

March 27, 1934.

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PROJECTION SYSTEM AND APPARATUS

Filed June 26, 1929

7 Sheets-Sheet 1



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March 27, 1934.

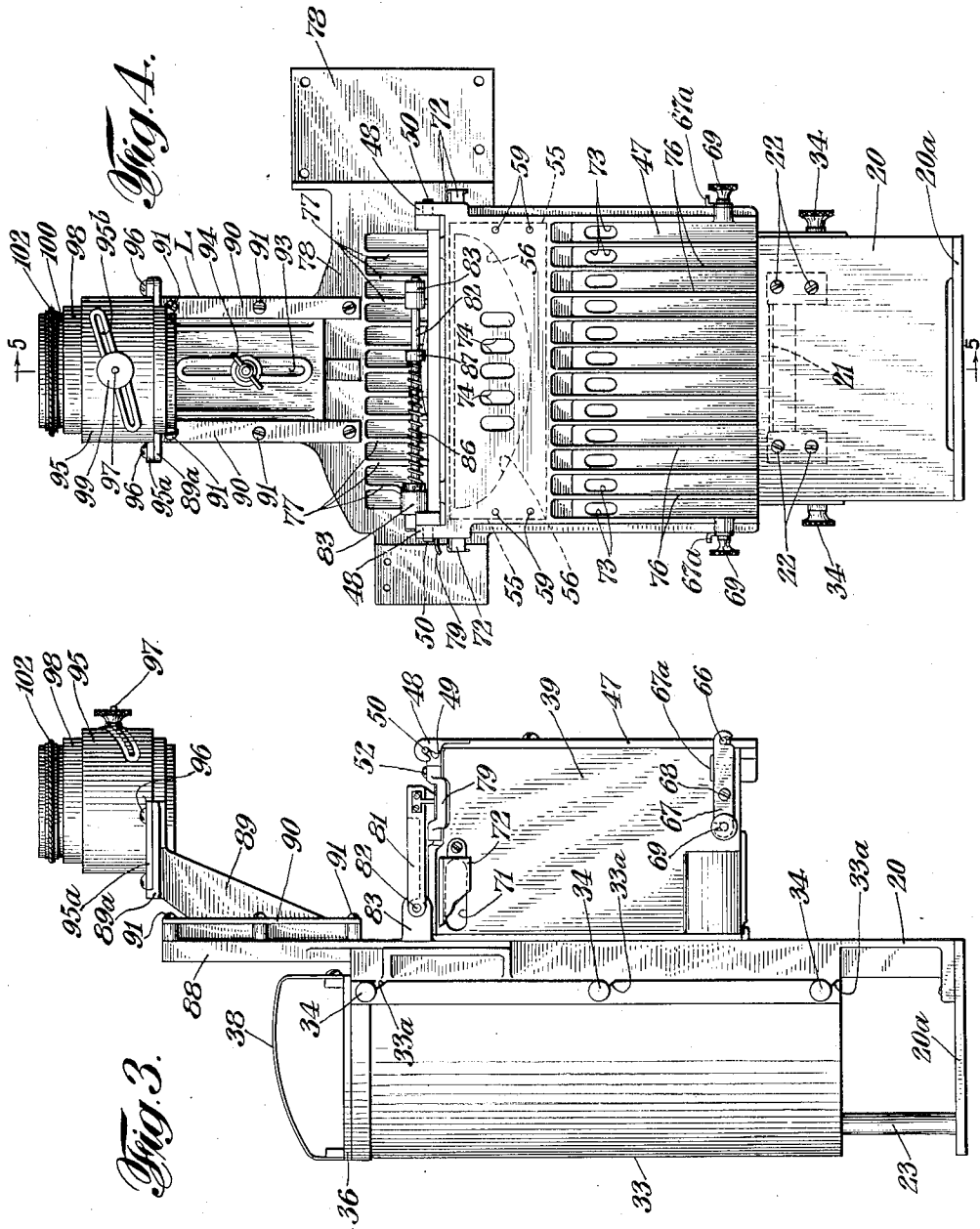
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 2



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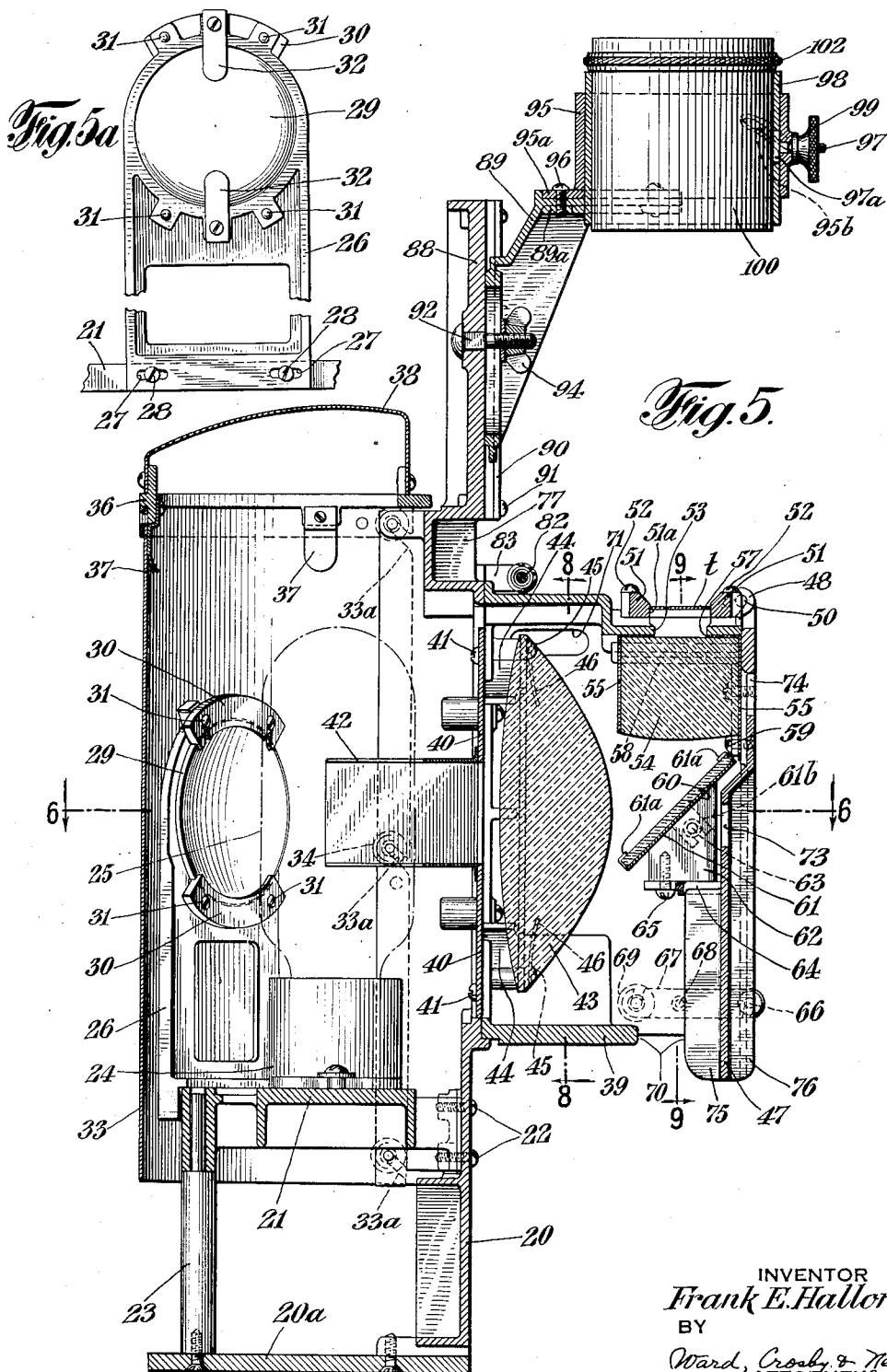
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 3



