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R. H. WAPPLER.

ILLUMINABLE SPECULUM.

APPLICATION FILED APR. 6, 1906.

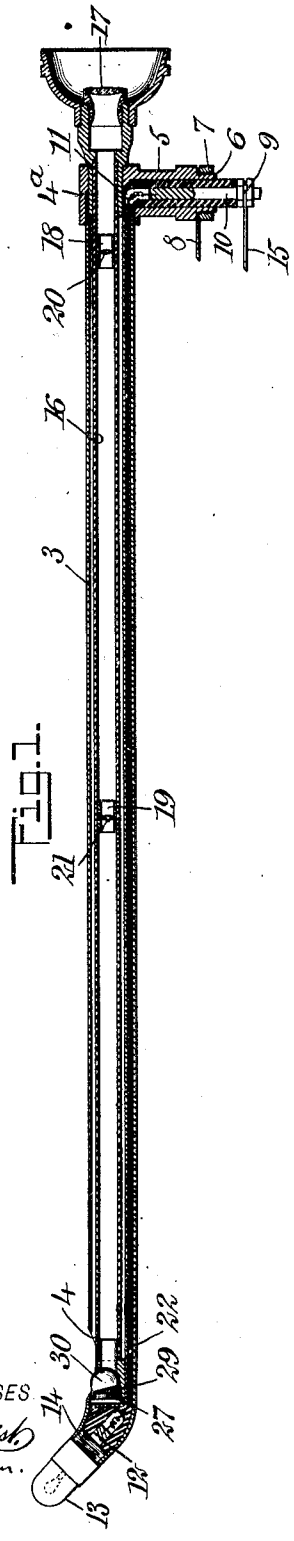


Fig. 1.

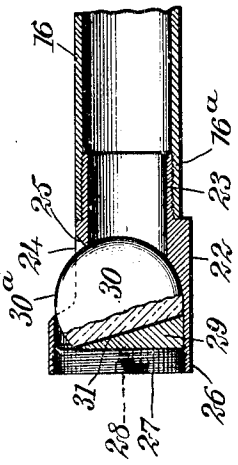


Fig. 2.

WITNESSES

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ILLUMINABLE SPECULUM.

No. 849,344. Specification of Letters Patent. Patented April 2, 1907.

Application filed April 6, 1906. Serial No. 310,237.

To all whom it may concern:

Be it known that I, REINHOLD H. WAPPLER, a citizen of the United States, and a resident of the city of New York, (borough of Manhattan,) in the county and State of New York, have invented a new and Improved Illuminable Speculum, of which the following is a full, clear, and exact description.

My invention relates to illuminable specula—that is, to instruments used generally for looking into dark places—and more particularly employed for examining cavities in various parts of the human body. As is well known, such instruments are indispensable to surgery and medicine.

My invention further relates to means whereby the focal range of the cystoscope is modified in such manner that the particular length of the tube used for the sight-barrel may be varied to suit different conditions and whereby the clearness of the image brought to view is greatly increased.

My invention further relates to means whereby the field of vision of the observer is enlarged in the sense that the observer is enabled to see objects and portions thereof which are almost directly between his eye and the lens of the cystoscope, and therefore ordinarily invisible.

My invention enables the operator to see the far side of a surface which may be interposed almost directly between his eye and the lens.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal section through an illuminable speculum embodying my invention, and Fig. 2 is an enlarged fragmentary section showing the "three-quarter" lens partly broken away and also showing the mountings for supporting this lens.

The outer barrel of the device is shown at 3 and is cut away at 4 near one end, as shown in Fig. 1. A sleeve 4^a encircles the opposite end of this outer barrel and is provided with a neck 5, having a threaded portion 6, upon which is revolubly mounted a clamping-collar 7 for securing a wire 8. A binding-post 9 is supported by the neck 5, and centrally within this binding-post is a stem 10, which is connected with a wire 11. This wire extends practically the entire length of the outer barrel and engages a terminal 12 of a miniature incandescent lamp 13. The other terminal of this lamp is shown at 14 and communicates directly with the outer barrel and through the neck 5 with the wire 8, a wire 15 being secured to the binding-post 9, and the wires 8 and 15 thus together constitute the means whereby the current is supplied to the incandescent lamp, so that the same may be energized in the usual manner. The inner tube is shown at 16 and is provided with an eyepiece 17 and with tubular lens-holders 18 19. The lens-holders contain lenses 20 21, which are preferably double convex, as shown, but may be of other types. The inner tube 16 slides telescopically into the outer barrel 3 substantially in the usual manner.

