Sept. 15, 1936. J. G. GRAMSA 2,054,417

PROJECTING MACHINE

Filed Feb. 10, 1932 3 Sheets-Sheet 1

Fig. 1.

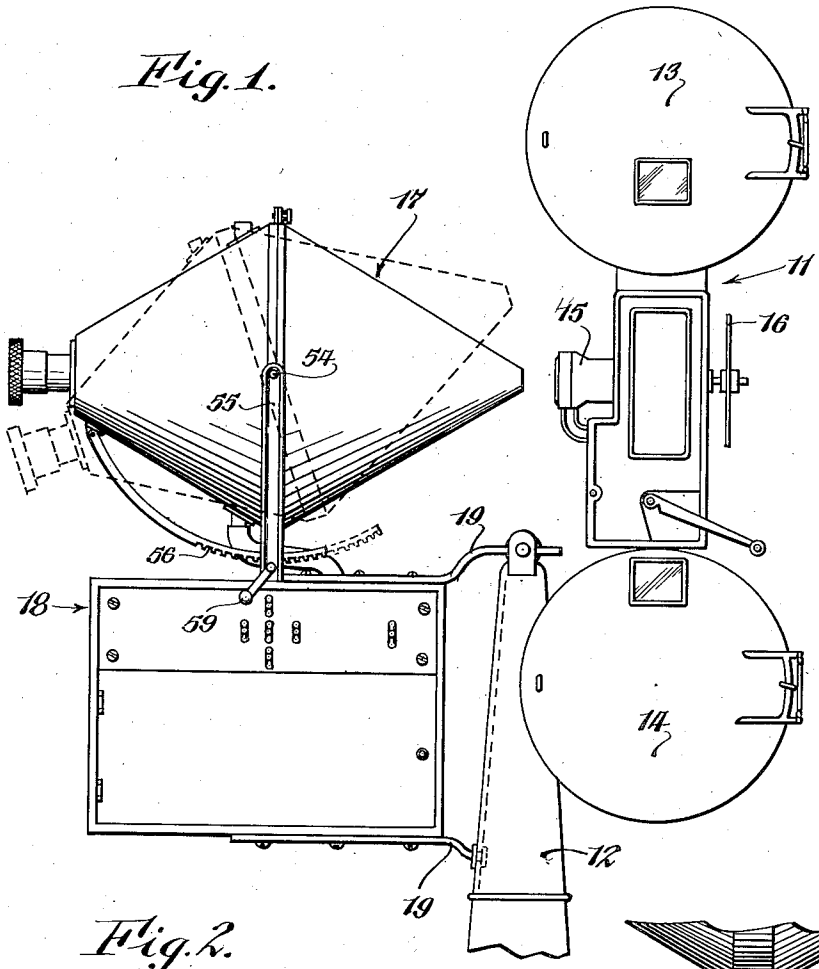
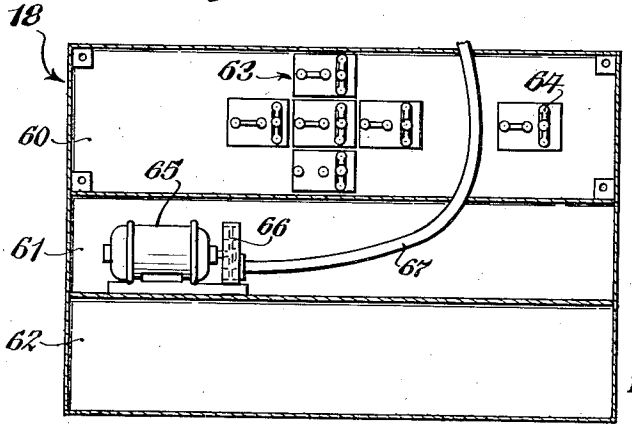


Fig. 2.



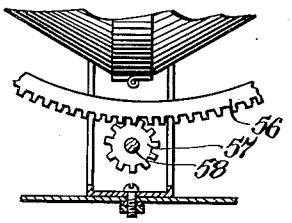


Fig. 3.