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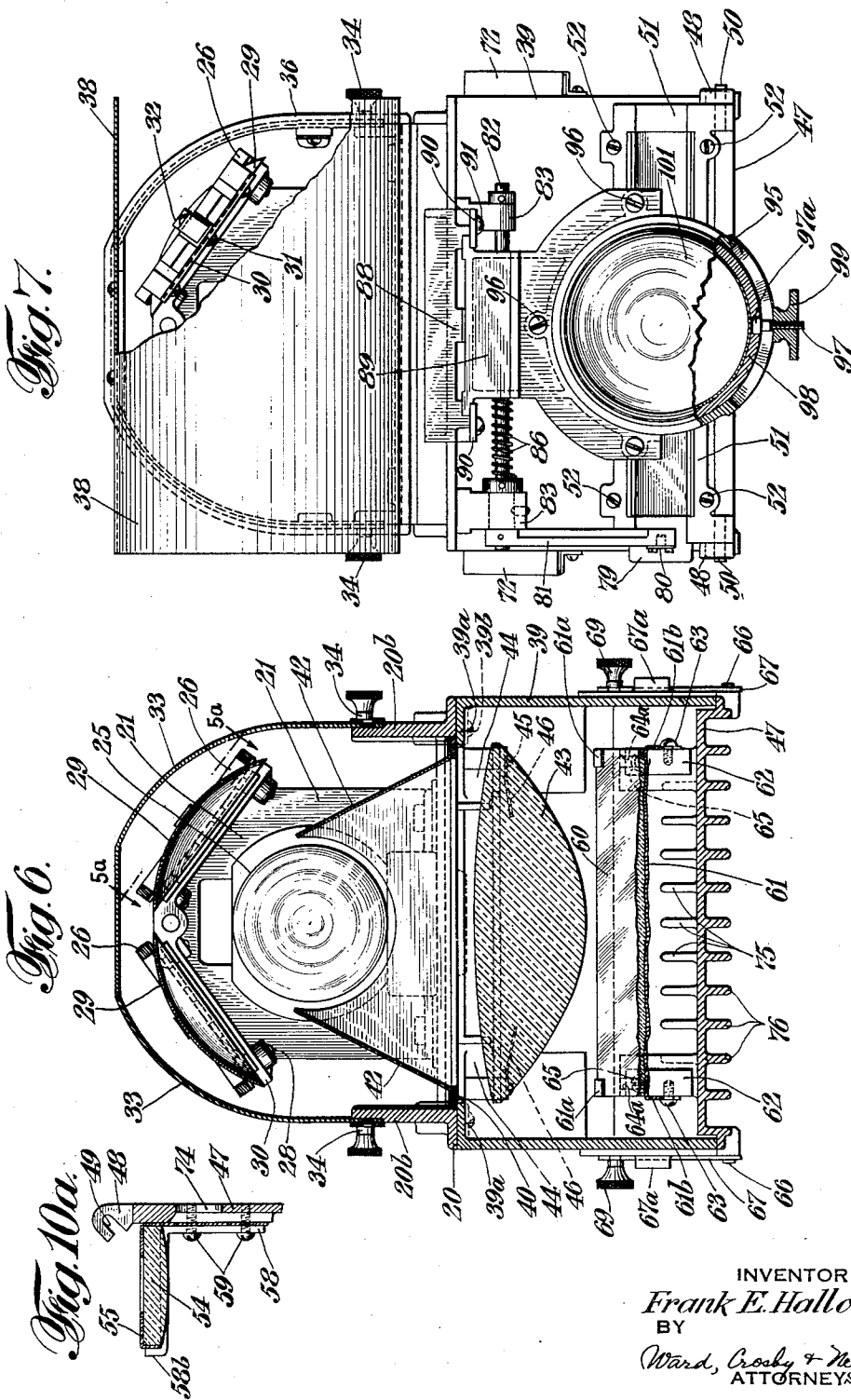
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 4



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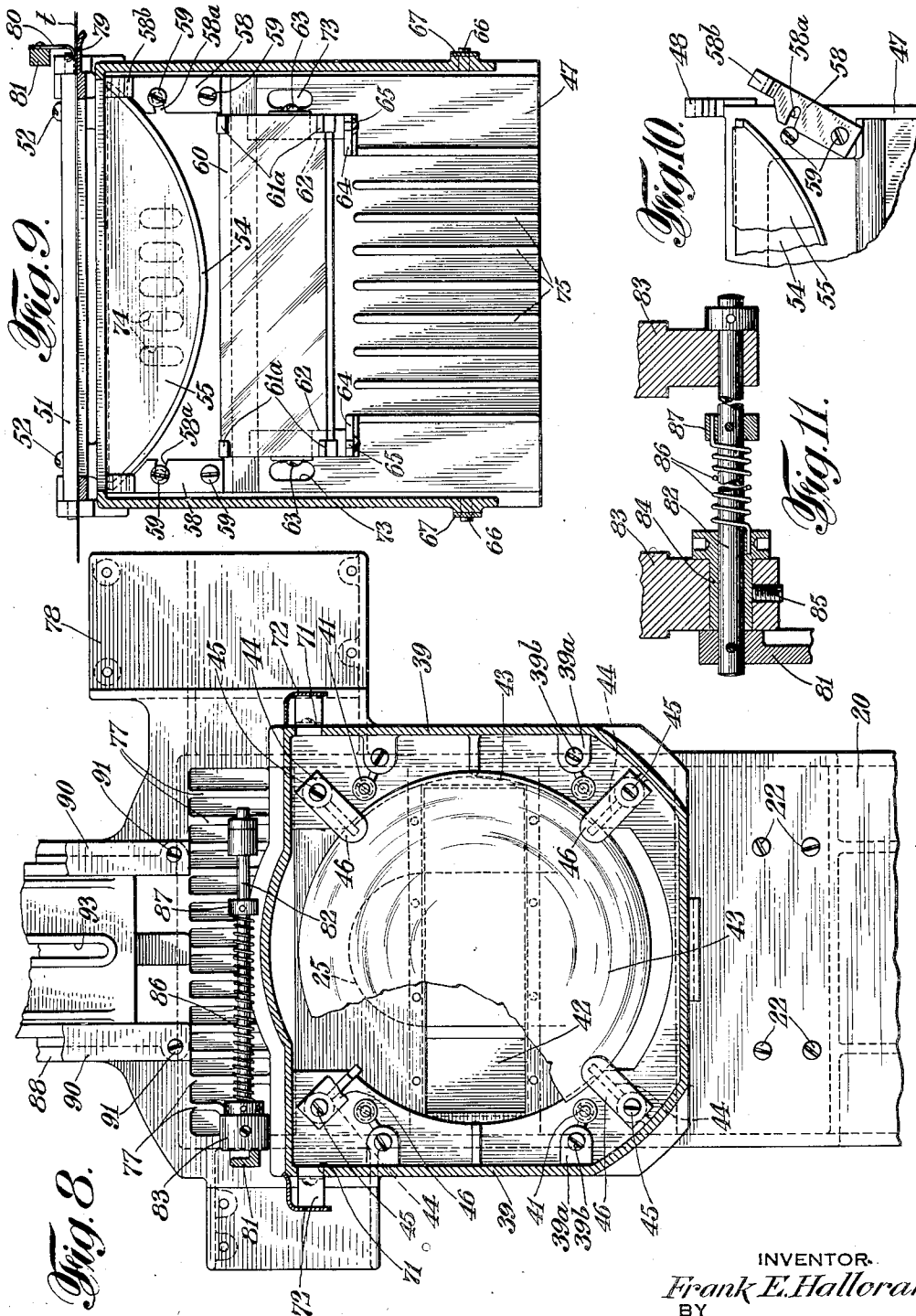
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 5



