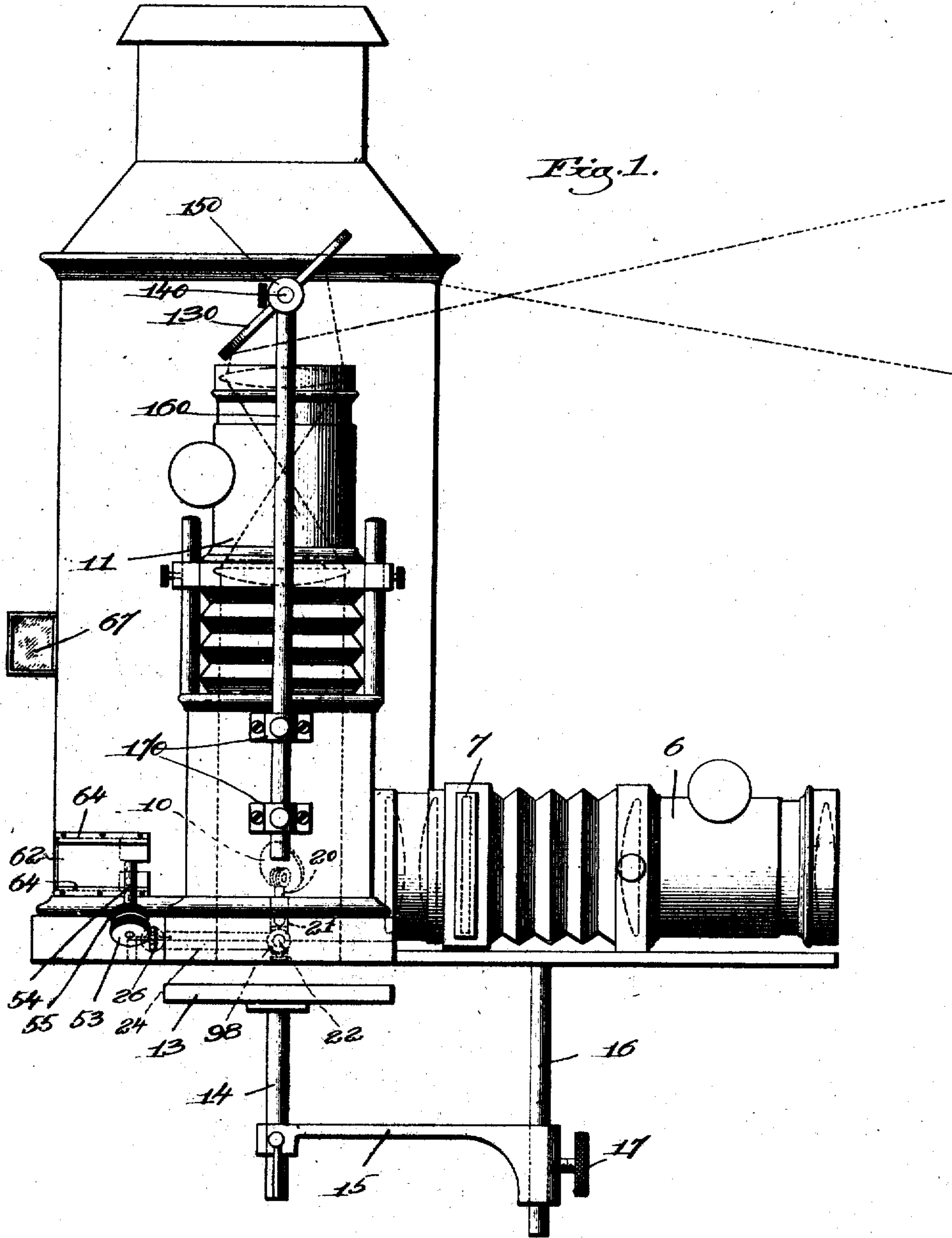


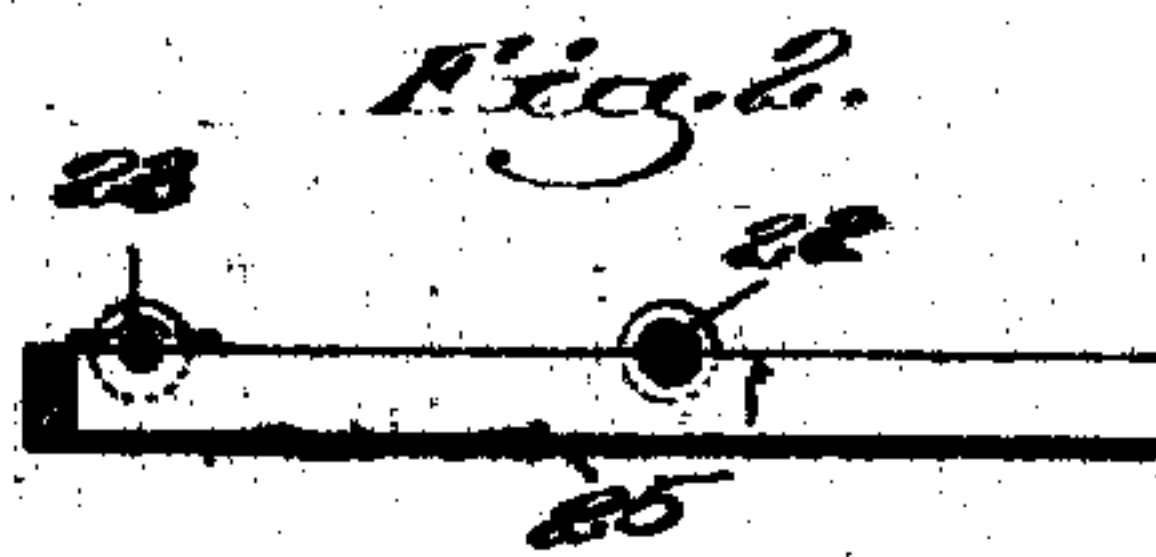
E W. GOODRICH.
PROJECTION APPARATUS.
APPLICATION FILED JAN. 27, 1908.

908,560.

Patented Jan. 5, 1909.
4 SHEETS—SHEET 1.



Witnesses:
Fred. S. Gumbart
Joseph M. Ward.



Inventor.
E. W. Goodrich,
by Henry H. H. H. H.

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Fig. 3.

