with notch 41 to prevent relative rotation between the telescope and tube 16. To bring fenestra 18 in the field of vision of the telescope, it is merely necessary to release latch 66 from notch 41 and rotate the telescope through 180° with respect to tube 16, permitting latch 66 of the detent means to enter into registration with notch 42.

Thus it will be seen that the construction herein shown and described is well adapted to accomplish the objects of the present invention. It will be understood, however, that the invention may be embodied otherwise than here shown, and that in the form illustrated certain obvious changes in construction may be made. Therefore, I do not wish to be limited precisely to the construction herein shown except as may be required by the appended claims considered with reference to the prior art.

I claim:

1. In an instrument of the character described, an endoscopic tube and a forward extension for said tube comprising a first unit having one end secured to the front end of said tube and a second unit, one end of said second unit forming a universal connection with the other end of said first unit.

2. In an instrument of the character described, an endoscopic tube and a forward extension for said tube comprising a first unit secured at its rearward end to the front end of said tube and a second unit closed at its forward end and open at its rearward end, the rearward end of said second unit engaging the forward end of said first unit in a manner to form a universal connection therewith.

3. In an instrument of the character described, an endoscopic tube and a forward extension for said tube comprising a first unit secured at its rearward end to the front end of said tube, said first unit including a rounded forward portion, and a hollow second unit having a closed forward end and an open rearward end, said rearward end of said second unit embracing said rounded portion of said first unit and forming a universal connection therewith.

4. In an instrument of the character described, an endoscopic tube and a forward extension for said tube comprising a first unit secured at its rearward end to the front end of said tube, said

first unit including a rounded forward portion, and a hollow second unit having a closed forward end and an open rearward end, said rearward end of said second unit embracing said rounded portion of said second unit and forming a universal connection therewith, and resilient means within said second unit biasing the same in a direction away from said first unit.

5. In an instrument of the character described, an endoscopic tube, a forward extension for said tube comprising a first unit having one end secured to the front end of said tube and a second unit having one end swivelly connected to the other end of said first unit, a lamp having at least a portion thereof disposed in the tube, resilient means bearing against said first unit and said lamp for moving said lamp in a direction toward the rear of said tube, and means for limiting movement of said lamp in said direction.

6. In an instrument of the character described, a first device comprising an endoscopic tube having at least one lateral fenestra, a second device comprising a telescope having its forward portion in said first device and capable of including said fenestra in its field of vision, a third device rotatably coupled to the first device and removably attached to the second device to respectively permit relative angular movement and prevent axial movement between said first and said second device, and means for preventing relative rotation between said first and second devices when the same are in a predetermined relative angular position.

7. In an instrument of the character described, a first device comprising an endoscopic tube having at least one lateral fenestra, a second device comprising a telescope having its forward portion in said first device and capable of including said fenestra in its field of vision, a third device rotatably coupled to the first device and removably attached to the second device to respectively permit relative angular movement and prevent axial movement between said first and said second device, and spring-pressed detent means for preventing relative rotation between said first and second devices when the same are in a predetermined relative angular position.

8. In an instrument of the character described, a first device comprising an endoscopic tube having a plurality of lateral fenestras formed therein and spaced therearound, a telescope having a portion in said first device and capable of including any one of said fenestras in its field of vision depending on the relative angular position of said telescope and said first device, a second device rotatably coupled to said first device and removably attached to said telescope to respectively permit relative angular movement and prevent axial movement between said first device and said telescope, and means carried by one of said devices and cooperating with the other of said devices to prevent relative rotation between said first device and said telescope when the same are in relative angular positions in which any one of said fenestras is in the field of vision of said telescope.

9. In an instrument of the character described, a first device comprising an endoscopic tube having a plurality of lateral fenestras formed therein and spaced therearound, a telescope having a portion in said first device and capable of including any one of said fenestras in its field of vision depending on the relative angular position of said telescope and said first device, a second device rotatably coupled to said first device and removably attached to said telescope to respectively permit relative angular movement and prevent axial movement between said first device and said telescope, one of said devices having a plurality of spaced apertures, and releasable detent means carried by the other of said devices, said detent means registering with one of said apertures when said devices are in a corresponding relative angular position to prevent relative rotation between said devices, said apertures and detent means being so arranged as to effect such registration when each of said fenestras is in the field of vision of said telescope.

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Number	Name	Date
1,880,551	Wappler	Oct. 4, 1932
2,079,233	Wappler	May 4, 1937
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