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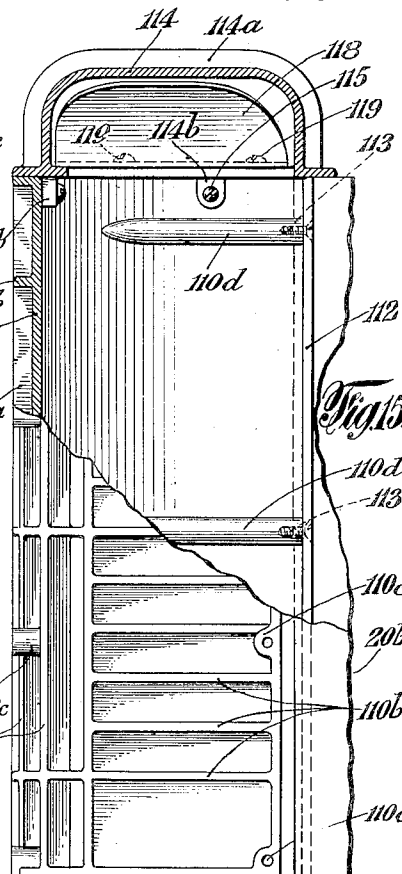
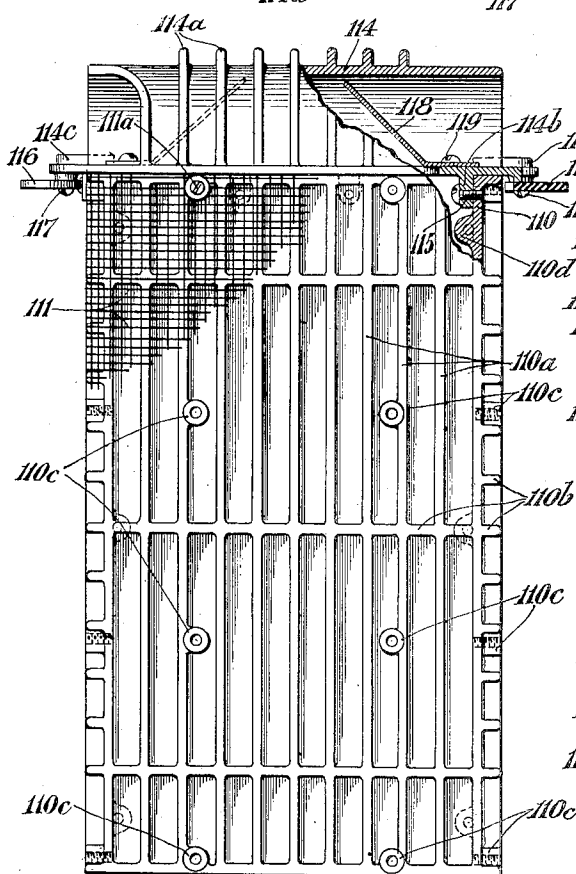
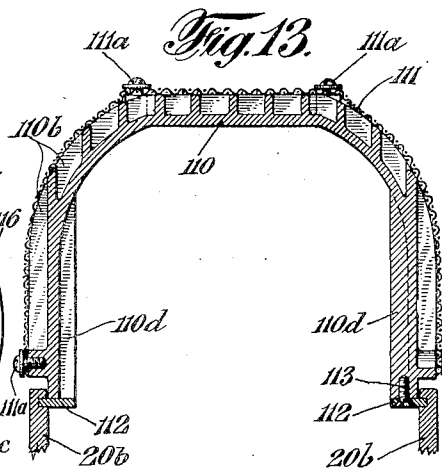
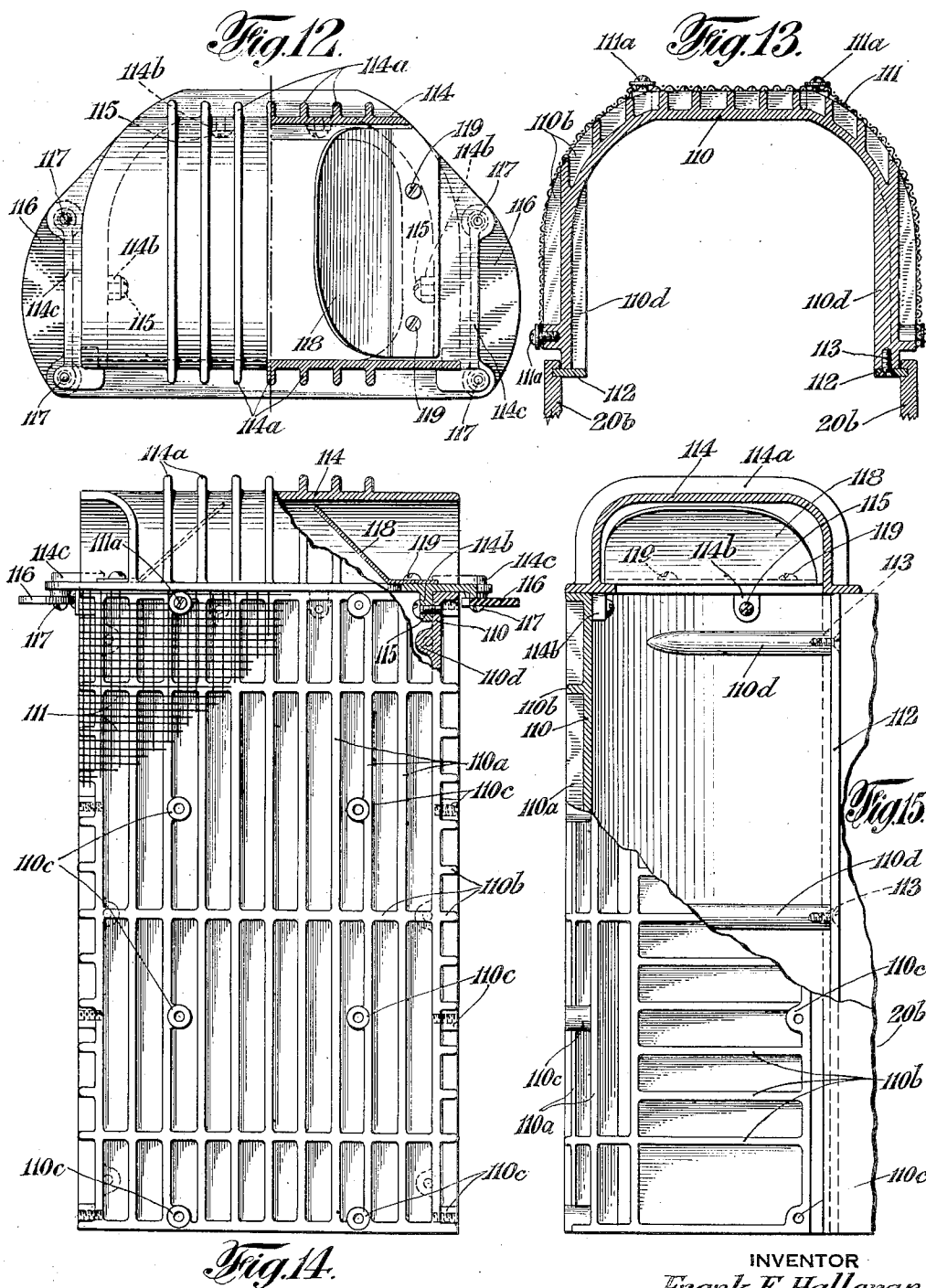
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 6