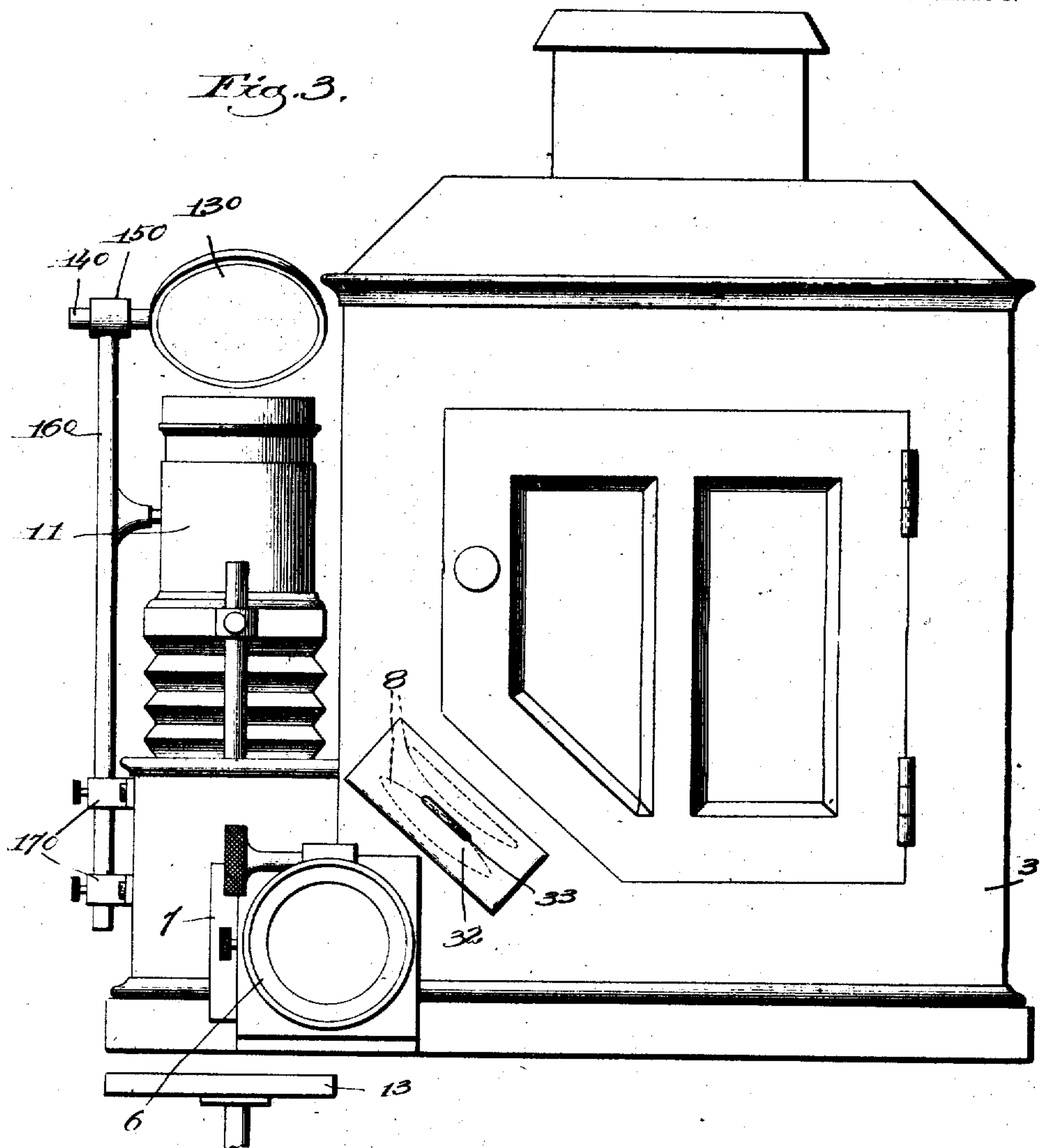


Fig. 4.

