April 18, 1939. W. A. ARNESEN 2,154,885

OTOSCOPE AND SIMILAR INSTRUMENT

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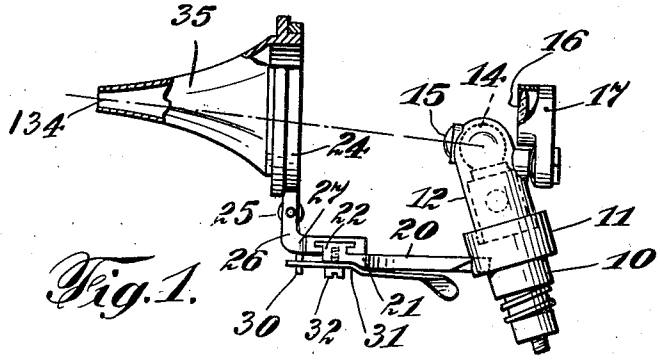

Fig. 1.

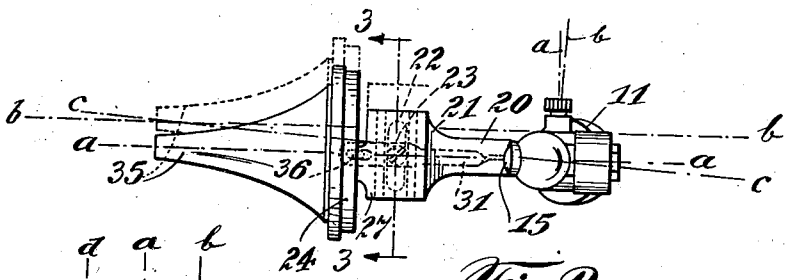

Fig. 2.

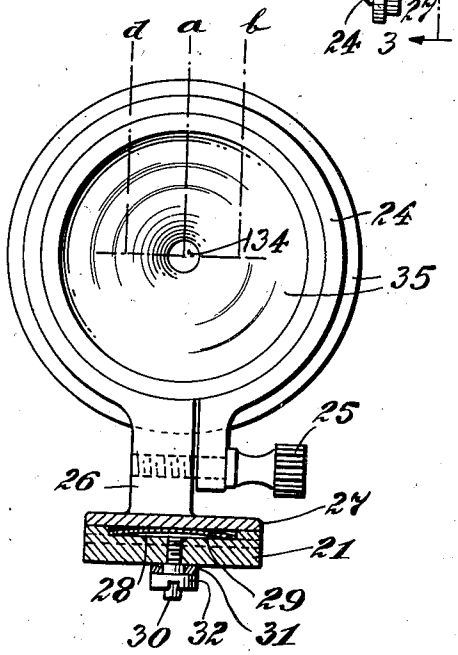

Fig. 3.

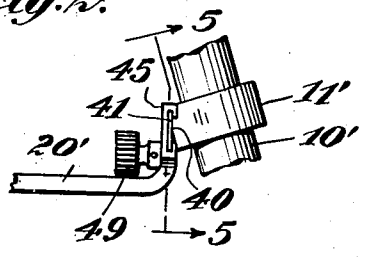

Fig. 4.

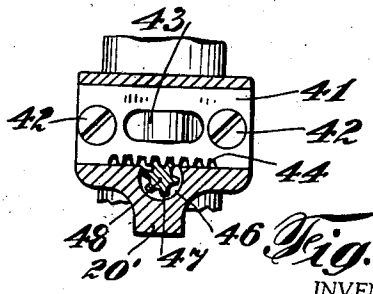

Fig. 5.

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OTOSCOPE AND SIMILAR INSTRUMENT

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6 Claims. (Cl. 128—9)

This invention relates to improvements in diagnostic instruments and more particularly to improvements in otoscopes and similar instruments.

In the use of otoscopes, some difficulty has been experienced in manipulating an operating instrument in connection with the otoscope, since ordinarily the source of light rays is in direct alignment with the objective opening of the speculum used in the otoscope. Some efforts have been made to facilitate the use of operating and similar instruments in otoscopes, but heretofore such efforts have been generally unsuccessful.

