

No. 731,496.

PATENTED JUNE 23, 1903.

P. POIRIER & P. MICHEL.

GASTROSCOPE.

APPLICATION FILED DEC. 13, 1901.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 4

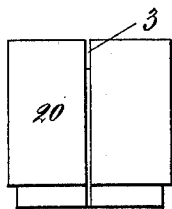


Fig. 6

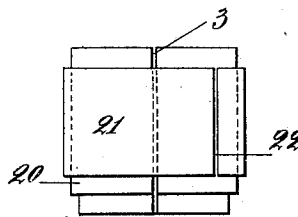


Fig. 5

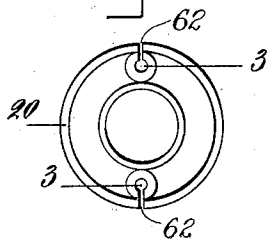


Fig. 7

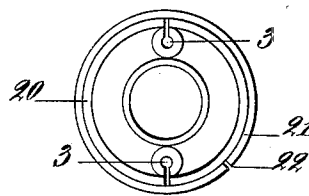


Fig. 8

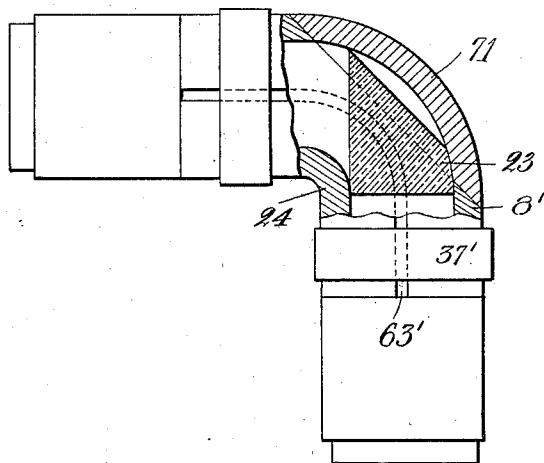


Fig. 9

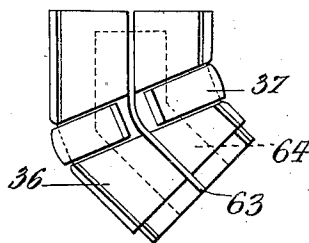
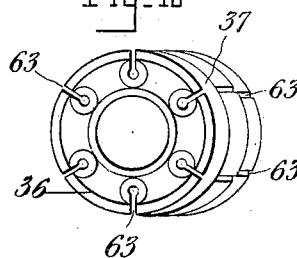


Fig. 10



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GASTROSCOPE.

SPECIFICATION forming part of Letters Patent No. 731,496, dated June 23, 1903.

Application filed December 13, 1901. Serial No. 85,789. (No model.)

To all whom it may concern:

Be it known that we, PAUL POIRIER and PAUL MICHEL, citizens of the Republic of France, and residents of Paris, France, have invented certain new and useful Improvements in Gastrosopes, of which the following is a specification.

Our invention has for its object an apparatus designed for the inspection of the stomach, and is intended to enable lesions and the like which may exist in this organ to be examined, and consequently to enable the treatment applicable for particular cases to be determined.

The essential feature of this apparatus is the combination of an electric-lamp arrangement, intended to illuminate the interior of the stomach, with a tube, which may be made either flexible or rigid, as required to allow first of its insertion into the stomach through the mouth and the pharynx and when introduced to enable an optical examination of the stomach to be effected by means of a suitable arrangement of prisms and lenses.

To allow of the invention being better understood, we will now refer to the accompanying drawings, which illustrate one form of the invention.

In the drawings, Figure 1 is a full-size elevation and partial section of the apparatus. Fig. 2 is a view in sectional elevation of two separate elements of the tube which form the principal feature of our apparatus. Fig. 3 is a detail plan view of one of these parts. Figs. 4 and 5 are respectively an elevation and a plan view of an independent tubular element which may be inserted or removed into the tube for regulating the length thereof, it being shown in open position. Figs. 6 and 7 are views similar to Figs. 4 and 5, showing the element in locked position. Fig. 8 is a side elevation, partly in section, of a modified form of angle-joint for the throat end of the tube. Figs. 9 and 10 are respectively an elevation and a plan view of an insertible elbow-ring for changing the direction of the lower end of the tube.

