July 11, 1939. G. C. EDWARDS 2,165,246

APPARATUS FOR PROJECTING AERIAL SIGNS

Filed Nov. 13, 1936 3 Sheets-Sheet 1

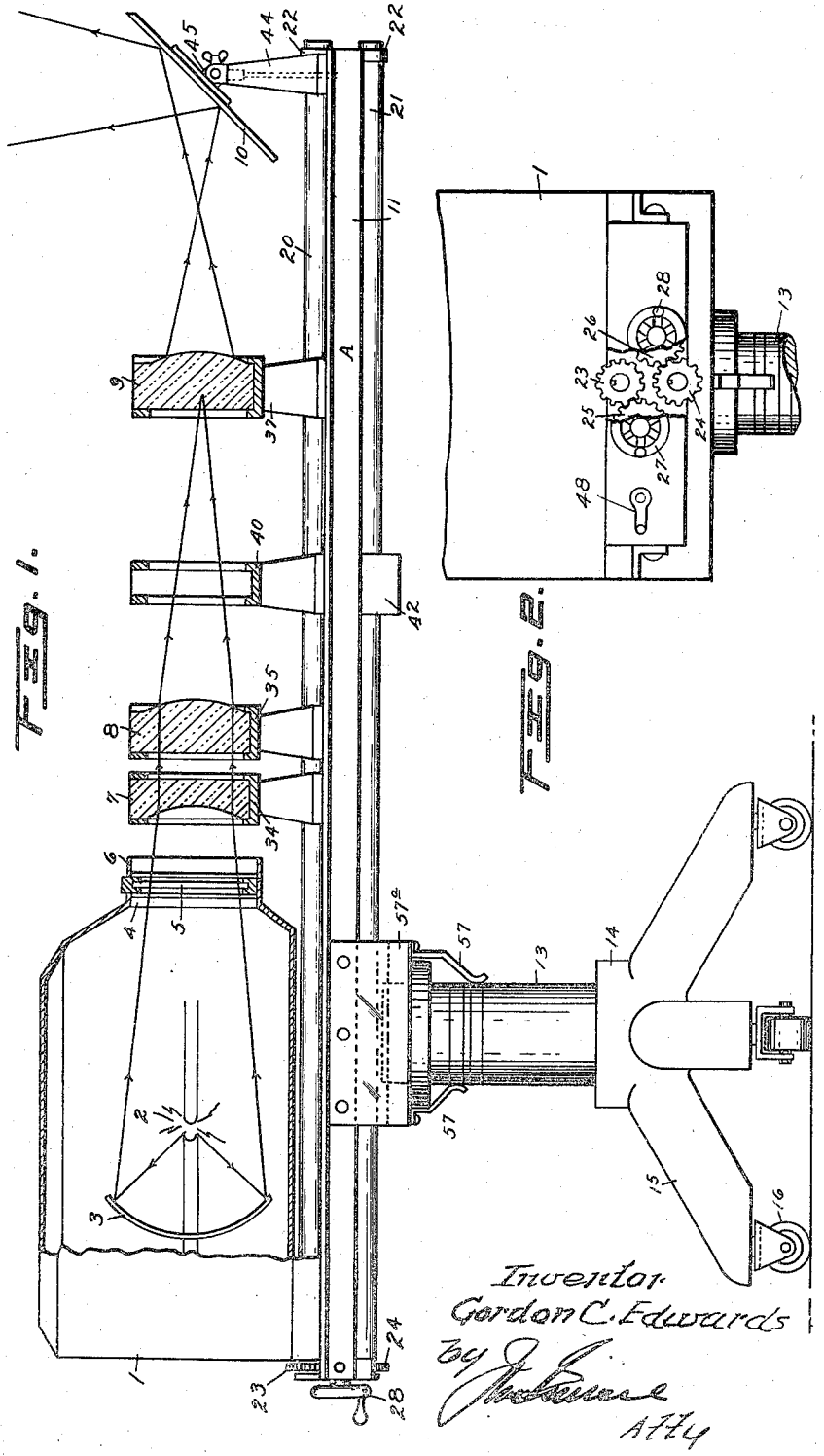


Fig. 1.

Fig. 2.