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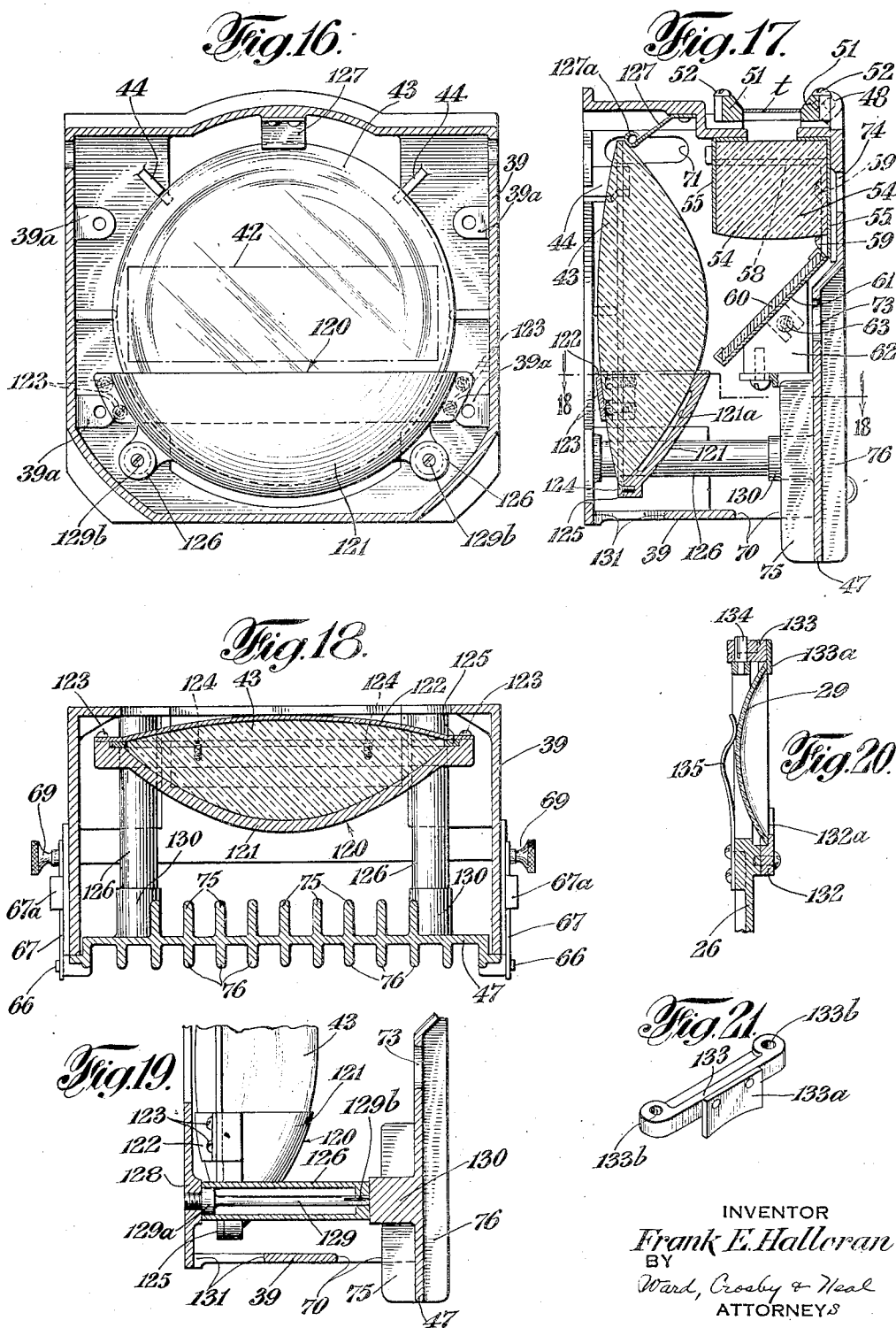
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PROJECTION SYSTEM AND APPARATUS

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

1,952,249

PROJECTION SYSTEM AND APPARATUS

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Application June 26, 1929, Serial No. 373,767

27 Claims. (Cl. 88—24)

My invention relates to a projection system and apparatus utilizable particularly for effecting the display of images of information-imparting representations or characters.

5 My invention relates particularly to an apparatus, organization or arrangement which operates in a highly satisfactory and efficient manner.

10 My invention relates to an apparatus or organization, as aforesaid, involving detachable and/or adjustable parts or devices contributing to the ease and efficiency of operation.

Further objects, advantages, and characteristics of my invention will be hereinafter stated and 15 described.

My invention resides in the novel system, apparatus or arrangement of which one form is shown by way of example in the accompanying drawings.

20 For an understanding of my invention and for an illustration of one of the forms of my apparatus, organization or arrangement may take reference is to be had to the accompanying drawings, in which:

25 Figure 1 is a plan view showing essential parts of a complete projection system;

Fig. 2 is a front elevational view, partly broken away, of the arrangement shown in Fig. 1;

30 Fig. 3 is a side elevational view of apparatus constructed in accordance with my invention;

Fig. 4 is a front elevational view of the apparatus shown in Fig. 3;

35 Fig. 5 is a vertical sectional view, partly in elevation, and is taken on the line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 5a is a rear elevational view of a part of the apparatus shown in Fig. 5 and as such apparatus appears when viewed from the line 5a—5a of Fig. 6, for example;

40 Fig. 6 is a horizontal sectional view, partly in plan, and is taken on the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 is a plan view, partly broken away, of the apparatus shown in Figs. 3 and 4;

45 Fig. 8 is a vertical sectional view, partly in elevation and partly broken away, and is taken on the line 8—8 of Fig. 5, looking in the direction of the arrows;

50 Fig. 9 is a vertical sectional view, partly in elevation, and is taken on the line 9—9 of Fig. 5, looking in the direction of the arrows;

Fig. 10 is a rear elevational view of latching mechanism coactable with a lens;

55 Fig. 10a is a vertical sectional view of the latching mechanism shown in Fig. 10;

Fig. 11 is a vertical sectional view, partly in elevation, of spring mechanism coactable with a tape;

Fig. 12 is a plan view, partly broken away of a preferred form of wall structure forming a part 60 of a lamp casing;

Fig. 13 is a transverse, horizontal sectional view, partly in plan, of the structure shown in Fig. 12;

Fig. 14 is a rear elevational view, partly in section and partly broken away, of the structure 65 shown in Fig. 12;

Fig. 15 is a side elevational view, partly in section and partly broken away, of the structure shown in Fig. 12;

Fig. 16 is a vertical sectional view, partly in 70 elevation and conforming somewhat with Fig. 8, but showing another arrangement for supporting a lens;

Fig. 17 is a transverse, vertical section, partly in elevation, of the arrangement shown in Fig. 75 16;

Fig. 18 is a horizontal sectional view, partly in plan, and is taken on the line 18—18 of Fig. 17, looking in the direction of the arrows;

Fig. 19 is a fragmentary, transverse vertical 80 sectional view, partly in elevation, of the arrangement shown in Figs. 16, 17 and 18;

Fig. 20 is a vertical sectional view, partly in elevation, of a supporting arrangement for a 85 light-reflecting member and

Fig. 21 is a perspective view of one of the parts shown in Fig. 20.