An object of the present invention is to provide an otoscope construction of such character that an operating or other instrument can be manipulated through the objective opening of the speculum with ease.

Another object of the invention is to provide an otoscope of such character that the speculum can be moved slightly relative to the source of light rays, so that the source of light rays is offset relative to the axis of the objective opening of the speculum.

Another object of the invention is to provide an otoscope arrangement in which the speculum carrier is so connected to the support for the source of light rays that the speculum carrier can be moved substantially rectilinearly relative to the light rays support.

In carrying out the above and other objects of the invention, an otoscope somewhat similar in general construction to that shown in my Patent No. 1,990,972, issued Feb. 12, 1935, is provided. In this arrangement, which is the preferred form of the invention, the source of light rays is mounted at the end of a tubular support and has secured thereover a lens cap. This lens cap with its condensing lens is adjustable relative to the source of light rays in that it can be rotated about the axis of the light bulb support and can also be adjusted longitudinally of this support. The speculum carrier is spaced from the source of light rays by means of an arm and is so connected to this arm that the speculum carrier can be moved in such fashion as to cause the axis of the objective opening of the speculum to be offset slightly relative to the normal axis of projected light rays. With this slight offset, it is possible to introduce an operating or other instrument through the objective opening of the speculum more readily than could be accomplished when the axes of the objective opening and the light rays are substantially coincident.

In one form of the invention the speculum carrier is secured to the spacing arm by a sliding arrangement operated by a lever, as the result of which the speculum carrier can be moved laterally in either direction in a substantially rectilinear fashion relative to the arm and to the light bulb support. In another form of the invention the arm itself is mounted for sliding motion relative to the light bulb support so that the arm and the speculum carrier can be moved in the same manner as in the preceding embodiment of the invention.

Other features, objects and advantages of the invention will become apparent by reference to the following detailed description of the accompanying drawing, wherein

Fig. 1 is a side elevation of an embodiment of the invention.

Fig. 2 is a plan view of the same device showing various positions which can be assumed thereby.

Fig. 3 is an enlarged section taken substantially on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary showing of a modification of the invention; and

Fig. 5 is an enlarged section taken substantially on the line 5—5 of Fig. 4.

Referring now to the drawing and particularly to Figs. 1 to 3, inclusive, 10 indicates generally a cylindrical light bulb supporting member, such member having an annular enlargement 11, partially hollowed out, at the top thereof and a lens cap 12 fitting over the end of the member 10 in which the light bulb 14 is socketed. The lens cap 12 has a condensing lens 15 secured therein and has pivotally mounted on the opposite side thereof an inspection lens 16 in a lens mount 17. This construction has been illustrated in my Patent No. 1,990,972, issued Feb. 12, 1935.

Extending outwardly from the enlargement 11 is a spacing arm 20, the outer end of which is windened as at 21, and the top of which is provided with a T-head as at 22. The speculum carrier consists of an expansible ring 24 controlled by an adjusting screw 25, the material of the ring being extended downwardly as at 26 and then bent at right angles and widened as at 27. This widened out portion 27 is provided with a T slot for the reception of the T-head 22. The top of the T-head 22 is hollowed out as shown at 28 for the reception of a leaf spring 29 which fits in the recess and bears against the top of the T slot in the member 27. This spring, due to the friction set up thereby, serves to hold the speculum carrier in adjusted position. Extending downwardly from the portion 27 of the speculum

carrier is a pin **30**. Pivotally secured underneath the head part **21** of the spacing bar is a lever **31** which extends toward the light support as shown clearly in Fig. 1. The pivoting of this lever is accomplished by means of a screw **32** threaded into the enlargement **21**.

The normal position of the instrument is shown in heavy lines in Fig. 2, wherein it will be seen that the axes of the objective opening **34** of a speculum **35** and of the condensing lens **15**, are substantially coincident. In other words, in this position the rays of light directed toward the speculum by the condensing lens from the bulb **14** are concentrated at the objective opening of the speculum. Of course these rays are directed into the speculum cavity in somewhat cone fashion, with the field of the rays increasing as the object to be examined is more remote from the condensing lens. In other words, the field of the light rays directed by the condensing lens is considerably larger than the objective opening of the speculum. It will be apparent from an observation of this instrument that a longer length operating instrument, or other instrument, could be passed through the objective opening of the speculum only with some difficulty, since the lens cap is so aligned with the objective opening as to be in the path of such a longer instrument.