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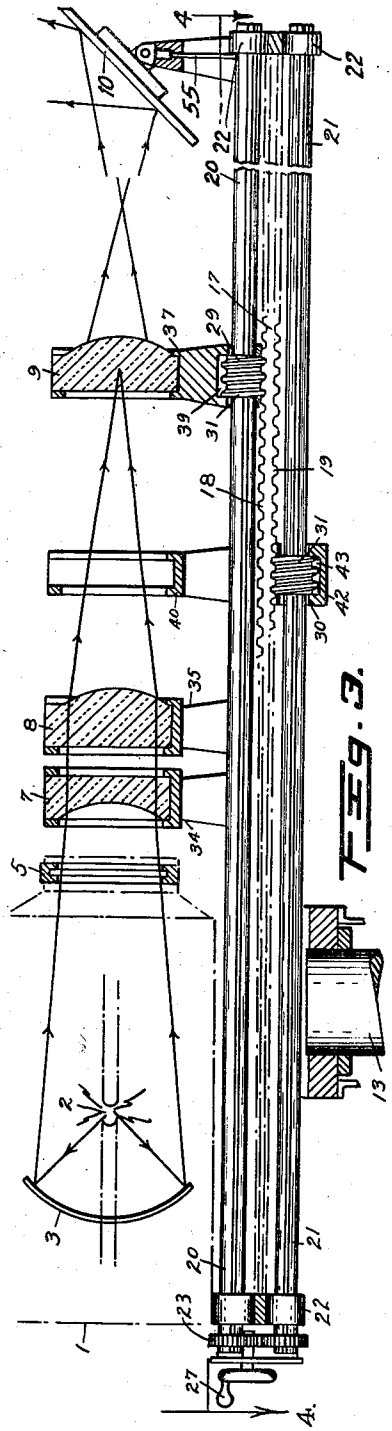


Fig. 3.

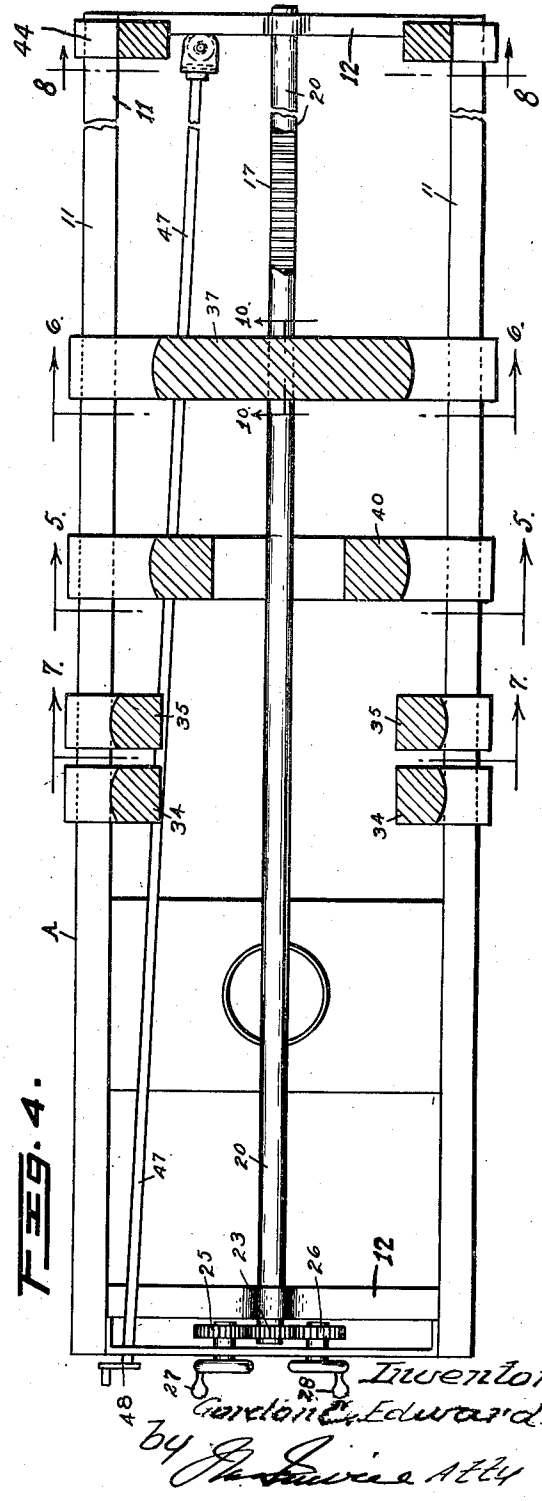


Fig. 4.