My invention relates particularly to an organization or arrangement for passing a light beam through an elongated passage traversed by 90 a tape or web of substantially transparent material, said tape or web comprising or having printed thereon suitable representations or characters usually abbreviated and serving to impart information. An example of such tape or web is 95 that acted upon by the printing mechanism of a "stock ticker".

The light beam, after it traverses the aforesaid tape or web, passes through a suitable objective lens and then, ordinarily, is reflected by a suitable 100 mirror system into engagement with an elongated screen of suitable character on which images of the aforesaid representations or characters are made visible to an observer or audience. Usually, the screen is of such dimensions as to receive 105 images of all the representations or characters defined within the aforesaid elongated passage for any instantaneous position of the tape or web. However, as the latter moves, the images correspondingly move across the screen, each ap- 110

pearing at one end thereof, moving thereacross, and finally vanishing from view.

Referring to Figs. 1 and 2, there is illustrated, in general, an organization or system comprising a unit or mechanism P for printing or forming characters on a tape or web, a unit or mechanism F for feeding or moving said tape or web along a path, and a unit or device L for passing a light beam into coacting relation with said tape or web to project images of said printed or formed characters onto a screen.

The aforesaid mechanism P may be of any suitable or desired character; as illustrated, it comprises a housing or casing 1 having rotatably mounted therein a reel 2 from which the tape or web *t* passes into coacting relation with respect to a suitably operated printing device indicated generally at 3. In the example shown, the mechanism P is supported by a member 4, in turn, supported by the same base 5 which supports the device L.

The unit or mechanism F, likewise, may be of any suitable character; as illustrated, it comprises a frame 6 having a shaft 7 journaled therein, said shaft 7 being operated by any suitable motive device, not shown, and carrying a drum 7a at one end thereof. The frame 6 also carries idler rollers 8 and 9 together with a tape feeding roller 10 biased in a counter-clockwise direction, Fig. 2, toward the aforesaid drum 7a. The tape *t*, after it leaves the unit L, passes first over the roller 8, then between the drum 7a and roller 10, then over roller 9, and finally is wound upon a spool or reel 11 journaled upon a shaft 12 carried by an upstanding part of the frame 6. Shaft 12 is connected to and driven from the shaft 7 by a flexible belt 13.

Ordinarily, the printing mechanism P is remotely operated and it functions to print stock quotations on the tape *t* which is fed from the mechanism P in accordance with the rate of printing. The motive device described above for operating the shaft 7 winds the tape *t* on the reel 11.

In accordance with my invention, the unit or device L is formed or constructed in a novel manner and possesses certain marked features contributing to the satisfactory and improved performance of the function intended.

Referring particularly to Figs. 2, 3, 4 and 5, said unit or device L is shown as comprising a standard or main frame member 20 supported on or carried by the base 5, or equivalent, in any suitable manner, as by the flange 20a. Extending laterally from the standard 20 is a member 21 suitably secured thereto, as by screws 22, Figs. 4 and 5. As illustrated in Fig. 5, the member 21, at the edge thereof removed from the standard 20, may be supported by a rod or member 23 secured to and upstanding from the aforesaid flange 20a, said member 23 comprising an upper portion of reduced diameter detachably or fixedly received in a perforation in the member 21.

Supported by the member 21 is a socket 24, Fig. 5, receiving the base of an incandescent lamp 25. Upstanding from the member 21 are a plurality of plates or members 26, 26, preferably, recessed for the sake of lightness as illustrated in Fig. 5a. The members 26, 26 are carried, respectively, by angularly related surfaces of the member 21 and, therefore, said members 26, 26 are disposed in angular relation, Fig. 6. Preferably and as illustrated in Fig. 5a, the members 26, 26 are adjustable or slidable toward and from each other. To this end, each of said members 26 may

be provided with elongated slots 27, Fig. 5a, through each of which passes a screw 28 threaded into member 21. Obviously, upon retraction of some of the screws 28, one member 26 may be moved toward or from the adjacent member 26, or all of the screws 28 may be retracted to permit adjustment of both members 26.

Carried in any suitable manner by each member 26 is a light-reflecting member or mirror 29 having a concave, light-reflecting surface. As illustrated in Figs. 5 and 5a, each member 26, in suitable spaced relation, carries arc-shaped members 30 facing each other and having shouldered surfaces receiving opposite edges of one of the light-reflecting members 29. As shown in Fig. 5, the lower arc-shaped member 30 may be suitably fixed to the member, as by screws 31. Similar screws 31 may be utilized for securing in position the upper arc-shaped member 30 but, preferably, said last named screws 31 are disposed within elongated, open slots. Obviously, upon retraction of the upper screws 31, the upper arc-shaped member 30 may be removed to thereby permit removal of the adjacent light-reflecting member 29 from its supporting member 26. If desired, each member 26 may carry a plurality of resilient members 32 forming a resilient backing for the light-reflecting member 29 carried thereby.

Carried by the parallel flanges 20b of the standard 20, Fig. 6, is a casing-forming member 33 preferably arc-shaped and detachably associated therewith, in any suitable manner; member 33 may be formed from metallic sheet material or otherwise. To this end and as illustrated, each vertical edge of said member 33 is provided with parallel, elongated slots 33a each open at end, Fig. 3. Passing through each slot 33a and threaded into the adjacent flange 20b is a screw 34. Obviously, when the screws 34 are retracted, the casing-forming member 33 may readily be removed from the standard 20. Ordinarily, the interior surface of the casing-forming member 33 is painted or coated with suitable light-diffusing material, not shown.

As illustrated particularly in Figs. 3, 5 and 7, a cap member may be carried, preferably detachably, by the casing-forming member 33. In the example shown, said cap member comprises a frame or ring 36 having depending therefrom resilient leaf springs 37 for detachably engaging the upper, inner surface of said casing-forming member 33. Carried by the spring 36 is the channel-forming, cap member 38 open at its ends and disposed in inverted relation.

As illustrated in Fig. 6, the area of plate 21 is shown as substantially less than the cross-sectional configuration of the casing-forming member 33. Furthermore, said plate 21, preferably, is recessed at opposite sides of the socket 24. When the lamp 25 is energized, the generated heat is transmitted to the surrounding air and, accordingly, this rises through the casing-forming member 33, engages and is deflected by the channel-shaped member 38 and passes therefrom at the openings provided at opposite sides thereof. At the same time, cold air enters the casing-forming member 33 by passing upwardly along the sides of and through the plate 21. In this manner, the lamp casing is ventilated in a highly satisfactory manner.

Substantially midway of the ends of standard 20, the inwardly turned flanges 39a, Fig. 6, of a casing 39 are suitably secured thereto, as by screws 39b. In the example shown, standard 20

and casing 39 are formed by casting operations and the design is such that a light beam may pass from the lamp 25 toward and into the casing 39. To this end, there is provided an opening of substantial size in the standard 20, said opening being in alignment with an opening of somewhat smaller size bounded by the aforesaid flange 39a of casing 39. The passage formed by said openings is closed, in part, by a plate 40 preferably of metallic sheet material and suitably secured to the flanges 39a of casing 39, as by screws 41, Fig. 5. Plate 40 has an aperture or opening preferably of rectangular configuration and extending throughout substantially its entire width, Fig. 6. Light from the lamp 25 passes through the opening last named and, preferably, this light is confined to or directed along its proper and intended path by a passage-forming member or structure 42 suitably secured to and carried by the aforesaid plate 40. Said member or structure 42 comprises top and bottom walls spanned by side walls, the former being shaped at one end for the partial reception of the bulb of the aforesaid lamp 25, Figs. 5 and 6. Ordinarily, the interior surfaces of all of the walls of structure 42 are painted or coated with suitable light-diffusing material. The side walls of said member or structure 42 diverge in a direction leading toward the casing 39 to thereby form an opening of the same size and configuration and which registers with the opening in the aforesaid plate 40.