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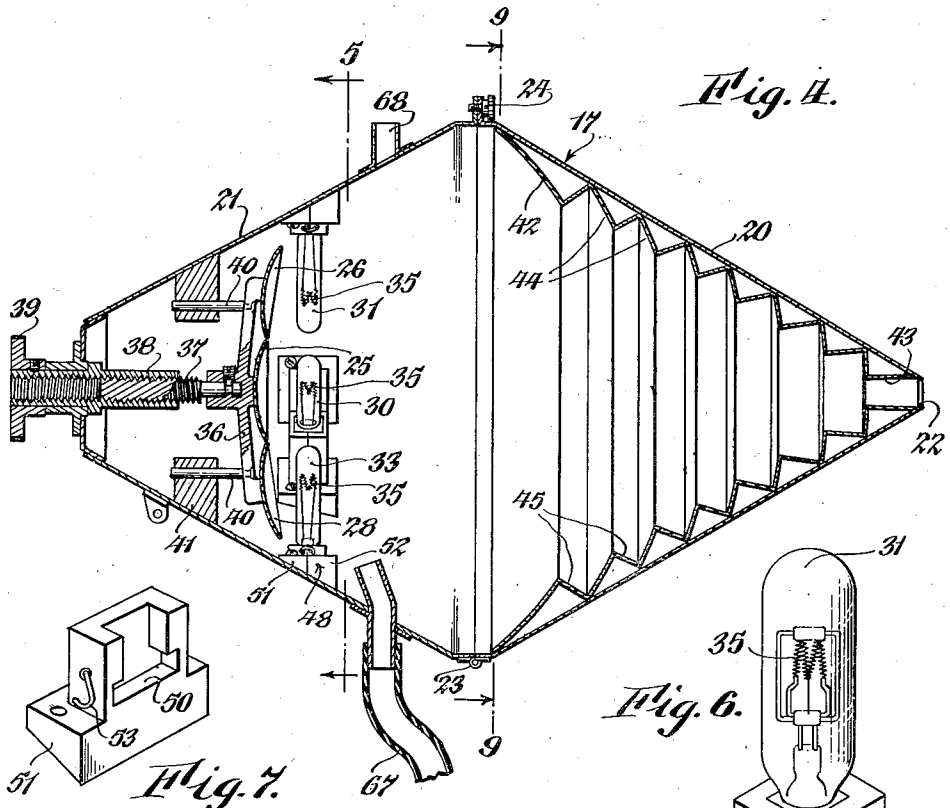


Fig. 4.

Fig. 7.

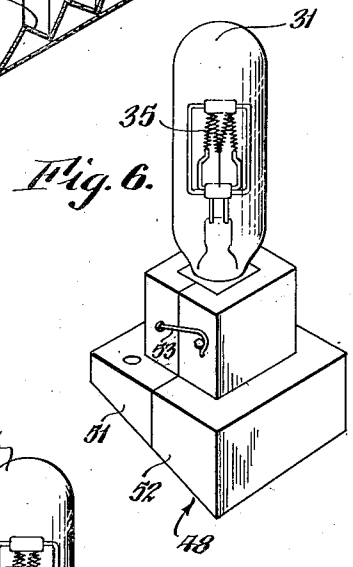


Fig. 6.

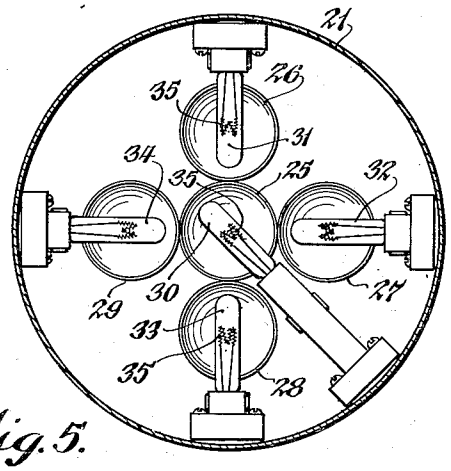


Fig. 5.

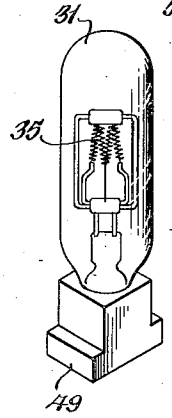


Fig. 8.