The same figures of reference represent the same parts in the various figures.

The apparatus consists, essentially, in a flexible tubular structure made up of independent tubular elements, said tubular ele-

ments having double walls and the connecting cords or wires passing through the annular space between the walls thereof, so as to permit the center to be free and open for the passage of rays of light. At the upper end of this tube is an elbow which projects horizontally, and at the angle of the elbow are presented suitable reflecting means for changing the direction of rays of light to an eyepiece at its opposite end, while at the lower end is provided an apparatus consisting principally of an electric light, a lens for collecting the rays of the same, and reflecting means for directing the light reflected from the internal walls of the organ up through the tube, and hence to the eyepiece at the outer end. Combined with this apparatus are means for rotating the lower end of the tube about a swivel-joint, whereby the examination may be directed to different points on the walls of the organ under examination, and, further, we provide when necessary means, such as elbow-joints, for changing the vertical angle of the rays of light. Concomitant with these principal elements we also provide accessory features, such as one or more electric conductors serving the light at the lower end of the tube, conduits for the circulation of water and air, whether for preventing overheating due to the lamp or for distending the organ under examination, or, further, for cleaning the optical glasses, lenses, prisms, and mirrors placed in the extremity of the instrument. Under certain circumstances we may also provide means at the upper extremity of the tube comprising a double eyepiece for enabling two observers to carry on the investigations simultaneously.

The apparatus (shown in its entirety in Fig. 1) comprises a single straight optical tube 40, which, as shown, has a rectangular elbow 8 at its rear end, and over its front end is fitted a screw-cap 41, whose forward end abuts against the end of the tube 40 and is loosely rotatable thereon, as shown. In the end 42 of the cap is mounted a lens 9, constituting an eyepiece, which is preferably surrounded by a hood 10. Around the body of the tube 40 is loosely fitted a sleeve 43, which is freely slidable on the tube, but is prevented from turning thereon by any suitable means, and has at its front end a screw-threaded head

11, which is adapted to engage with screw-threads 12, formed on the interior surface of the cap 41. It will be seen, therefore, that by rotating the cap 41 the sleeve 43 is moved longitudinally on the tube 40.

The vertical portion of the apparatus is a continuation of the tube 40 from the lower end of the elbow 8 and is made up of a series of tubular segments or joints 1, which are shown separated from each other in Fig. 2 and are provided with interlocking tongue-and-groove joints at their meeting extremities, as shown, so that when the sections are drawn together they will be rigid and in line one with the other. These sections have concentric cylindrical walls, the inner one of which is designated 44, and the central space within this inner wall is left open for use as an optical tube, while the inner space 19 between the two walls is utilized for various conduits (designated 3, 13, 14, 15, and 16 in Fig. 3) leading between the upper and lower ends of the tube, as will be described, the conduits being, of course, continuous and flexible, so as to permit the flexure of the tubular sections one on the other.

At the lower end of the apparatus are located two members 6 and 7 of special shape, the former of which directly follows the last of the tubular sections 1 and carries the prism or other reflecting means, while the terminal member 7 carries the electric light, together with a lens. The member 6, while having an annular tongue-and-groove joint similar to that between the other members, is rotatable relative to the main portion of the tube, whose lower section is also of slightly different form from the other sections.

The ends of the cord 2 are carried up through conduits 3 on opposite sides of the sectional tubing, as shown in Fig. 3, and at their upper ends they are carried out through openings 4 in the sides of the tube 40 and wound around screw-posts 47 on the sleeve 43. By this arrangement it will be seen that the sections forming the tubing are strung together, so as to be normally flexible, but are rendered rigid and straight by simply rotating the cap 41, so as to draw up the sleeve 43.

Through the end of the tube 40 is inserted a long glass-column prism 48, whose rear end is cut to form an oblique surface 49 at forty-five degrees with the axis of the prism, so that light-rays directed up through the vertical section of the tube are totally reflected at 49 and pass out through the eyepiece 9.