Disposed within the casing 39 adjacent the plate 40 is a condenser lens 43 maintained in the position illustrated in any suitable manner. To this end and as shown in Figs. 5, 6 and 8, lugs 44 projecting from the flanged section 39a of casing 39 serve as seats for said lens 43. Each lug 44 has a screw 45 threaded into an extension thereof for maintaining a clip 46 of flexible metallic material in engagement with the outer face of said lens 43 to hold the latter on its seats. Obviously, the screws 45 may be retracted to thereby loosen clips 46 and permit removal of the lens 43.

Detachably carried by the casing 39 is a plate or member 47 forming the front wall thereof. In the example shown, plate 47 has or comprises arms or extensions 48 formed at each side thereof. As illustrated, each extension 48 is provided with an elongated slot 49 open at one end for the reception of a pin or stud 50 projecting in opposite directions from the ends of guide structure 51 for the tape *t*. As shown in Figs. 3, 5, 7 and 17, said guide structure 51 is suitably secured to the upper surface of the top wall of casing 39, as by screws 52, and comprises spaced, parallel bars connected at their ends by transverse members, said bars and members defining a rectangular opening 51a aligned with a similar opening 53 formed in said top wall of casing 39.

Suitably secured to the interior surface of the plate 47 is a condensing lens 54. In the example illustrated, said lens 54 is detachably related to said plate 47 and, to this end, there may be utilized a frame 55 formed, preferably of sheet metal and having front and rear walls connected by a top wall. Referring to Fig. 4, the front wall of frame 55 is shown as substantially rectangular but is provided, preferably, with a recess 56 slightly larger than the front face of lens 54 and, therefore, permitting said front face to be closely adjacent or in contact with the inner surface of plate 47. The top wall of frame 55, likewise, is substantially rectangular but is provided with a rectangular opening 57 of substantially the same

size and in alignment with the opening in the guide structure 51, Fig. 5. Referring to Figs. 5 and 9, the rear wall of frame 55 is substantially arc-shaped in configuration and overlies the adjacent or rear face of lens 54.

As illustrated in Figs. 9, 10 and 10a, clamps 58, 58 are shown as disposed at each end of the frame 55 to retain the lens 54 therein and to secure the same in position on the plate 47. The clamps 58 are angular and the bases thereof are disposed, respectively, on the front face of frame 55 at opposite ends thereof, a pair of screws 59 passing through the base of each clamp 58, through the adjacent portion of frame 55 and being threaded into the plate 47. One of the screws 59 of each pair passes through an ordinary perforation whereas the other screw of the same pair passes through an elongated slot 58a open at one end. Each clamp 58 comprises an angular portion terminating in a locking portion 58b for engagement with the adjacent extremity of the rear wall of frame 55.

With the clamps 58 positioned as illustrated in Fig. 9, the respective angular portions thereof engage opposite ends of the lens 54 to securely and firmly hold it in position in the frame 55 and on the plate 47. Upon slight retraction of the screws 59, the clamps 58 may pivot about the respective lower screws 59, Figs. 9 and 10, and be swung as illustrated in Fig. 10 because of the provision of the slots 58a. The lens 54 may now readily be removed from the frame 55 and, in as simple a manner, may be reinserted therein when desired.

Referring to Figs. 5, 6, 9 and 17, a light-reflecting mirror 60 is shown as positioned below the lens 54 and to one side of the lens 43. Mirror 60 may be supported in any suitable manner, and, in the example illustrated, it is carried by a backing plate 61 preferably of metallic sheet material and having clamping lugs 61a, in the example shown, bent around said mirror 60 at the respective corners thereof. Preferably, the mirror 60 is longer than as illustrated and, therefore, extends beyond each end of the backing plate 61. Each end of plate 61 comprises an ear 61b, Figs. 5 and 6, each ear 61b being suitably secured to a block 62, as by a screw 63. The blocks 62 have inclined faces engaging the plate 61 and they are supported, respectively, by lugs 64 projecting at right angles from the plate 47, disposed in parallel relation and formed integrally therewith. The lugs 64, preferably, have elongated slots 64a through each of which extends a screw 65 threaded into the respective blocks 62.

The mirror 60 is disposed at an angle of 45 degrees with respect to the light beam passing thereto from the condensing lens 43 and, therefore, said mirror 60 functions to deflect said light beam so that it passes upwardly in a vertical direction. Upon slight retraction of the screws 65, the blocks 62, plate 61 and mirror 60 may be shifted bodily and as a unit either toward or from the lens 43 as desired. During such movement, the mirror 60 preserves its 45 degree inclination maintaining the light beam in its vertical direction and, as a result, the upward path of the deflected light beam is shifted in one direction or another as the case may be to cause it to pass through the axis of the herein-after described objective lens.

As hereinbefore stated, the plate 47 is pivoted on the pins 50 and it may be retained detachably in the position illustrated in Fig. 5 in any suitable manner. To this end, if desired, there

may be utilized an arrangement such as shown in Figs. 3, 4, 5, 6, 9 and 18 wherein the plate 47 is illustrated as having alined pins 66 projecting beyond each vertical side thereof. Coacting with each pin 66 is a latch or lever 67 pivoted at 68 on the exterior surface of each side wall of casing 39 which also has a headed screw 69 threaded thereinto. As illustrated in Figs. 3 and 5 at each side of casing 39 there should be a pin 66, a pivot 68, and a screw 69 disposed substantially in horizontal alinement. Each lever 67 comprises a finger piece 67a and elongated slots at the opposite lever ends, said slots extending in opposite directions, one slot receiving a pin 66 on plate 47 and another slot receiving the shank of a screw 69 carried by casing 39. When the plate 47 is to be maintained vertically or in position closing the front of casing 39, the aforesaid latching mechanism is positioned as illustrated in Figs. 3 and 5, the screws 69 being tightly threaded into the adjacent wall of casing 39. Under such circumstances, the levers 67 are maintained securely in their latching positions. However, when the screws 69 are retracted, the respective levers 67 are freely swingable from engagement with said screws 69 and the pins 66. When thus swung, the plate 47 may be swung about its pivots 50 and may readily be detached therefrom, if desired.

Ordinarily, some suitable arrangement should be provided for ventilating the casing 39 and for cooling the wall structure thereof. In the example shown, an opening 70 is provided in the bottom casing wall for the admission of cool air which rises through the interior of said casing 39 to withdraw or abstract heat from the various walls thereof, the lenses 43 and 54, the mirror 60, and other parts or members disposed interiorly of the casing. This heated air may pass from the casing 39 through openings 71 formed in the side walls thereof, said openings having baffle members 72 disposed adjacent thereto and secured to the respective casing side walls, if desired. Some of this heated air may escape through openings 73 provided in the plate 47 at one side of the mirror 60 and through other openings 74 likewise formed in said plate 47 at one side of the lens 54.