A lens-holder 22 is provided with a neck 23, threaded externally and screwed into a threaded portion 16^a of the inner tube 16. The lens-holder 22 is cut away at 24 and is provided with a bevel 25 upon that side toward the eyepiece 17. The lens-holder 22 is further provided with an enlarged cylindrical portion 26, which has the peculiarity that its geometrical center is out of alinement with the geometrical center of the inner tube 16—that is to say, the enlarged cylindrical portion 26 of the lens-holder is somewhat eccentric relatively to the inner tube 16.

A plug 27, threaded externally, as shown, is revolubly fitted into the cylindrical portion 26 of the lens-holder and is provided with a slot 28, whereby it may be turned, and thus screwed into position and unscrewed therefrom. A wedge 29, having a circular periphery, is disposed within the cylindrical portion 26 of the lens-holder and is engaged directly by the inner face of the revoluble plug 27. A lens 30, made of rock-crystal glass or any transparent material, is made in the form of a three-quarter sphere—that is to say, the lens would be a sphere except for the fact that about one-quarter of it is cut away, so as to form a plane surface, as indicated in Fig. 2. This plane surface is coated with a layer 31 of quicksilver or other material capable of reflecting light. The geometrical optical center of the lens is slightly out of alinement with the geometrical center of the inner tube 16 for the reason above stated—to wit, that the cylindrical portion 26 of the lens-holder 22 is eccentric relatively to the tube 16. The lens 30 thus protrudes slightly at the point 30^a,

this point being immediately adjacent to the bevel 25 and extending outwardly where the outer tube 3 is cut away at 4.

I find from actual trial that if the geometrical center of the lens 30—that is to say, the center of curvature of this lens—be placed ever so slightly out of alinement with the axis of the inner tube 16 the range of vision of the observer is increased enormously. So much so is this the case that a very slight protrusion of the surface 30^a enables the operator to see almost directly backward, as it were, certain portions of his own face being distinctly visible through the cystoscope. In fact, with a cystoscope approximating a foot in length and provided with a lens such as shown, disposed as indicated in Fig. 2, the observer can see such parts of his own face as are located within an inch or two of his line of vision. The optical principles accounting for this apparently disproportionate bend of the light-rays are somewhat complicated, and therefore no attempt is made to describe them herein. I find, further, that if there be two of the lenses 20 21, one of these lenses being located approximately near the longitudinal middle of the inner tube, the other being disposed intermediate of this point and the eyepiece 17, the refraction of the light-rays takes place in such manner that no difficulty whatever is experienced in causing the device to exhibit a sharp and clear-cut image. Moreover, I find that the relative length of the cystoscope may be varied in wide limits without interfering with this effect, which seems to be due entirely to the fact that two lenses 20 21 are used in the relation stated. I also find that the planospherical lens 30, if so formed as to have the proportions above stated, not only still further increases the range of vision and enables the observer to see backward almost directly in his direct line of vision, but also improves the definition of the images observed.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a tubular member into which the observer looks, a planospherical lens disposed partially wthin the line of sight through said tubular member, the geometrical center of said lens being displaced relatively to the longitudinal axis of said tubular member, and a reflecting-surface disposed adjacent to said plane surface of said lens.

2. The combination of a three-quarter spherical lens provided with a plane surface, a reflecting-surface disposed adjacent to said plane surface, and a tubular member so disposed that its longitudinal axis passes through a part of said planospherical lens, the relative position of said lens and said tubular member being such that the geometrical center of said lens is displaced relatively to the longitudinal axis of said tubular member.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

REINHOLD H. WAPPLER.

Witnesses:

JOHN KEIM, Jr.,

FRANK KAISER.