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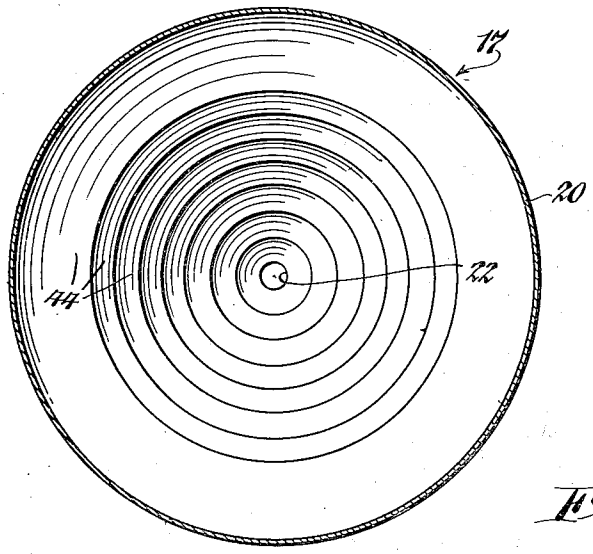


Fig. 9.

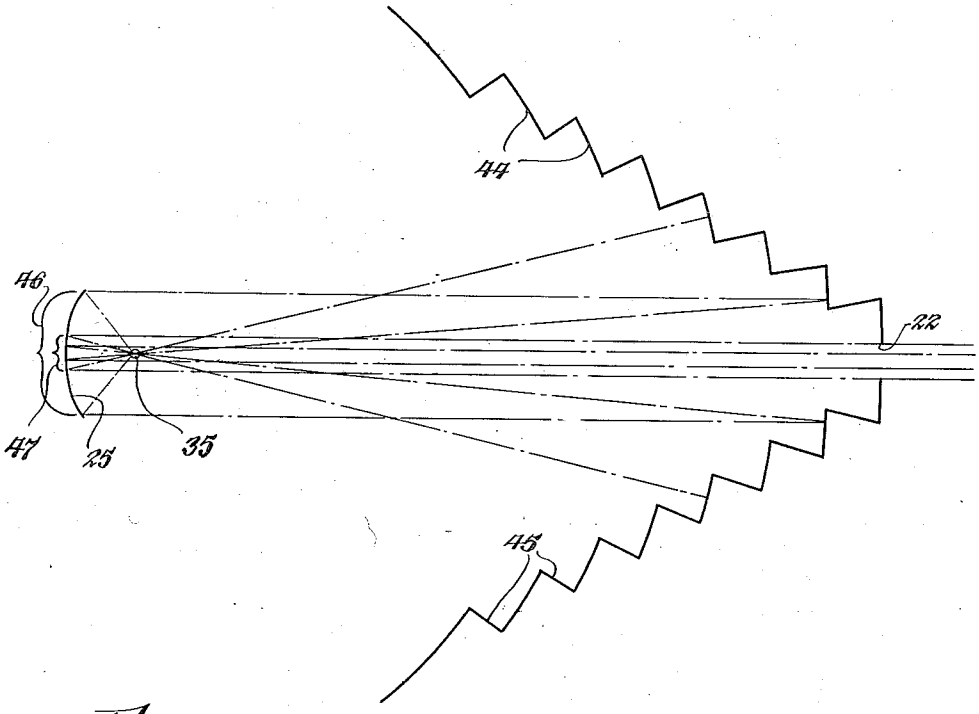


Fig. 10.

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Patented Sept. 15, 1936 2,054,417

UNITED STATES PATENT OFFICE

2,054,417

PROJECTING MACHINE

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Application February 10, 1932, Serial No. 592,044

10 Claims. (Cl. 88—24)

This application is a continuation in part of and a substitute for my copending application Serial No. 127,929 filed August 7, 1926.

The invention relates to improvements in projecting apparatus and more particularly the invention is concerned with improvements in the light projecting means therefor.

One object of the invention is to provide apparatus which is capable of producing a beam of light in which a substantial part of the rays of the beam are parallel, thereby maintaining light losses at a minimum.

A further object is to provide apparatus which is adapted to produce a light beam of high intensity with a minimum consumption of current.

A still further object is to provide apparatus in which the light projecting means is operative to produce light beams of different colors or combinations of colors.

A still further object is to provide a novel arrangement of the parts of the apparatus, whereby adjustment and replacement of the parts may be conveniently effected.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of a moving picture machine equipped with a lamphouse and lamp control system constructed in accordance with the invention.