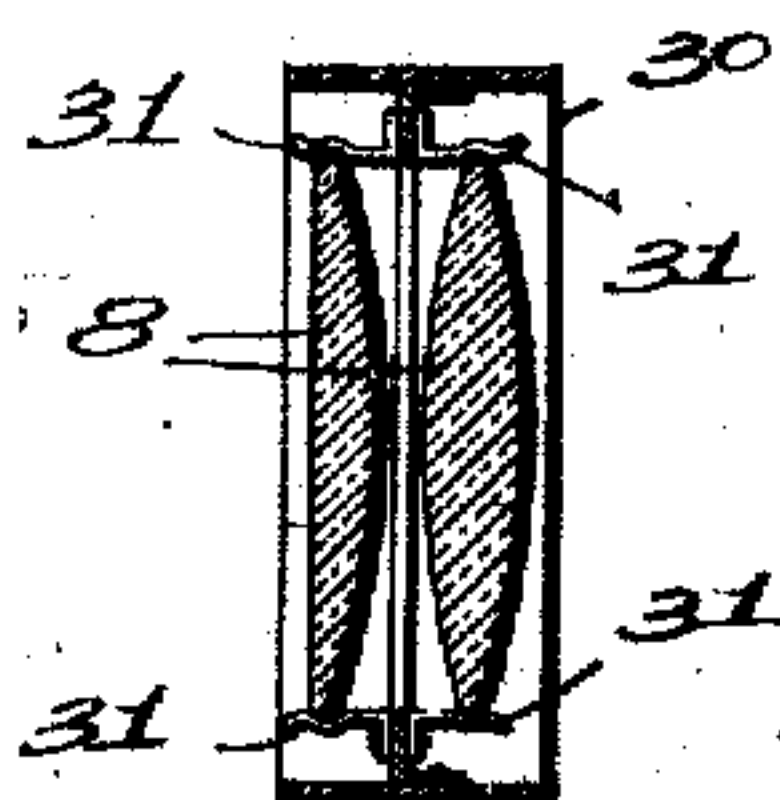
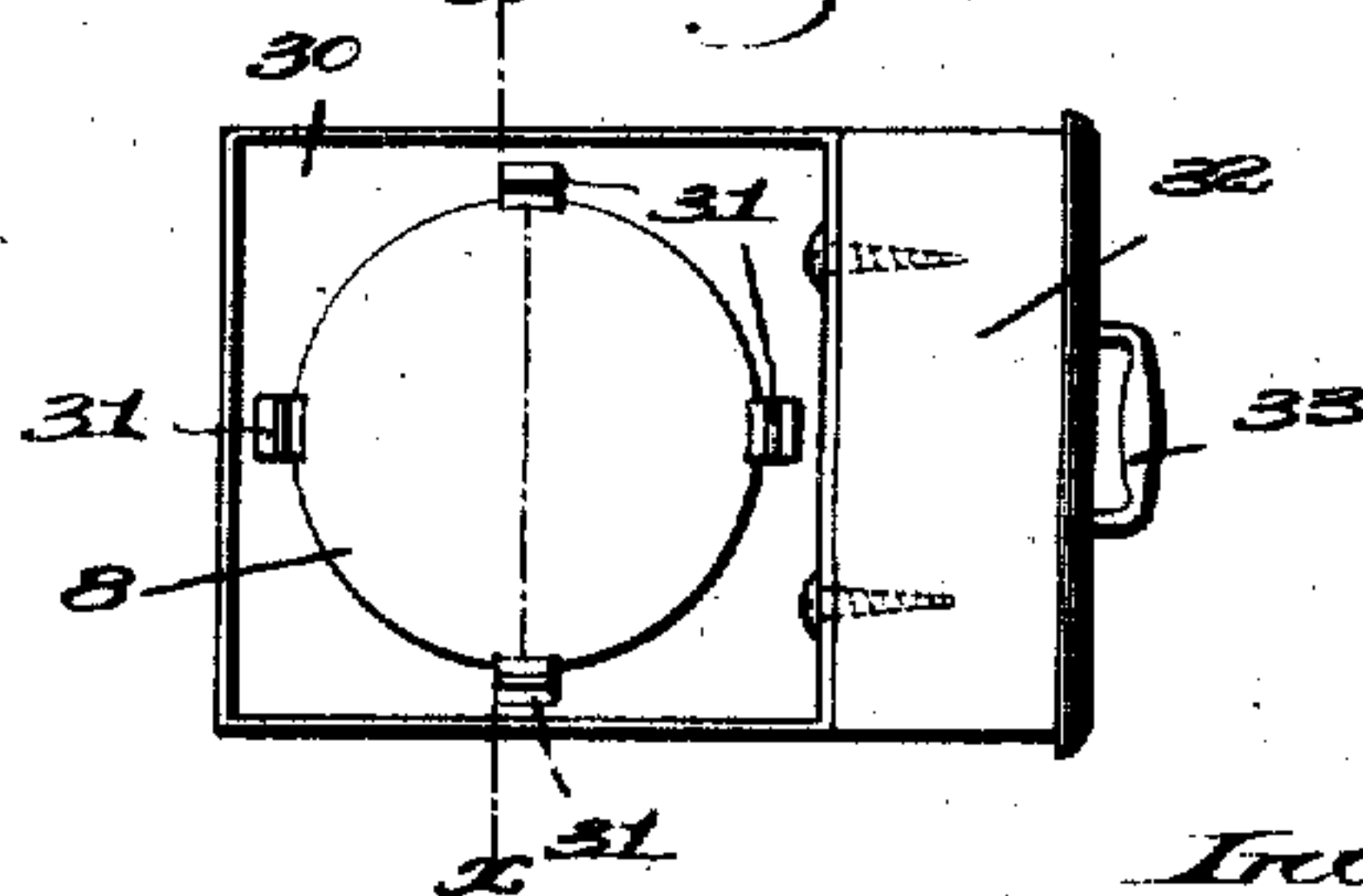