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Fig. 5.

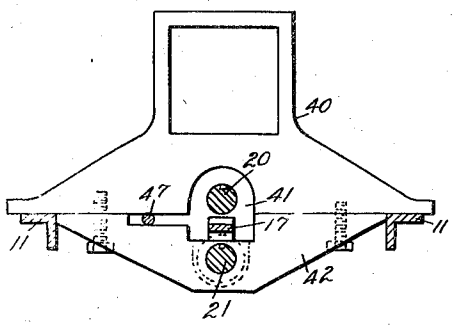


Fig. 6.

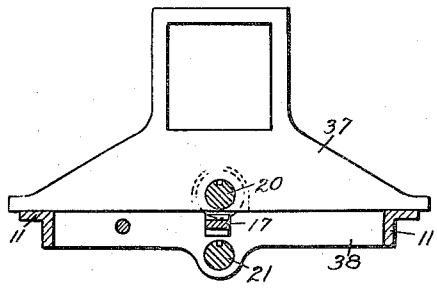


Fig. 8.

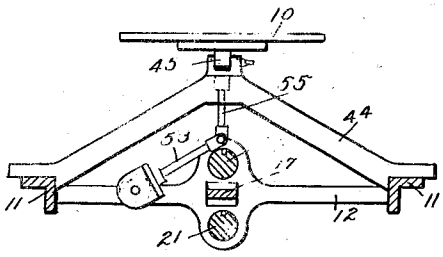


Fig. 7.

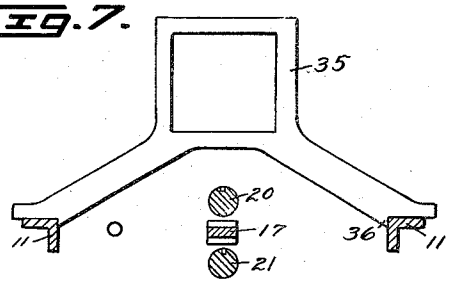


Fig. 10.

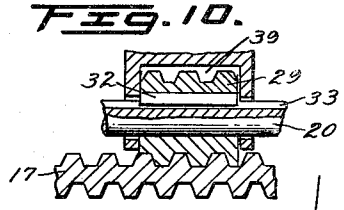
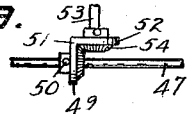


Fig. 9.



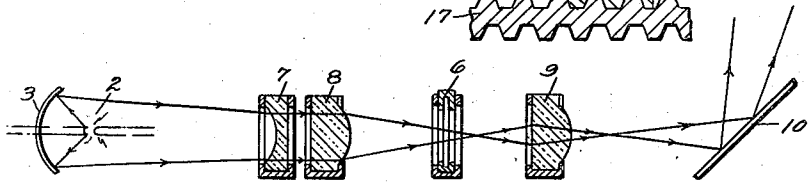


Fig. 11.

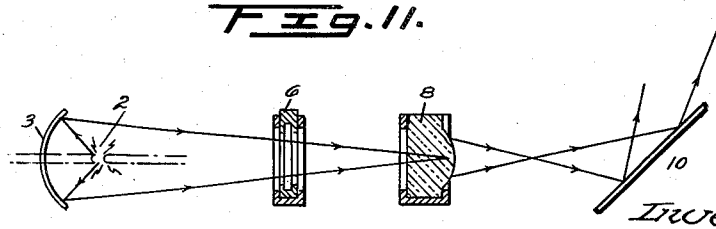


Fig. 12.

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Patented July 11, 1939

2,165,246

UNITED STATES PATENT OFFICE

2,165,246

APPARATUS FOR PROJECTING AERIAL SIGNS

Gordon C. Edwards, Toronto, Ontario, Canada

Application November 13, 1936, Serial No. 110,751

2 Claims. (Cl. 88—24)

My invention relates to a method and apparatus for projecting aerial signs, as described in the present specification and shown in the accompanying drawings that form a part of the same.

To render the projection of aerial signs successful, commercially or otherwise, with assurance of the maximum of visibility and clarity, irrespective of atmospheric conditions within extremely wide limits, it is desirable that the background against which the image is thrown be of a substantially permanent and stationary nature so as to be readily located at all times and in any desired direction and also that it be of sufficient density to throw the image into bold relief without itself being visible.