The wall structure of casing 39 may present a corrugated, finned or ribbed surface to facilitate heat dissipation. In the example shown and with this end in view, the inner surface of plate 47 is provided with ribs 75 and the outer surface with ribs 76.

If desired, the standard 20 in the region thereof near the top of the casing-forming member 33 may be provided with heat-radiating ribs 77 utilizable for more rapidly dissipating the heat generated by the lamp 25. Preferably, in this region, the standard 20 comprises an extension 78 to which is secured the frame 6 of unit F.

The tape *t* as it passes from left to right, Fig. 2, directly engages and is supported by the aforesaid transverse members of the tape guide structure 51. Disposed adjacent the entrance to said guide structure 51 is a shelf member 79, Fig. 9, having a downwardly curved extremity facilitating passage of said tape *t* in the desired direction. Some arrangement should be provided in this region for applying a slight retarding force to the tape *t*. This may be of any suitable character. In the example shown, there is thus utilized a resilient member 80 having a bowed end directly engaging the tape *t* and carried by a bar or member 81, in turn, carried by a rod or shaft 82

oscillatable in bearings 83, Fig. 11, formed, preferably, integrally with the standard 20. The shaft 82 engages one of the bearings 83 indirectly through a sleeve 84 freely rotatable in said last named bearing 83 when not restrained by a pin or screw 85. Secured to the sleeve 84 is one end of a spring 86 helically disposed upon said shaft 82 and secured at its other end to a collar 87 keyed thereto.

The spring 86 biases the lever 81 downwardly, Fig. 9, so that the resilient member 80 engages the tape *t* with the desired force. The latter may be decreased or increased by loosening the screw 85 to rotate the sleeve in one direction or the other to either wind or unwind the spring 86.

Referring to Figs. 1, 2, 3, 4, 5, 7 and 8, the standard 20 is illustrated as comprising an upper extension 88 on one side of which a bracket 89 is suitably supported for sliding movement. To this end, strips 90 may be suitably secured, as by screws 91, to opposite sides of the same face of extension 88 with which said strips 90 form passages or slots for the reception of tongues formed at opposite sides of said bracket 89. As one example of an arrangement for detachably retaining bracket 89 in any desired position, there may be utilized a bolt 92, Fig. 5, non-rotatably secured in the extension 88 and extending through a vertical slot 93 formed in bracket 89, a wing nut 94, when tightened on bolt 92, retaining bracket 89 in a desired position.

Bracket 89 terminates in a horizontal shelf portion 89a, Figs. 3 and 4, to which a flange 95a of a ring 95 is secured preferably in readily detachable relation, as by screws 96. Ring 95 is provided with an arcuate inclined, slot 95b through which extends the shank of a screw 97, the head 97a of which is polygonal in configuration and closely fits a recess of similar configuration in a sleeve 98, Fig. 5. Coacting with the screw 97 and with the exterior surface of ring 95 is a nut or clamping element 99. The sleeve 98 slidably and freely receives the casing 100 of an objective lens 101, the rim 102 of casing 100 coacting with the top of sleeve 98 to limit downward movement of the objective lens structure.

The light beam reflected upwardly by the mirror 60 passes first through the condenser lens 54 and then through the objective lens 101. Thereafter, said light beam, usually after deflection by a suitable mirror system, not shown, is passed into coacting relation with a suitable viewing surface, not shown, where images of the characters on the tape *t* are exhibited. To bring the objective lens 101 to its proper focusing position, the bracket 89 may be moved either upwardly or downwardly and the lens 101 brought to approximately its proper position. Thereafter, the nut 99 may be loosened and then moved either to the right or left, Fig. 4, to more accurately position said lens 101 in its proper focusing position. This action is effected because the head 97a of screw 97 is larger than the width of slot 95b; in effect, therefore, said head 97a is pocketed within the sleeve 98 and the latter moves upwardly when the screw 97 is moved to the right and downwardly when said screw 97 is moved to the left, Fig. 4. The objective lens 101 moves with the sleeve 98 and, hence, it may readily be brought to a desired focusing position with precision and nicety. After the lens 101 has been brought to its desired position, the nut 99 may be advanced on the screw 97 to bring

the former into binding relation with the ring 95. As a result, all of the parts are firmly and securely locked in position to positively retain the lens 101 a desired distance above the lens 54.

Where the light beam is to be projected an unusual distance to a viewing surface, it may be necessary to remove the screws 96 and dispose a spacer block between the shelf 89a and flange 95a. This constitutes an extremely simple arrangement for lengthening the space between the lenses 101 and 54 to accommodate lenses of more than the usual focal distance while still retaining the value of the close adjustment to be effected by utilizing the screw 97 and slot 95b.

The operation is as follows:

When a stock ticker is incorporated in the system with which my invention is applicable, the tape *t* is fed in the usual manner from left to right, Figs. 1 and 2, said tape unwinding from the reel 2, having information-imparting characters printed thereon by the mechanism 3, and thereafter being wound upon the reel 11. It results, therefore, that a section or length of said tape is continuously on the guide structure 51 and it is this section or length through which the light beam is passed to visualize to an observer or audience images of the characters formed thereon.

To this end and upon illumination of the lamp 25, light passes first through the channel structure 42, then through the lens 43 and engages the mirror 60 as an elongated band of light. From the mirror 60, the light beam is directed vertically upward into coacting relation with the lens 54, through a length or section of the tape *t* on the guide structure 51, then through the objective lens 101. From the latter the light beam passes, usually, to a mirror system, not shown, thence through a suitable screen, not shown, and then directly to the observer or audience whereby there is rendered visible on said screen images of the characters appearing on the section or length of the tape *t* then on the guide structure 51. If said tape *t* is stationary, said images remain stationary; however, when said tape *t* is moving, the images likewise move in one direction across the screen, appearing first at one end thereof, passing thereacross and finally fading from view at the other end thereof.

In accordance with my invention, it is desirable that certain parts or elements of the hereinbefore described apparatus be cast from molten metal. By so doing, there is produced a structure or arrangement which undergoes little change in configuration upon application thereto of the heat generated by the lamp 25 or upon application of the stresses due to careless manipulation. Ordinarily, the standard 20 is formed from such material and, therefore, during change of temperature thereof, there is little or no deformation to disturb the dimensional relations between the parts.

Similarly and for the same reason, it is desirable that the lamp support 21, the mirror supports 26, casing 39 and its detachable front wall 47, and bracket 89 be cast from molten metal the same as is the standard 20. The arrangement, structurally, is of the chassis type in which the related parts are jointed and fastened together in a way to insure fixed relationship. As a result, a high degree of rigidity is obtained and correct alinement of the various elements of the optical system is preserved even though the apparatus as a whole undergoes considerable change in temperature under the influence of

the lamp 25 or if said apparatus should be subjected to rough handling or installed on a non-rigid support.

As stated above, the essential or fundamental parts of the apparatus should be cast from molten material; however, some of the parts are substantially independent of the elements of the optical system and these may be formed of sheet metal, if desired. Thus, for example, the plate 40, the light channel 42, the casing-forming member 33 and its cap member 38 may be formed from sheet material. However, as hereinbefore described, the casing-forming member and its cap member may be cast from molten metal, if desired.

The lamp socket 24 is mounted directly on the member 21 and, ordinarily, is adjustable toward or from the standard 20 to vary the distance between the lamp filament and the lens 43.