Fig. 5.



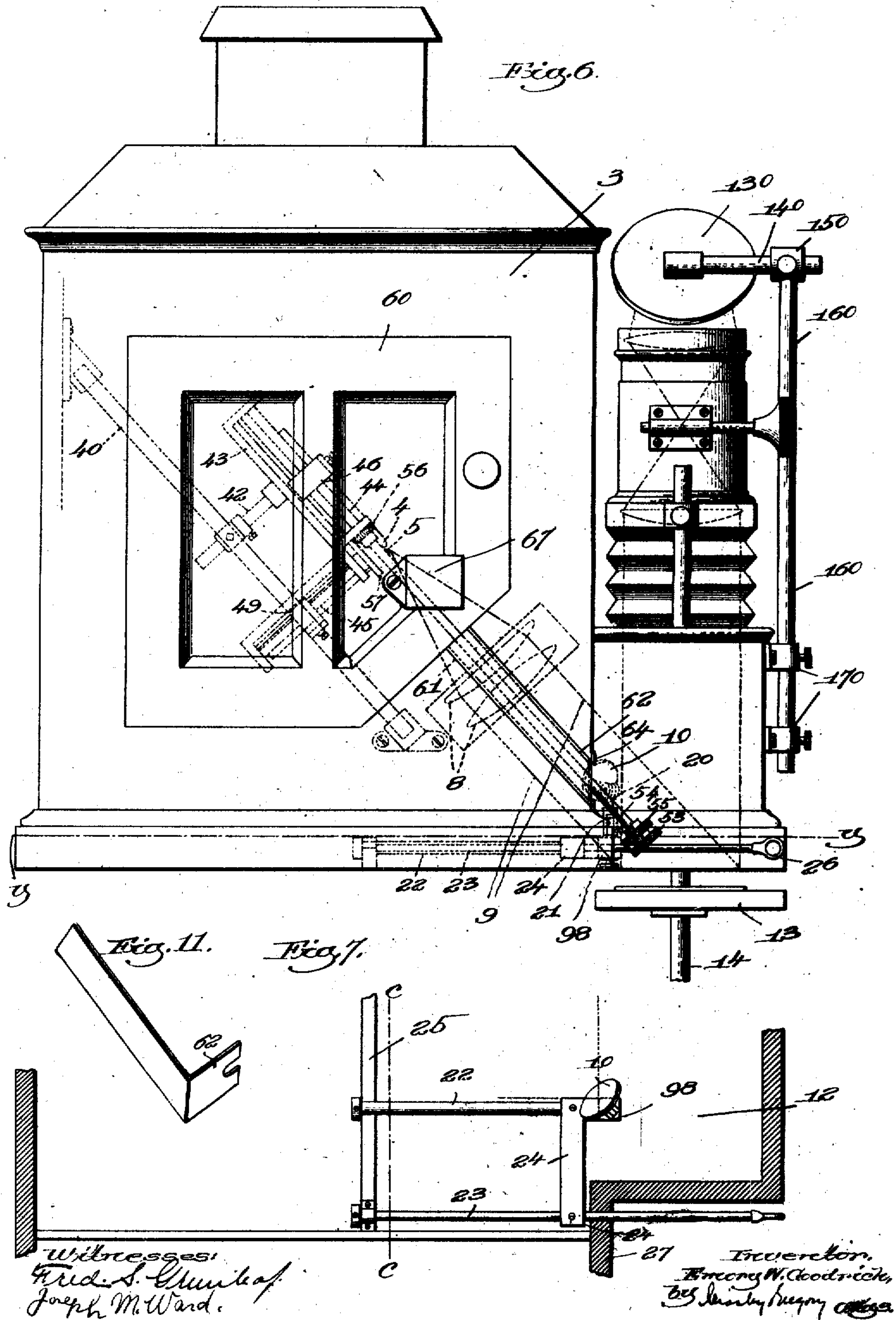
Witnesses:
Fred. S. Gumbaf.
Joseph M. Wood.