Figure 2 is a vertical section through the control box showing the control switches and ventilating motor.

Figure 3 is a fragmentary section of the gear and rack mechanism for tilting the lamphouse.

Figure 4 is a longitudinal section through the lamphouse.

Figure 5 is a vertical section through the lamphouse taken along line 5—5 of Figure 4.

Figure 6 is a perspective view of one of the lamps and its socket.

Figure 7 is a perspective view of a part of the socket.

Figure 8 is a perspective view of one of the lamps.

Figure 9 is a vertical section taken along line 9—9 of Figure 4.

Figure 10 is a diagrammatic view illustrating the manner in which the light beam is produced.

The invention is applicable to various types of projecting apparatus. For purposes of illustration it is shown in connection with a motion picture machine 11 of conventional construction. As illustrated in Figure 1, the machine is supported from a suitable standard 12 and includes convention film holders 13 and 14, a lens holder 15 and a shutter 16. The lamphouse 17 and control box 18 therefor are suitably supported by arms 19 from the standard 12 in the desired relation to the said machine.

The lamphouse 17, as best shown in Figure 4, includes a casing formed of front and rear conical sections 20 and 21 respectively. The former is provided with an aperture 22 at its apex through which the light is projected from the casing into the lens holder 15. The sections 20 and 21 are preferably connected by a hinge 23 and a diametrically opposed threaded element 24, the latter being operable to secure the sections in their operative position while being readily removable to enable access to the interiors of the sections for cleaning, repairing or adjusting of the parts within the casing.

The light projecting means, as illustrated, includes a plurality of parabolic reflectors which are arranged in a group, the said group including a central reflector 25 and a series of secondary reflectors 26, 27, 28 and 29 arranged about the central reflector. Electric lamps 30, 31, 32, 33 and 34 are arranged in front of the reflectors, the filaments 35 of the said lamps being focused with reference to the corresponding reflectors. The lamp 30 is preferably of clear glass but one or more of the other lamps are preferably colored in order that colored beams may be projected by them. Any desired colors may be employed but the three primary colors red, blue and yellow are preferably utilized so that by combining different lamps a wide range of colors can be obtained while by illuminating all of the lamps a white light of high intensity is obtained. Each of the reflectors is arranged to project a beam of light through the aperture 22, the beam of light from the central reflector 25 being substantially axial of the casing while the beams of light from the secondary reflectors converge toward and merge with the beam of light from the central reflector. The beams of light produced by the various reflectors are considerably greater in cross-sectional area than the area of the aperture 22. Hence, only a part of each beam is permitted to pass directly through the aperture. Those portions of the beams of light which pass directly through the aperture are rectified in the lens holder 15 and are projected in the form of a single beam toward the screen.

The reflectors are carried in the position described by the arms of a spider 36. Means is provided whereby the spider, and hence the reflectors may be adjusted axially of the casing in order to control the beam of light directed

through the aperture 22. To this end the spider is carried by a threaded element 37 which fits within a threaded sleeve 38. The latter extends through the end wall of the section 21 and carries an element 39 which may be manually adjusted to vary the position of the reflectors. The spider 36 carries pins 40 which extend through suitable openings formed in guide blocks 41 carried by the section 21. The said pins permit movement of the group of reflectors axially of the casing during adjustment of the element 39 while preventing angular movement of the said group. It will be apparent, therefore, that by rotating the element 39 in the required direction the group of reflectors may be moved to control the light beams in the manner desired.

That portion of the light from the reflectors which, owing to the diameter of the beams, does not pass directly through the aperture 22 constitutes a large percentage of the total reflected light. In order to utilize this portion of the light which would otherwise be dissipated, means is provided for reflecting such light to the central reflector 25 so that it may be reflected by the latter through the aperture 22. To this end auxiliary reflecting means is arranged in the conical section 20 of the casing which is adapted to intercept those portions of the beams of light which fail to pass through the aperture. The auxiliary means consists of a conical shell 42 which is suitably secured within the front section of the lamphouse and which is provided with an opening 43 which registers with the aperture 22. The shell 42 is formed with concentric annular corrugations. The latter provide elliptical band reflectors 44 which reflect toward the central reflector 25 and inwardly facing reflecting bands 45 which are adapted to reflect light toward the opposite side of the shell. A reflector of the type desired has the advantage that a large part of the light striking the front of the lamphouse will be reflected into the central reflector 25 and utilized to project the pictures, thereby enabling the concentration of a relatively large part of the total light emitted and hence permitting the lamp system to be operated with a relatively low consumption of current.