The lower extremity of the apparatus, comprising the members 6 and 7, are connected by a swivel-joint to the upper portion of the tube, and by winding up one end of the cord 2 about the post 47 and simultaneously unwinding the other the lamp and the prism 17 are rotated about the optic axis, so as to direct the examination to any desired portion of the stomach-wall. A further range of adjustment is given by the insertible sections of tubing shown in Figs. 4, 6, and 9. In Fig.

4 is shown a tubular section 20 similar to the sections designated 1, but the conduit 3 of which is connected to the exterior by a longitudinal slit 62, so as to enable the cord 2 to pass through these slits and the sections to be inserted between any two of the numerous sections of tubing where it is desired to lengthen the apparatus. To hold the cord 2 against coming out, we may also provide a ring 21, cut through at one side, as at 22, which surrounds the body of the section 20 and enables the cord to pass through the slit 62 only when the cut 22 registers therewith, so that after the cord has been passed through at each side by turning the ring 21 into the position shown in Figs. 6 and 7 it is locked therein and prevented from coming out. A similar member is shown in Figs. 9 and 10, the object of which is not simply to lengthen the tube, but also to change the direction of the light and the point toward which the examination is directed. This member is elbowed and carries a number of axial slits 63 around its periphery, into any of which the cord may be threaded and held therein by a ring 37 in an analogous manner to the ring 21. Within the elbowed member 36 is located a prism 64 for refracting or reflecting the light upwardly in the direction of the altered optic axis.

By means of the swivel-mounting of the lower end of the apparatus, taken in conjunction with the elbowed insertible member 36, practically any point of the wall of the stomach may be examined, and the instrument has a perfect and complete range of adjustability. For very slight variations of direction the apparatus may be moved, of course, bodily to a slight extent without altering its adjustment.

Fig. 8 shows a modification of the upper elbow-joint 8 of the apparatus where it is desired to form the horizontal as well as the vertical portion of the apparatus in tubular sections. The elbow (designated 8') is a separate piece, similar to the elbow shown in Fig. 9, except that it is an elbow of ninety degrees and has two rings 37', surrounding its respective ends, and correspondingly-formed grooves 63', passing longitudinally around the bend for lodging the cords 2. In this case the long prism 48 of Fig. 1 is replaced by a short rectangular prism 23, which is preferably fixed to a segmental section 71, formed to be separated and removed from the elbow proper when it is desired to inspect or renew the same.

The entire flexible portion of the apparatus is covered in use with a flexible tubular covering 73, of india-rubber or like material, which without altering its flexibility prevents any organic liquids from penetrating the interior of the tube and corroding the same.

The apparatus is operated as follows: The tube being rendered flexible by rotating the cap 41 until the cords 2 are sufficiently slack,

the end of the tube can be introduced through the esophagus, after which it is rendered rigid and rectilinear by turning the cap 41 in the opposite direction, which draws the sections of the tube together. When the tube is in this condition, it is ready for observation, and the current being turned on the lamp will glow, and its reflections from the walls of the stomach will be directed up through the prism 17 to the upper end of the tube and thence to the eyepiece 9. The direction toward which the end of the tube is turned may be regulated both vertically and horizontally in the manners which have been already described and need not be further here referred to.

Of course we may vary the forms, dimensions, proportions, and accessory parts and employ for their construction such materials as we may deem suitable without materially departing from the scope of the invention.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An instrument for examining the internal parts or cavities of the body, comprising a tube formed in separable annular sections, one or more cords on which said sections are strung, means for tightening said cords to render said sections solid and rectilinear one with another, and suitable optical devices at one or both ends of said tube, substantially as described.

2. An instrument for the examination of the interior cavities of the body, comprising a tube formed in separable tubular sections interlocking one with another, a plurality of cords passing along the sides of said sections and on which the latter are strung, means for shortening said cords upon the outermost or end section whereby to draw the sections of the tube together and render them rectilinear and rigid, and suitable optical devices located at one or both ends of the tube for directing rays of light therethrough, substantially as described.