Inventor:
E. W. Goodrich,
by Stanley E. Gregory,
attys.

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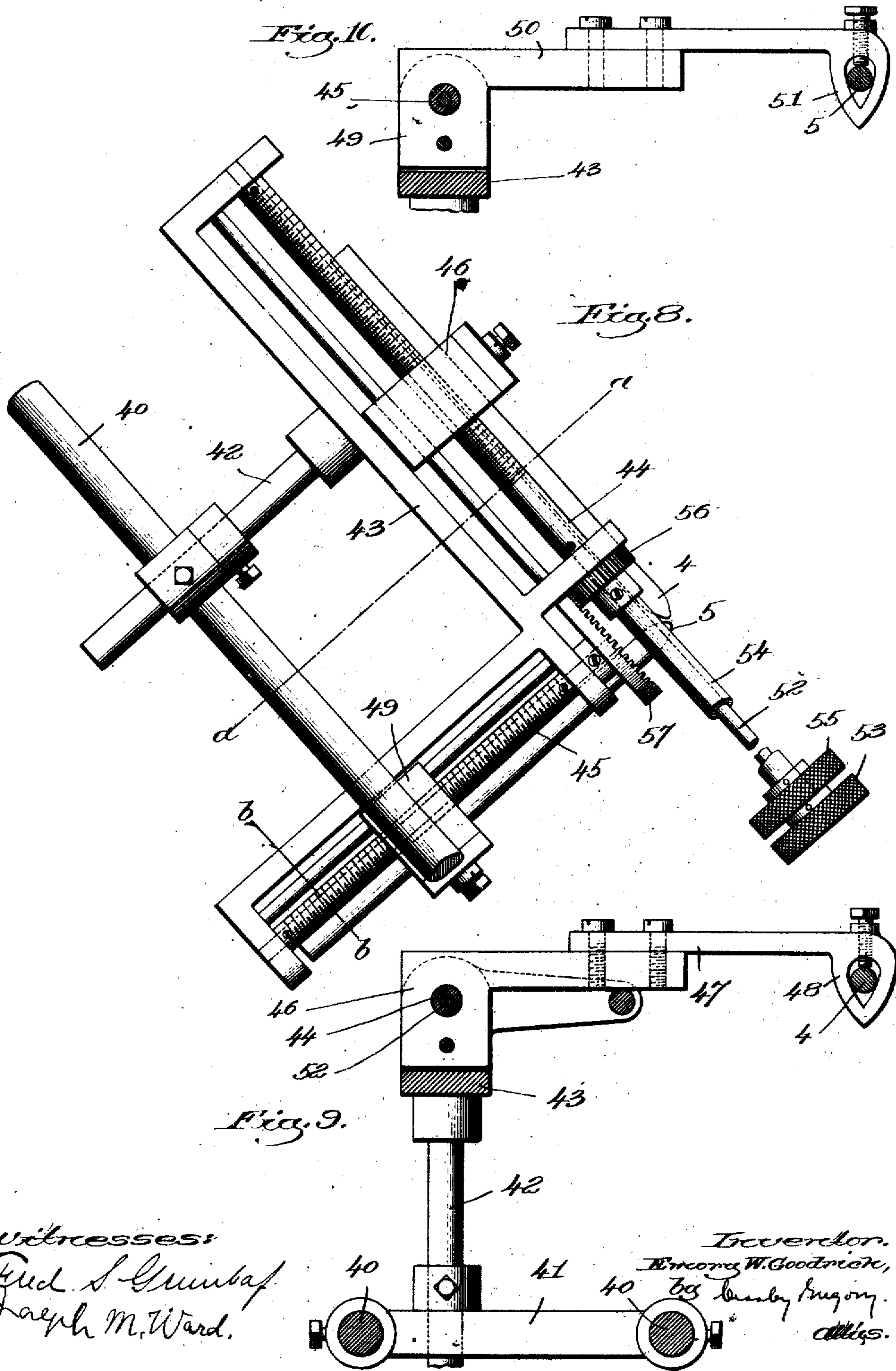
4 SHEETS—SHEET 3.