These ideal conditions can only be obtained by the utilization of the atmosphere as a background but heretofore no projecting method or apparatus has been devised which has been capable of bringing about the necessary coordination between the apparatus and the atmospheric particles whereby to provide a focal point at which the light beam will be affected by the action of the atmospheric particles to clearly define and suspend the image being projected.

In some cases, heretofore, complicated mechanical screens have been provided on which to throw the image but any such device is impractical, complicated and extremely expensive due to the fact that it must be extended to a very great height above the ground to give a sign sufficiently large to be noticeable and in a position where it will be observed by the maximum number of persons.

In other cases attempts have been made to utilize beams of light upon which to project an image, or images, This method, however, has been proved to be entirely unsatisfactory as under any but the most favorable condition light beams will utterly fail to provide an efficient background.

Dense clouds have also been known to have been utilized as a background but here again great difficulties have been encountered which have mitigated against practical employment of such a method. Clouds of sufficient density are rarely available and are usually moving so rapidly as to make it impossible to locate a sign with any degree of permanency. In addition to the disadvantage attributable to the movement of the cloud there is usually considerable irregularity in shape which tends further to give the image a distorted appearance. It is usually necessary to project at a substantial distance when clouds are used as a background, and the distortion prevents a clear readable sign. The apparatus can be operated only for limited periods when there is little likelihood of a large audience.

My invention overcomes the difficulties attendant upon the use of hitherto known methods by the provision of an extremely accurate projecting apparatus adapted to utilize the invisible particles in the atmosphere as a background to arrest the light beam and cause the formation of the image in accordance with the design cut in the stencil which constitutes a part of the apparatus.

The main object of the invention is to provide simple and efficient means whereby advertising or other matter may be projected into the atmosphere so as to be visible irrespective of atmospheric conditions.

Another object of the invention is to provide a method and apparatus which will focus an image upon the invisible particles of the air as a background, or screen.

A further object of the invention is to provide projecting apparatus of simple and durable construction, which may be easily rotated and otherwise adjusted whereby the image may be readily focused in correspondence with the then obtaining atmospheric conditions and projected for display in any desired location in the atmosphere, and whereby such image may be moved around as desired.

A still further object of the invention is the provision in the line of light of suitable heat resisting means whereby a projection lens made of glass very accurately ground may be employed without danger of its being adversely affected by the heat from the lamp.

There are many details contributing to the accomplishment of the general objects just set forth and these together with the objects and advantages will become apparent from the following description and be particularly pointed out in the appended claims.

In describing the preferred embodiment the invention chosen for purposes of illustration and description herein reference will be made to the accompanying drawings in which:

Figure 1 is a side elevation of my improved projecting apparatus with a portion of the wall of the lamp housing broken away and other parts shown in section.

Figure 2 is an end elevation of a portion of the structure shown in Figure 1, with parts broken away to show the mechanism for accomplishing the relative adjustment of certain of the parts.

Figure 3 is a central longitudinal sectional view through the structure shown in Figure 1.

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a cross sectional view through the projecting apparatus, taken on the line 5—5 of Figure 4.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 4.

Figure 7 is a cross sectional view taken on the line 7—7 of Figure 4.

Figure 8 is a cross sectional view taken substantially on the line 8—8 of Figure 4.

Figure 9 is a detail view of the gear assembly used to rotate the reflecting mirror.

Figure 10 is a vertical sectional view taken substantially on the line 10—10 of Figure 4.

Figure 11 is a diagrammatic side elevational view, with parts in section, of a modification of the projecting apparatus shown in Figure 1.

Figure 12 is a diagrammatic side elevational view, partly in section, of another modification of the apparatus.

Like numerals of reference indicate corresponding parts in the various figures.

Referring to the drawings 1 is a housing suitably adapted interiorly for supporting an arc lamp 2 and a reflecting mirror 3 positioned behind said lamp and by means of which the light from said lamp is reflected in a converging beam towards an opening 4 in one wall of the housing wherein is adapted to be positioned under certain conditions a stencil 5. This stencil may be made of any suitable material with the image or characters which it is desired to portray in the air cut out to permit the rays of lights to pass through. The preferred method of removably supporting the stencil is by means of a frame 6 secured around the opening 4 exteriorly of the housing and having an opening through one wall whereby the stencil may be inserted, or removed. In this way one stencil can be easily and quickly substituted for another as occasion demands.