In order to overcome this objection, the lever **31** which engages the pin **30** by means of a slot arrangement **36** (Fig. 2) can be moved to cause the speculum carrier and the speculum to be moved to the dotted line position of Fig. 2. This lateral movement, which is of a substantially rectilinear character relative to the spacing bar **20** and the light support **10**, changes the position of the speculum relative to the lens cap from the position by the line *a* to the position shown by the line *b*. Thus it will be seen that the axis of the objective opening of the speculum just clears the side of the lens cap, thereby permitting ready introduction of a suitable instrument through the speculum opening. Should the lens cap be set in the normal position and maintained in that position after the speculum has been moved laterally, still sufficient light rays will pass from the objective opening to illuminate the area under inspection. This, of course, is due to the cone-like spread of the projected light rays before mentioned. However, if it should be desired to cause the projection of more concentrated rays through this objective opening, the lens cap can be rotated a very slight amount until the axis of the condensing lens and the projected light rays is along the line *c*—*c* of Fig. 2, instead of along the normal line *a*—*a*. Even this movement of the lens cap, however, will not interfere with the introduction of an instrument through the objective opening. While it is preferable that the lens cap be so constructed as to permit it being rotated a slight amount necessary to change the direction of the axis of the directed rays, still it should be understood that the mechanism for imparting a lateral rectilinear motion to the speculum carrier can be used with facility in an instrument wherein the source of light rays is immobile. In some instances it may be desirable to move the speculum carrier laterally in the opposite direction to that shown in Fig. 2, which movement can be accomplished by a reverse movement of the lever **31**. The speculum carrier, therefore, can be moved to either side of its normal position shown in full lines of this figure. These positions are also shown by the lines *a*, *b*, and *d*, of Fig. 3, wherein the line *a* indicates the normal axis of the speculum, and the lines *b* and *d* the axes when the speculum has been moved to the full extent in either direction.

In the modification shown in Figs. 4 and 5 the enlargement **11'** of the light bulb support **10'** instead of being circular is substantially U-shaped in exterior outline. The edge representing the top of the U is then flattened off at an angle to the axis of the member **10'** and so shaped as to have a projection **40**. A thin plate **41** is fastened to this projection **40** by means of screws **42**, or in any other suitable manner, in such fashion that the projection **40** and the plate **41** combine to form a T-head. The lower edge of the plate **41** has teeth **44** cut therein so that this plate is in effect a rack. The spacing arm **20'** in this modification of the invention has an angular arm part **45** of greater width than the major part of the arm. This enlargement **45** is provided with a T slot for the reception of the T-head formed by the parts **40** and **41**. A leaf spring **43** is positioned in a recess in the T-head for the same purpose as spring **29** previously described. A recess **46** is cut in the enlargement **45** for the reception of a gear **47** positioned so that the teeth thereof engage the rack teeth **44**. This gear is mounted on a shaft **48** which has an adjusting screw **49** on the opposite end thereof for manually rotating the shaft and the gear. The arm **20'** will continue uninterrupted into the speculum ring carrier without the provision of the shift mechanism shown in Figs. 1 and 2, since it will be evident that the entire arm and the speculum carrier can be shifted as a unit by the rack and gear arrangements shown in Figs. 4 and 5.

It should be understood, however, that these arrangements are shown merely as illustrative mechanisms by which the laterally substantially rectilinear motion of the speculum and the speculum can be obtained. Obviously either one of the mechanisms could be substituted for the other thereof without departing from the scope of the invention.