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Patented Jan. 5, 1909.
4 SHEETS—SHEET 4.



Witnesses:
Fred S. Grunbaf
Joseph M. Ward.

Inventor.
E. W. Goodrich,
by Aubrey Ferguson,
attys.

UNITED STATES PATENT OFFICE.

EMORY W. GOODRICH, OF SOMERVILLE, MASSACHUSETTS.

PROJECTION APPARATUS.

No. 908,560.

Specification of Letters Patent.

Patented Jan. 5, 1909.

Application filed January 27, 1908. Serial No. 412,788.

To all whom it may concern:

Be it known that I, EMORY W. GOODRICH, a citizen of the United States, and a resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Projection Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to projection apparatus of that type adapted for both opaque and transparent projection work.

The object of the invention is to provide a novel apparatus of this class which is simple and compact in its construction; which is so arranged that all adjustments of the lamp, mirror, lenses, etc., can be made from the front of the machine or from that side of the machine on which the operator stands in manipulating it; which is so constructed that the condensing lenses can be readily removed or replaced; and which is improved in many other ways all as will be more fully herein-after described and then pointed out in the claims.

Referring to the drawings wherein I have illustrated one embodiment of my invention, Figure 1 is a front view of a projection apparatus embodying my invention; Fig. 2 is a section on the line *c-c*, Fig. 7; Fig. 3 is a side view of the projection apparatus; Fig. 4 is a section on the line *x-x*, Fig. 5; Fig. 5 is a side view of the removable holder for the condensing lens; Fig. 6 is a view of the apparatus showing the opposite side from that shown in Fig. 3; Fig. 7 is a section on the line *y-y*, Fig. 6; Fig. 8 is a side view of the lamp; Fig. 9 is a section on the line *a-a*, Fig. 8; Fig. 10 is a section on the line *b-b*, Fig. 8; Fig. 11 is a detail of the cover for the slot in the lamp house.

3 is the lamp house of any suitable or usual construction within which is situated the lamp or other source of illumination.

While it is within my invention to use any suitable means for producing the desired light I have herein shown an arc lamp for this purpose, the carbons of which are designated 4 and 5.

The lamp is shown in dotted lines Fig. 6. Associated with the lamp are the usual condensing lenses 8 for condensing or collimating the rays from the lamp into a beam.

My improved apparatus is designed for

both opaque projection work and transparent projection work, and I have shown herein two objectives, one for transparent work and the other for the opaque projection work. The objective for the transparent work is designated generally by 6, and it has associated therewith a holder 7 for supporting the transparency.

The beam 9 of rays collimated by the condensing lenses 8 has an angular relation to the objective 6, said beam being directed downwardly in an inclined direction, as best seen in Fig. 6, and in order to reflect said beam of rays into the objective and onto the transparency, I employ a mirror or reflector 10 which is situated at the proper angle to thus reflect said rays.

One advantage of this construction is that while the reflector 10 will reflect practically all of the light rays, yet it will not reflect to any great extent the heat waves, and the reflected beam of light is therefore much cooler than the beam collimated by the condensing lens. This is a decided advantage because it permits transparencies to be used which are sensitive to heat and which might be injured by the heat of an ordinary unreflected beam of light rays.

The objective which is used in opaque projection work is designated generally by 11. This objective stands vertically at right angles to the objective 6 and the casing is open beneath said objective, as at 12.

Situated beneath the opening 12 is a horizontal table 13 on which the opaque object may be placed. Said table is preferably made vertically adjustable so that opaque objects of different thicknesses can be used. While this vertical adjustment of the table may be effected in various ways without departing from the invention I have herein shown the table as provided with a stem 14 which is adjustably mounted in a bracket or arm 15, and said bracket is in turn adjustably mounted on a suspender 16 depending from the frame of the projection apparatus, said bracket being held in adjusted position on the suspender by a clamping screw 17. This construction permits the table to be adjusted and also to be swung horizontally out from under the frame of the apparatus and in position to receive opaque objects of any character.