A concave lens 7 positioned in alignment with the stencil receives the light rays which have been reflected through the openings in the stencil by means of the mirror 2, and this lens, due to its shape and position, transforms said rays into a parallel beam which then passes through a projecting lens 8 positioned close to the lens 7 and through a second projecting lens 9, by means of which latter it is projected upon a mirror 10 and thereby reflected into the atmosphere. By adjusting the projecting lens 9 and the mirror 10 as described hereinafter, a sharp image is obtained utilizing the invisible particles of the atmosphere as a background or screen.

The lens 7 owing to its proximity to the lamp 2 is subject to great heat which causes it to become very hot, even when properly cooled by air currents, or by liquid, and for this reason it is preferable that it be made of quartz or some similar material which is adapted to withstand severe heat.

Due to the fact that the amount of light projected from each successive lens is less than that projected from the last preceding lens it is apparent that the heat to which each successive lens in the line is subjected is reduced accordingly and as a consequence whereas the first lens, 7, requires to be made of quartz, or other heat resisting material, the second lens, 8, may be made of glass accurately ground and the final projecting lens, 9, can be made of the finest of glass ground to the highest degree of accuracy. By utilizing a series of lenses each succeeding one of which is more accurate than the preceding one, a final projecting lens may be used which is so highly corrected that it will, when properly focused, penetrate the atmosphere until a body of moisture of sufficient density to provide a background, or screen is reached. In this way it is possible to make the image clearly visible without a background other than the invisible particles of the air and the invisible moisture therein.

To insure ease and efficiency in operation it is essential that the various elements of the device be so mounted as to be rotatable as a unit and also that certain of the parts be adjustable relative to one another.

The mounting for the various elements hereinbefore described and their adjusting mechanism, preferably consists of an elongated horizontally disposed frame A of rectangular shape in plan formed of a pair of parallel side members 11, preferably of right angle formation in cross section, and end pieces 12 connecting said side members at their opposite ends. This frame A carries the housing 1 positioned at one end thereof and also carries the stencil and the various lenses and their supports and said frame is in turn mounted at substantially its balance point for rotation on a circular standard 13 carried by a base 14. The base 14 is preferably provided with radial feet 15, each having a castor 16 set therein whereby the device may be easily moved from one location to another.

A rack 17 consisting of a bar having worm threads on both its upper and lower surfaces, as indicated by the numerals 18 and 19 respectively, extends longitudinally of the frame A midway between the side members 11 and is rigidly secured at its opposite ends to the end pieces 12 of the frame.

20 and 21 are shafts extending longitudinally of the supporting frame A and positioned respectively above and beneath the rack 17 in equidistant relation thereto, said shafts being journaled in suitable bearings 22 in the respective ends 12 of the frame.

The shafts 20 and 21 are provided at their ends adjacent the housing 1 with gears 23 and 24 respectively. Gears 25 and 26 suitably mounted on opposite sides of the transverse centre of the frame A mesh with the gears 23 and 24 respectively and crank numbers 27 and 28 cooperating with said gears 25 and 26 respectively provide adequately spaced means for rotating said shafts 20 and 21 independently of each other.

Slidably mounted on the shafts 20 and 21 respectively are relatively short sleeves 29 and 30, each of which is provided with an exterior spiral thread 31 adapted to mesh with the teeth on the adjacent face of the bar 17. Each of the sleeves 29 and 30 is provided with an interior key 32 which projects loosely into a slot 33 in the face of the associated shaft whereby to key the worm sleeve to its respective shaft for coincident rotary movement and at the same time to permit of longitudinal movement of the sleeve along its shaft by reason of the threaded relationship between the two.

The lenses 7 and 8 are supported by holders 34 and 35 which extend across the frame A and rest on the opposing side members 11, the said holders being cut away centrally to bridge the shafts 20 and 21 as is clearly shown in Figure 7, and being provided with short projections 36 which extend downwardly parallel with the in-

ner walls of the said side members whereby to prevent lateral movement of the holders. It will be noted however, that the holders 34 and 35 are not locked in any way against movement longitudinally of the frame and while no adjustment of the lenses 7 and 8 should normally be required and no means for moving their holders is shown or described herein it is apparent that if occasion for movement arises one, or other, or both of holders may be moved by hand along the frame.