While the instrument disclosed herein can be used manually in a number of positions, the normal position thereof is that in which the support is held upright as shown in Fig. 1. Accordingly, movement of the various parts of the device have been described in the specification and claims as being movements taking place when the device is so held. In other words, lateral movement of the speculum carrier may be defined as horizontal movement thereof when the support is in an upright position. It is to be understood however, that the same type of relative movement can be accomplished regardless of the position of the support. Likewise, the vertical axial planes of the light projecting member and of a speculum carried by the carrier are to be construed as planes passing vertically through these parts when the device is held in the upright position shown in Fig. 1.

From the foregoing it will be seen that the present invention in any form shown and described provides arrangements whereby the objective opening of a speculum can be shifted relative to the light projecting mechanism, so that this mechanism will not interfere seriously with the use of operating or other instruments which must pass through the objective opening and which normally are of such length as to engage the light projecting mechanism. It is to be understood that various modifications other than those shown can be accomplished without departing from the scope of the inven-

tion, in view of which any limitations imposed thereupon are to be such only as are set forth in the following claims.

I claim:

1. In a diagnostic instrument of the character described, a support, a source of light rays secured thereto, a speculum carrier secured to said support in spaced relation to said source of light rays so that the axis of a speculum carried by said carrier extends outwardly at a substantial angle to the longitudinal axis of said support, and a sliding connection intermediate said support and said carrier whereby said carrier can be moved laterally substantially rectilinearly to a limited extent relative to said support, the rays of light from said source being adapted to be directed through said speculum in any adjusted position of the speculum.

2. In a diagnostic instrument of the character described, a support, a source of light rays secured thereto, a speculum carrier secured to said support in spaced relation to said source of light rays so that the axis of a speculum carried by said carrier extends outwardly at a substantial angle to the longitudinal axis of said support, means for projecting rays from said source along an axis substantially coincident with the axis of said carrier, and a sliding connection intermediate said support and said carrier whereby said carrier can be moved laterally substantially rectilinearly to a limited extent relative to said support, said projecting means being movable to project rays toward the objective opening of a speculum carried by said carrier in any position thereof.

3. In a diagnostic instrument of the character described, a support, a source of light rays secured thereto, an arm extending outwardly from and at a substantial angle to the longitudinal axis of said support, a speculum carrier, and an adjustable connection securing said carrier to the outer end of said arm for limited sliding lateral substantially rectilinear movement relative to said longitudinal axis of said support, said speculum carrier being adapted to hold a speculum with the axis of the speculum extending outwardly at a substantial angle to the said longitudinal axis of said support, the rays of light from said source being adapted to be directed through said speculum in any adjusted position of the speculum.

4. In a diagnostic instrument of the character described, a support, a source of light rays secured thereto, an arm, an adjustable connection securing said arm to said support for substantial lateral rectilinear movement relative thereto with the arm extending outwardly from the support at a substantial angle to the longitudinal axis of the support, and a speculum carrier extending outwardly from the remote end of said arm.

5. In a diagnostic instrument a support, a light projecting member, an adjustable connection securing said light projecting member to said support, a speculum carrier spaced from said support, an adjustable connection securing said speculum carrier to said support, said connections being adjustable to bring the vertical axial plane of said light projecting member into substantial coincidence with the vertical axial plane of a speculum carried by said speculum carrier, said last mentioned connection being adjustable within limits to displace said speculum carrier laterally relative to said support into a position in which the vertical axial plane of a speculum carried thereby is out of coincidence with the vertical axial plane of said light projecting member in any adjusted position of said light projecting member.

6. In a diagnostic instrument a support, a light projecting member, an adjustable connection securing said light projecting member to said support, a speculum carrier spaced from said support, an adjustable connection securing said speculum carrier to said support, said connections being adjustable to bring the vertical axial plane of said light projecting member into substantial coincidence with the vertical axial plane of a speculum carried by said speculum carrier, said last mentioned connection being adjustable within limits to displace said speculum carrier laterally relative to said support into a position in which the vertical axial plane of a speculum carried thereby is out of coincidence with the vertical axial plane of said light projecting member in any adjusted position of said light projecting member, said first mentioned connection being adjustable to cause said light projecting member to direct light rays into a speculum carried by said carrier in any of its adjusted positions.

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