When the apparatus is used for opaque projection work the mirror 10 is moved out

of the way so as not to interfere with the beam of rays 9. Said beam will thus be thrown directly onto the table 13 thereby to illumine the object. The fact that the beam
 5 of rays is thrown obliquely onto the table does not affect in any way the results desired. The light rays radiating from the illumined object pass to the objective 11, and from said objective are reflected onto the
 10 screen. For this purpose I have provided a mirror 130 which is sustained above the objective 11 and is in position to reflect the image of the illumined object toward the same screen on which the image of the trans-
 15 parent object is projected by the objective 6. The mirror 130 is made adjustable both vertically and angularly so that it can be easily adjusted into the proper position to re-
 20 flect the beam of light rays passing through the objective 11 in such a direction that the image of the opaque object will be projected onto the screen in the same position as the image of the transparency. Said mirror is
 25 shown as mounted on a stem 140 which is adjustably sustained by a head 150 at the upper end of a rod 160, and the rod 160 is vertically adjustable in suitable bearings 170. The mirror 130 serves not only to reflect the
 30 image of the illumined object onto the same screen which is used for receiving the transparent projection but it also serves as an "image - erecting mirror" which prevents
 35 perversion of the projected figure. As stated above said mirror 10 is so mounted that it can be moved out of the way of the beam of
 40 rays 9, and while this may be done in a variety of ways without departing from my invention I have herein shown a construction wherein said mirror is mounted in a sliding
 45 carrier or frame.

The frame herein shown comprises the two side pieces 22 and 23 which are rigidly connected by the cross bar or yoke 24. Both sides are slidably mounted in bearings formed
 45 in a rest or support 25, and the side 23 extends through the wall 27 of the lamp house and is provided with a finger piece or pull 26 by means of which the sliding frame can be manipulated.

50 The mirror 10 is pivoted to a stem 20 which sets over and is sustained by a standard 21. This standard has a hub 98 which receives the end of the cylindrical side piece 22 and is held in position thereon by a set
 55 screw. The standard can be adjusted about the side piece 22, and the mirror can be turned both on its pivot at the top of the stem 20 and also about the standard 21 as an axis, and by means of this construction said
 60 mirror can be adjusted into any desired position. The guides for the side pieces or rods 22 and 23 guide the mirror in its sliding movement, and the exposed finger piece 26 affords a convenient means for moving the
 65 mirror into and out of position. Any other

suitable way of mounting the mirror 10 might be employed without departing from my invention however.

Since the amount of light required for transparent projection work is usually much
 70 less than that required for opaque projection work, it is not necessary to reflect the entire beam of rays 9 by the mirror 10. Accordingly a small mirror, such as shown in the
 75 drawings, and which is of a size to reflect the image only of the arc light, may be sufficient unless the objective has a long focus in which case a mirror of a size to reflect substantially all of the beam 9 would be preferable.
 80

In apparatus of this character the condensing lenses are usually subjected to heat from the lamp, and it not infrequently happens that one or the other of said lenses becomes broken while the apparatus is in
 85 operation. In most devices of this character the removal of either or both of the condensing lenses involves opening a door in the side of the lamp house and reaching into the
 90 lamp house. The removal of the condensing lenses in this way is sometimes a rather difficult task and requires more or less time.

The condensing lenses are mounted in a holder which is arranged to be readily removed from the lamp house whenever it
 95 is necessary to clean or change the lenses. This holder is designated by 30, and is shown best in Figs. 4 and 5. It comprises a frame having an opening therein of the size of the
 100 condensing lenses, and provided with spring clips 31 to engage the edges of the lenses and support the latter. The frame is secured to a block or head piece 32 which is provided with a handle 33. The wall of the lamp
 105 house is made with an opening of a size to receive the block 32 and frame 30, and when said holder is inserted into the opening the lenses 8 stand in the proper position relative to the arc. Said lenses can be readily removed by simply withdrawing the holder
 110 and then removing the lenses from the clips 31. This takes but a moment's time, and by means of this construction a broken lens can be replaced without interfering materially with the operation of projecting images.
 115 The block or head piece 32 fills the opening in the wall of the lamp house when the holder is in place and constitutes a closure for said opening.

The lamp herein shown is provided with
 120 the usual mechanism for adjusting the carbons, but it is so arranged that it can be fed from the front of the lamp house. In order to provide for this I have arranged the following construction. The lamp is sup-
 125 ported on two rods 40 that are secured in suitable supports in the lamp house; said rods have mounted thereon a yoke 41 in which is adjustably mounted a stem 42 carrying a frame 43 on which the adjusting de-
 130

vices for the carbons are mounted. This frame is L-shaped and one arm thereof has journaled therein a rod 52 on which is mounted an exteriorly screw-threaded sleeve 44 which works in a nut 46. Said nut has extending therefrom an arm 47 which carries at its end a carbon holder 48. The other arm of the frame has journaled therein a screw-threaded shaft 45 which works in a nut 49, and said nut 49 also has extending therefrom an arm 50 having at its end a carbon holder 51. The rod 52 has fast thereto a thumb piece 53 by which it may be turned. Surrounding said rod is a sleeve 54 also having a thumb piece 55 secured thereto, said sleeve carrying the gear 56 which is adapted to mesh with a gear 57 fast on the shaft 45. By operating the thumb pieces 55 and 53 separately the carbons can be fed independently, and by working them together, the carbons may be fed simultaneously. This general method of feeding the carbons is old and forms no part of my present invention. The novel feature about the lamp is its construction by which the thumb pieces for feeding the carbons are placed in front of the arc and are therefore accessible at the front of the projection apparatus.