The projecting lens 9 is mounted in a holder 37 which rests on the opposing sides 11 of the frame and has a central extension 38 secured on the lower face thereof and depending downwardly between said sides, through which the bar 17 and the shaft 21 extend loosely. The upper shaft 20 extends loosely through the body of the holder 37 above the extension 38 and said body is recessed from the under side to provide a housing 39 for the worm sleeve 29. It will thus be apparent that when the shaft 20 is rotated by means of the crank member 27 the worm gear 29 keyed to said shaft will be moved along the rack by the co-acting worm threads and as the sleeve is mounted within the holder, the latter, and consequently the lens 9, will be moved along the frame towards, or away from, the housing 1, according to the direction in which the shaft is rotated.

Under certain atmospheric conditions it may be desirable to position the stencil 6 between the lenses 8 and 9, in which event it is desirable that means be provided for conveniently adjusting the stencil in relation to the projecting lens 9. For this purpose a holder 40 is provided, into which the stencil may be easily inserted. This holder 40 has a portion 41 cut away to permit of the passage of the upper shaft 20 and the rack 17 and is further provided with a downwardly depending central portion 42 provided with a recess 43 constituting a housing for the worm sleeve 30 carried by the shaft 21, whereby the worm threads on said sleeve will mesh with the teeth on the lower face of the rack 17 so that on the rotation of the shaft 21 the sleeve will be moved therealong and will draw the holder with it.

The mirror 10 is mounted on a holder 44 by means of a universal joint 45 whereby the angle of inclination of the mirror may be altered at will. The holder is supported at opposite ends by the side pieces 11 of the frame A on which it may be moved longitudinally if desired.

It is desirable that means be provided whereby the inclination of the mirror 10 may be altered by the operator while stationed at the lamp housing and to this end a rod 47, having a crank portion 48 positioned at the rear of the housing, is projected through the corresponding end of the frame and through the holders 37, 40, and 44 which provide bearings therefor, and terminates adjacent the opposite end of the frame. A bevel gear 49 is carried by the rod 47 near the end at which the mirror 10 is located and this gear is secured to the rod by means of a set screw 50 whereby the position of the gear on the rod may be altered in accordance with the longitudinal adjustment of the mirror on the frame.

A right angular bracket 51 has one of its arms encircling the collar of the bevel gear 49 whereby it is movable along the shaft 47 with said bevel gear, and has its other arm 52 positioned parallel with said shaft. A link 53 carries a bevel gear 54 at one end thereof mounted in the arm 52 of the bracket and meshing with the bevel gear 49 and said link at its other end is pivotally connected to the lower end of a rod 55 extending at angle in relation to said link and which is rigidly secured to the universal joint 45. It will be apparent that to alter the inclination of the mirror 10 it is simply necessary to rotate the rod 47 by means of the crank 48 and through the meshing of the gears 49 and 54 rotary movement is imparted to the link 53 which in turn causes movement of the rod 55 to alter the inclination of the mirror according to the direction in which the said rod 47 is rotated.

When it is desired to move the mirror 10 along the frame A it is first necessary to loosen the bevel gear 49 from the shaft, by means of the set screw 50, whereby the said gear may move along the shaft in accordance with the movement of the mirror and after the adjustment of the mirror has been accomplished the set screw is again turned to lock the gear to the shaft.

In Figure 11 a modified arrangement of elements is shown in which the stencil is positioned in the holder 40 between the lenses 8 and 9 with the lenses adjusted to cause crossing of the rays before entering the final projecting lens 9.

In Figure 12 another modification is shown wherein the lenses 7 and 8 are omitted and the stencil is positioned in proximity to the projecting lens 9. In this case the rays of light are projected directly against the stencil and the portion of light passing through the openings in the stencil are properly focused by means of the projecting lens 9. In this case, the projecting lens is subjected to a somewhat higher temperature although only a small portion of the light emitted from the lamp reaches it owing to the fact that the major part is shielded by the opaque part of the stencil.

The lamp 2 is suitably connected by means of electrical wires 56 with a plurality of brush contacts 57 which are mounted peripherally of the bearing bracket 57*a*, which extends downwardly from the frame A for rotative engagement with the stand and 13, and are adapted to bear against rings 58 which encircle the standard 13 and are connected by wires 59 to the source of electric power.