3. An instrument for the examination of the interior cavities of the animal body, comprising a tube composed of double-walled interlocking tubular sections, a plurality of cords on which said sections are strung together, said cords passing between the double walls of the sections, a lamp carried at the lower end of the tube, means at the upper end of the tube for taking up slack in said cords to render the tube rigid and rectilinear, suitable reflecting means for directing rays of light along the axis of the tube, and an eyepiece at the upper end of the tube, substantially as described.

4. An instrument for the examination of the interior cavities of the animal body, comprising a tube composed of double-walled interlocking tubular sections, a plurality of cords on which said sections are strung together, said cords passing between the double walls of the sections, a lamp carried at the

lower end of the tube, means at the upper end of the tube for taking up slack in said cords to render the tube rigid and rectilinear, suitable reflecting means for directing rays of light along the axis of the tube, an eyepiece at the upper end of the tube, the lower terminal member of the tube being connected by a swivel-joint with the other members, and means for rotating said terminal member from the upper end of the tube.

5. An instrument for examining the internal cavities of the animal body, comprising a rigid tubular member at the outer end, an eyepiece formed at one end of said rigid member, an elbow formed at the other, reflecting means located at the elbow for changing the direction of the rays of light, a series of interlocking tubular sections connected to said rigid member below said elbow, a terminal member having a swivel connection with the other tubular members and having a nipple extending within the lowermost tubular member, a cord helically wound around said nipple and fixed thereto at one point thereof and carried up through conduits in the walls of the successive tubular members and the upper rigid member, means mounted on the said rigid member for drawing up the ends of said cord to take up the slack and rigidify the tube formed of said tubular members, and means for drawing up one end of said cord and releasing the other, whereby to rotate said terminal member about the said swivel-joint.

6. An instrument for examining the internal cavities of the animal body, comprising a rigid tubular member at the outer end, an eyepiece formed at one end of said rigid member, an elbow formed at the other, reflecting means located at the elbow for changing the direction of the rays of light, a series of interlocking tubular sections connected to said rigid member below said elbow, a terminal member having a swivel connection with the other tubular members, a cord fixed to said terminal member at one point thereof and carried up through conduits in the walls of the successive tubular members and the upper rigid member, a screw-cap pivotally mounted on the fore end of said rigid member, a sleeve freely sliding on said rigid member and prevented from turning thereon and having a threaded engagement with said screw-cap, and posts on said sleeve to which the ends of said cord are connected whereby the members of said tube may be drawn together to render said tube rigid and rectilinear.

7. An instrument for examining the internal cavities of the animal body, comprising a rigid tubular member at the outer end, an eyepiece formed at one end of said rigid member, an elbow formed at the other, reflecting means located at the elbow for changing the direction of the rays of light, a series of interlocking tubular sections connected to said rigid member below said elbow, a terminal member having a swivel connection with the

other tubular members, a cord fixed to said terminal member at one point thereof and carried up through conduits in the walls of the successive tubular members and the upper rigid member, means mounted on said rigid member for drawing up the ends of said cord to take up the slack and rigidify the tube formed of said tubular members, a reflector mounted in said rigid tubular member, and an electric lamp also mounted in said terminal member.

8. An instrument for examining the internal cavities of the animal body, comprising a rigid tubular member at the outer end, an eyepiece formed at one end of said rigid member, an elbow formed at the other, reflecting means located at the elbow for changing the direction of the rays of light, a series of interlocking tubular sections connected to said rigid member below said elbow, a terminal member having a swivel connection with the other tubular members, a cord fixed to said

terminal member at one point thereof and carried up through conduits in the walls of the successive tubular members and the upper rigid member, means mounted on said rigid member for drawing up the ends of said cord to take up the slack and rigidify the tube formed of said tubular members, a reflector mounted in said tubular member, an electric lamp also mounted in said terminal member, and a tube or conduit leading from the upper end of the instrument through the walls of said tubular sections and debouching within said terminal member, whereby water may be introduced thereinto.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

PAUL POIRIER.
PAUL MICHEL.

Witnesses:

JULES FREYOLLET,
EDWARD P. MACLEAN.