In the use of the machine the number of lamps which is employed may be varied as circumstances may require. For most purposes, when modification in color of the light is not required, a beam of the required intensity may be projected through the aperture 22 by the use of the lamp 30 and the central reflector 25 associated therewith.

As best shown in Figure 10 the reflector 25 projects a beam of light axially of the lamphouse which in cross-sectional area is substantially larger than the area of the aperture 22. The reflector is preferably designed to project a beam of a size and intensity such that if concentrated in a beam having a cross-sectional area equal to the area of the aperture 22, it will be of an intensity adequate for projecting purposes. The beam of light produced by the reflector 25 is of substantially uniform cross-section throughout its length, the diameter of the beam being indicated by the bracket 46. The only light, therefore, which is reflected directly through the aperture 22 is the light reflected by that portion of the reflector 25 which is indicated by the bracket 47 and which in area corresponds to the area of the aperture 22. The remainder of the light beam is intercepted by the elliptical reflecting bands 44 adjacent the aperture and are reflected rearwardly to the reflector 25. The elliptic bands 44 are so formed that light from the reflector 25 will be reflected back to that part of the reflector indicated by the bracket 47 and hence will be reflected by the reflector 25 through the aperture 22. In other words, the entire beam of light from the reflector 25 is concentrated and caused to pass through the aperture 22. The use of a parabolic reflector has the advantage that substantially all of the light rays are parallel, thereby providing a beam which is of substantially uniform intensity and avoiding losses such as occur when the rays projected through the aperture are moving in various directions. The elliptical bands 44 which lie outside of the zone covered by the beam from the reflector 25 are formed to direct that portion of the light which passes directly from the light source to them back through the light source to the reflector 25. This light, therefore, which is not originally included in the beam produced by the reflector 25 is, by the use of these additional elliptical band reflectors, caused to become a part of the said beam. It will be apparent, therefore, that the beam of light projected through the aperture 22 includes substantially the entire beam produced by the reflector 25 in addition to a substantial part of the light which passes directly from the light source to the elliptical band reflectors 44.

In order to enable proper positioning of the lamp filaments 35 with respect to the reflectors, a split socket 48 is preferably employed. The lamp base 49 which carries the lamp and filament is of T-shape (see Figure 8) and is fitted in a T-shape recess 50 formed by the joining together of the two halves 51 and 52 of the socket. The half socket 51 is suitably secured to the rear section 21 of the casing and the companion half socket 52 is secured to the half socket 51 by a suitable fastening 53. In order to replace a lamp, therefore, it is only necessary to separate the two parts of the socket and insert the new lamp which, as fitted in the socket, is accurately positioned in relation to its reflector. Any desired arrangement of contacts and leads may be used to connect the lamps to power.

The lamphouse is preferably supported on the control box 18 so that it can be tilted and adapted to machines requiring lamphouses of different inclinations. For this purpose the rear section 21 of the lamphouse is provided at its front end with trunnions 54 which fit in suitable bearings at the upper ends of standards 55 mounted upon the control box. The tilting of the lamphouse is effected by a rack 56 which is pivotally connected to the rear end of the lamphouse and which meshes with a pinion 57 (see Figure 3) carried by a shaft 58. The latter is suitably journaled in the standards 55 and may be operated to rotate the pinion 57 by a crank 59. The control box 18 is divided into compartments 60, 61 and 62. The upper compartment 60 houses the switches 63 which are employed in connecting the various lamps to power and a switch 64 which is adapted to control a motor 65. The switches 63 are preferably grouped similarly to the lamps which they control in order to avoid mistakes in operating the lamps. The motor 65 is mounted in the central compartment 61 of the control box and drives a fan 66 which is adapted to force cooling air through a conduit 67 into the interior of the lamphouse thereby cooling the lamps. The heated air passes from the lamphouse through a suitable vent 68 at the

top thereof. The lower compartment 62 of the control box may be employed for storing tools or other supplies incident to the operation of the machine.