It will be noted that the carbons are supported at the end of arms and are, therefore, situated considerably at one side of the screw-threaded shafts. The rod 52 and sleeve 54 are long enough to extend through the front wall of the lamp house, as clearly shown in Figs. 1 and 6, so that the lamps may be fed from in front and without the necessity of reaching around behind the lamp house, as is the case in many devices of this class.

The lamp house is provided with the usual door 60 in one side and is also provided with a slot 61 in said side, said slot leading from the door opening to the point where the stem 54 projects. This slot 61 is normally closed by a cover 62 which is of the shape shown in Fig. 11 and which is held in place by means of guides 64. The object of making the lamp house with the slot 61 is to facilitate the removal of the lamp. With the construction herein shown this can be accomplished by simply removing the cover 62 and opening the door 60 and then detaching the frame 43 from the yoke 41 and removing the lamp through the door opening and the slot 61, said slot permitting the projected stem 54 to be withdrawn from the lamp house.

It will be noted that the feeding means for the lamp and the pull 26 for shifting the mirror 10 are located on that side of the lamp house where the operator stands for inserting the slides into the holder 7 or placing the objects on the table 13. All of the mechanism of the apparatus, therefore, is located on the same side of the apparatus and is within easy reach of the operator.

67 designates a finder of any suitable or usual construction through which the arc is visible by the operator.

My device is simple and compact in its construction and can easily be changed from an opaque projection apparatus to a transparent projection apparatus simply by manipulating the pull 26 and shifting the mirror 10.

I have not illustrated herein all embodiments of my invention, but have shown the preferred embodiment only.

In the claims I shall refer to the source of illumination as a lamp, and by this term I mean to include any device for producing light.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a projection apparatus, the combination with a lamp, of two objectives situated at an angle to each other, a movable mirror to reflect light from said lamp toward one objective, and a horizontal object-supporting table in line with the other objective and in position to be illumined by the lamp.

2. In a projection apparatus, the combination with a lamp, of a horizontally-arranged objective, a mirror to reflect the light from said lamp toward the objective, a vertically-arranged objective, a horizontal object-supporting table beneath said latter objective and in position to be illumined by the lamp.

3. In a projection apparatus, the combination with a lamp, of a horizontally-arranged objective, a mirror to reflect the light from said lamp toward the objective, a vertically-arranged objective, a horizontal object-supporting table beneath said latter objective and in position to be illumined by the lamp, and means to move the mirror into and out of its operative position.

4. In a projection apparatus, the combination with a lamp, arranged to project a beam of light downwardly at an inclination, of a horizontal object-supporting table adapted to be illumined by said beam, a vertically-arranged objective above said table, a mirror above said objective, a second horizontally-arranged objective, a mirror adapted to reflect said beam toward said objective, and means to move the mirror into and out of operative position.

5. In a projection apparatus, the combination with a lamp and a lamp house therefor, of an objective, a mirror to reflect the light from the lamp toward the objective, means exterior to the lamp house for shifting the position of the mirror, and means on the same side of the lamp house for operating the lamp.

6. In a projection apparatus, the combination with an arc lamp, of a lamp house therefor, means exterior to the lamp house at the front of the arc for feeding said arc, and an objective.

7. In a projection apparatus, the combination with an arc lamp comprising carbon holders and a projecting stem for feeding said holders, of a lamp house therefor, said lamp house having a door-opening in one side and a slot extending therefrom to an adjacent side, said slot being parallel to and in line with the projecting stem whereby the lamp may be removed bodily from the lamp house through said door-opening and slot.

8. In a projection apparatus, the combination with a lamp including carbon holders and a projecting stem for feeding the carbon holders, said stem being situated in front of the lamp, of a lamp house having a door-

opening in the side and a slot extending therefrom toward the front thereof parallel with the stem of the lamp whereby said lamp may be removed from the lamp house through said door-opening and said slot, and means to removably sustain the lamp in the lamp house with the end of the stem exposed at the front side of the lamp house.

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

EMORY W. GOODRICH.

Witnesses:

LOUIS C. SMITH,
MARGARET A. DUNN.