In the operation of the invention the lamp is first adjusted to give the desired intensity. The mirror 3 reflects the light from the lamp against the stencil in which the image is cut and the light which passes through the openings in the stencil enters the heat resisting concave lens 7 by means of which the rays are transformed into a parallel beam and are projected into the projecting lens 8 which is ground to a higher degree of accuracy than the lens 7 owing to the fact that it is subject to less heat than said lens 7. The relatively small amount of light leaving the lens 8 is then projected in a parallel beam through the lens 9 which, on account of the low degree of heat to which it is subjected, may be made of glass very accurately ground whereby to focus the image very clearly at a distance. This lens 9 projects the light on to the face of the mirror 10. The mirror 10 is then given the proper inclination, through the medium of the crank 48 controlling the shaft 47 and its gear and link connection with the universal joint 45 on which the mirror is mounted, to reflect the beam in the required direction.

The beam of light is now reflected in the atmosphere and to locate a body of invisible par-

ticles of the air of sufficient density to clearly portray the image it is necessary to move the lens 9 along the frame A until the proper focus is obtained. This movement of the lens 9 is accomplished by rotating the crank 27 which causes the rotation of the shaft 20 and also the worm sleeve 29, which latter through its threaded engagement with the rack 17 is moved along said rack and draws with it the holder 37 in which the said lens is mounted. Under certain atmospheric conditions it may be desirable to move the mirror lengthwise of the frame in relation to the lens 9 and in such case the gear 49 is momentarily released from its shaft 47 by the release of the set screw 50, to allow the said gear to move along the shaft, upon which the mirror may be moved along the frame and the gear 49 again locked to its shaft.

In the event that the range of the universal mounting of the mirror is not sufficient to provide the desired variations in locating an image all of the elements comprising the projector may be moved as a unit on a horizontal plane by simply rotating the device on its mounting 13.

Should the stencil be located in the holder 40 between the projecting lenses 8 and 9 it will in all likelihood be found necessary to adjust said stencil in relation to the lens 9 and this is accomplished by means of the crank member 28 as described hereinbefore.

The present invention provides an arrangement of lens and means of adjusting the various elements not previously known and whereby an image can be quickly and clearly shown against the invisible particles of the atmosphere as a background.

The employment of a plurality of lenses in longitudinal alignment and each succeeding lens to the final one being of a successively higher degree of accuracy permits of penetration by the beam through the atmosphere until forming a body of sufficient density to provide a proper background.

While the preferred embodiment of the present invention has been herein shown and described, it is of course to be understood that alterations in details of construction and arrangements of parts as comes within the scope of the following claims for novelty may be made.

What I claim is:

1. In a machine for projecting aerial signs, the combination of a rotary platform, a lamp housing mounted on one end of said platform, a tiltable mirror mounted on said platform at the other end thereof, means operable adjacent to said housing for tilting said mirror, a lamp mounted in said housing, means located in said housing for directing the light from said lamp towards said mirror, a stencil carried by said housing and receiving the light from said lamp, a longitudinally slotted rotatable shaft extending lengthwise of said platform, a rack extending parallel with said shaft, said rack having a spiral thread thereon, a lens holder movable along said platform, a lens mounted in said holder for projecting the light transmitted through said stencil on to said mirror, said lens holder having an interior housing through which said shaft extends loosely, a sleeve encircling said shaft within said housing in said lens holder and having an interior key slidable in the slot in said shaft, said sleeve also having a spiral thread meshing with the thread on said rack whereby on the rotation of said shaft said sleeve will progress longitudinally of said shaft and cause coincident movement of said lens holder, and means for rotating said shaft.

2. In a machine for projecting aerial signs, the combination of a rotary platform, a lamp housing mounted on one end of said platform in opposition to said housing, means operable at a distance from said mirror to tilt same, a lamp mounted in said housing, means located in said housing for directing the light from said lamp towards said mirror, a stencil interposed in said light between said lamp and said mirror, a pair of longitudinally slotted shafts positioned one above the other and extending lengthwise of the platform in spaced relation to each other, a pair of holders movable along said platform, said holders respectively having interior recesses through which the respective shafts extend, sleeves slidably mounted on said shafts and confined within the respective recesses in said holders, said sleeves having interior keys slidably fitting within the slots in said shafts, said sleeves each having an exterior worm thread, a rigid rack extending lengthwise of said platform between said shafts and having threads on opposed faces only meshing with the threads on the sleeves positioned at the corresponding side thereof whereby said holders may be moved independently of each other, means for rotating said shafts, and a lens carried by one of said holders for projecting the light transmitted through said stencil on to said mirror for reflection into the atmosphere.

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