From the foregoing, it will be apparent that the apparatus is operable to project beams of varying colors and intensities. A particular advantage obtained by the use of parabolic reflectors is that when desired a beam of the required intensity may be obtained by the use of a single reflector, the latter in conjunction with the elliptical reflecting bands in the front of the lamphouse concentrating the entire beam of light projected by the reflector into a beam of substantially the size of the aperture of the lamphouse. Substantially all of the rays of the beam are parallel, thereby avoiding loss of light and enabling the projection of a beam of the required intensity with a minimum consumption of current.

I claim as my invention:

1. Light projecting apparatus comprising a lamphouse having an aperture at its front end, a light source in said lamphouse, a parabolic reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and an elliptical band reflector adjacent said aperture for reflecting the remainder of said beam rearwardly to that portion of said parabolic reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture.

2. In a projecting machine, a lamphouse having an aperture at its front end, a light source in said lamphouse, a parabolic reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and a reflector surrounding said aperture and formed to provide a plurality of elliptical bands for reflecting the remainder of said beam rearwardly to that portion of said parabolic reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture.

3. In a projecting machine, a lamphouse having a tapered front section and an aperture provided at the apex of said section, a light source, a parabolic reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and a reflector arranged along the tapered wall of said front section, said last mentioned reflector being formed to provide a plurality of elliptical bands which reflect that portion of said beam which does not pass directly through said aperture to that portion of said parabolic reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture.

4. In a projecting machine, a lamphouse comprising a casing having an aperture at its front end, a group of reflectors arranged at the rear of said casing and each adapted to reflect a beam of light through said aperture, a lamp arranged in front of each of said reflectors, and means for adjusting said group of reflectors as a unit toward and from said aperture.

5. In a projecting machine, a lamphouse comprising a casing having an aperture at its front end, a reflector adapted to project a beam of light forwardly through said aperture, a plurality of reflectors arranged adjacent said first named reflector and each adapted to project a beam of light forwardly through said aperture, a lamp arranged in front of each of said reflectors, means for selectively illuminating each of said lamps and reflective means provided at the front end of said casing and adapted to reflect light rearwardly into said first named reflector.

6. In a projecting machine, a lamphouse comprising a rear section and a front section of conical form having an aperture at its apex, a group of reflectors mounted in said rear section and each adapted to project a beam of light through said aperture, said group comprising a central reflector arranged concentrically with said housing, and a plurality of reflectors arranged adjacent said central reflector, a lamp arranged in front of each of said reflectors, means for causing one or more of said last named reflectors to project a beam of colored light, reflective means arranged on the inner side of said front housing section around said aperture and adapted to reflect light rearwardly into said first named reflector and means for selectively illuminating said lamps.

7. Light projecting apparatus comprising a lamphouse having an aperture at its front end, a light source in said lamphouse, a reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and an elliptical band reflector adjacent said aperture for reflecting the remainder of said beam rearwardly to that portion of said reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture.

8. A projecting machine, a lamphouse having an aperture at its front end, a light source in said lamphouse, a reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and a reflector surrounding said aperture and formed to provide a plurality of elliptical bands for reflecting the remainder of said beam rearwardly to that portion of said reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture.

9. In a projecting machine, a lamphouse having an aperture at its front end, a light source in said lamphouse, a parabolic reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture, an elliptical band reflector adjacent said aperture for reflecting the

remainder of said beam rearwardly to that portion of said parabolic reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture and means co-operating with said elliptical reflector for receiving light directly from said light source and for reflecting the said light back through said light source to said parabolic reflector so that it becomes a part of the beam directed toward said aperture.

10. In a projecting machine, a lamphouse having an aperture at its front end, a light source in said lamphouse, a parabolic reflector associated with said light source adapted to reflect a beam of light toward said aperture, said beam of light having a cross-sectional area substantially greater than the area of said aperture, whereby only a portion of said beam passes directly through said aperture and a reflector surrounding said aperture and formed to provide a plurality of elliptical bands, certain of said bands reflecting the remainder of said beam rearwardly to that portion of said parabolic reflector from which light is reflected directly through said aperture, whereby substantially the entire beam is concentrated and caused to pass through said aperture and other of said bands being adapted to receive light directly from said light source and to reflect the said light back through said light source to said parabolic reflector so that it becomes a part of the beam directed toward said aperture.

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