As more particularly described in my copending application Serial No. 373,612, filed June 25, 1929, the mirrors or light reflecting members 29 are utilized to obtain a more even distribution of light throughout the band thereof that coacts with the tape *t* and subsequently with the viewing screen; more particularly, said mirrors 29 function to intensify or strengthen the band of light at the ends thereof since these are the regions wherein the light intensity is at a minimum, the latter, of course, being objectionable. As clearly appears from Fig. 6, the mirrors 29 are so arranged that they direct light mainly toward opposite sides of the lens 43 and it is these regions of said lens 43 that are least illuminated by light passing directly from the filament of the lamp 25. Accordingly, said mirrors 29 function as described above, to wit, to obtain a more even distribution of light throughout the length of the light band. By retracting screws 28, one or both of the plates 26 may be shifted as desired to properly position one or both of the mirrors 29.

The passage-forming member or structure 42 forms a largely closed path between the lamp 25 and the lens 43 to thereby confine or direct the light along its intended and proper course. The interior surface of each side wall of the structure 42 coacts with a mirror 29 in the sense that some of the light reflected by each mirror 29 comes into engagement with one of the aforesaid side walls and is thereby reflected into engagement with the lens 43 at a side thereof. Thus, said side walls function to prevent leakage of light reflected by said mirrors 29 and they also trap light emanating from lamp 25 which would otherwise be lost.

The casing-forming member 33, as hereinbefore stated, may be painted or coated on its interior surface with light diffusing material. Said member 33 constitutes a substantial portion of the side wall structure forming the lamp casing and is readily detachable, upon manipulation of the screws 34, to permit access to the interior of said casing. Moreover, the cap member 38, likewise, may be readily detachable, as described.

The fins or ribs 77 radiate heat transmitted thereto by conduction from the heated air in the upper region of the lamp casing. Such heated air, of course, is deflected by the cap member 38 and passes from said lamp casing at the ends of the latter. However, the provision of the ribs 77 facilitates and increases the rate at which heat is transferred from the lamp casing. This, of course, is important because the lamp 25 necessarily is of rather high rating with consequent

inevitable output of a large amount of heat energy.

As hereinbefore described, the lens 43 may readily be released from the position shown upon retraction of the screws 45. Furthermore, said lens 43 may readily be removed from the casing 39 after the plate 47 has been elevated or after it has been removed from said casing.

The plate 47 forming the front wall of casing 39 constitutes a significant and important part of my invention. Said plate 47, preferably and usually, is cast from molten metallic material and has heat radiating rib structure at both sides of the lower portion thereof, the upper portion carrying the mirror 60 and the lens 54. Said plate 47, preferably, also comprises holes or openings 73 facilitating dissipation of heat from the mirror 60 and other holes or openings 74 facilitating dissipation of heat from the lens 54. The outer side of plate 47 is exposed to the atmosphere while the inner surface thereof is swept by a column of air passing into the casing 39 through the opening 70 and rising upwardly therein. Accordingly, in accordance with my invention, the temperature of the plate 47 ordinarily does not become excessive; consequently, little deformation thereof results and it can be handled without burning the operator. It follows, therefore, that the mirror 60 and lens 54 are maintained in fixed relationship with respect to each other and with respect to the other elements of the optical system with which they cooperate respectively; moreover, by the disclosed construction they are maintained relatively cool and, therefore, are not subjected to breakage and deterioration on account of excessive heat.

The provisions for heat radiation and air circulation, in the apparatus as a whole, result in longer life for all the glass parts and for the reflecting surfaces of the mirrors. Under excessive temperatures, the glass may fracture and the reflecting material on the mirrors may become tarnished and inefficient. This construction besides providing for comparative coolness, also makes possible the use of a lamp of much lower power rating than is the case with other projectors.

As hereinbefore stated, the mirror 60 is disposed at an angle of substantially 45 degrees with respect to the light beam passing thereto from the lens 43 and, accordingly, said mirror 60 functions to pass said light beam upwardly substantially in a vertical direction. Said reflected light beam, after passage through the lens 54, should coact with the objective lens 101 at the center thereof. However, if for any reason, this condition should not prevail, the screws 65 may be bodily shifted, while preserving the aforesaid angular relation to bring the reflected light beam to the center of the objective lens 101.

In order to bring the objective lens 101 approximately to its focusing position, the wing nut 94 may be loosened to adjust the bracket 89 either upwardly or downwardly as the case may be. After this approximate adjustment is obtained, said wing nut 94 may be tightened and the nut 99 suitably manipulated to bring said lens 101 to substantially its exact focusing position. As hereinbefore described, the last named action may readily be effected upon slight retraction of said nut 99 with subsequent bodily movement of screw 97 in slot 95b.

As hereinbefore described, the casing-forming member 33 and its cap member are formed of sheet metal. As well, they may be cast from

molten material, such an arrangement being illustrated in Figs. 12, 13, 14 and 15 where there is shown an arc-shaped casing-forming member 110 and an associated cap member. In the example shown, member 110 is cast from molten metallic material and the exterior surface thereof, preferably, is corrugated or provided with heat-radiating rib structure, the interior surface thereof, being coated either with light-diffusing material or with heat-absorbing material, such as lamp black. In accordance with this phase of my invention, the member 110 may be provided with spaced longitudinal ribs 110a and spaced transverse ribs 110b, all of said ribs being formed integrally therewith, preferably, by the casting operation.

As illustrated particularly in Figs. 12 and 13, the exterior surface of member 110, outwardly of the rib structure, may carry a screen 111 utilizable for the more efficient dissemination of heat and for protection against injury from contact. When screen 111 is to be provided, lugs 110c may be formed on said exterior surface of member 110 during the casting operation and, after said lugs 110c are drilled and threaded, screws 111a may be utilized for positively retaining screen 111 in position.

By coating the interior surface of casing-forming member 110 with light-diffusing material, a maximum amount of light is delivered through the lens system. However, as stated above, said interior surface may be coated with heat-absorbing material in which case, the screen 111, ordinarily, may be omitted. The same condition prevails with the hereinbefore described casing-forming member 33 which may be coated either with light-diffusing or light-absorbing material, as desired.

The member 110, in the example shown, is adapted to be detachably associated with the flanges 20b of standard 20 in which case the heretofore described screws 34 may be omitted. In lieu of the latter, the aforesaid flanges 20b may be suitably provided on their inner surfaces with vertical slots or passages facing each other and transversely aligned, Fig. 13. Slidably received, respectively, by said last named slots are members 112 formed integrally with the casing-forming member 110 or, and preferably, said members 112 are metallic strips suitably secured, as by screws 113, to enlarged sections 110d of member 110. To associate the member 110 with the flanges 20b, it is positioned thereabove with the members 112 aligned with the respective slots adapted to receive the same. Thereupon, said member 110 is moved downwardly into its casing-forming position about the lamp 25, downward movement of member 110 being limited by a flange or the like projecting from standard 20.

Detachably carried by the casing-forming member 110 is a cap member 114 of channel-forming configuration, in the example shown, and positioned in inverted relation. In the form of my invention disclosed in Figs. 12 through 15, cap member 114 is cast from molten material and, preferably, has heat radiating rib structure 114a formed integrally therewith and projecting from the outer surface thereof. Cap member 114 is separately formed from member 110 primarily to facilitate the casting operation.

Any suitable arrangement may be provided for detachably associating the cap member 114 with the casing-forming member 110. In the example shown, there is thus utilized a plurality of lugs or extensions 114b preferably formed in-

tegrally with the member 114. The lugs 114b are disposed in suitable spaced relation and are preferably so arranged as to snugly engage the inner upper surface of member 110 to which said lugs are detachably secured in any suitable manner, as by screws 115, one screw passing through each lug 115 and being threaded to the member 110.

For manually manipulating the cap member 114 and member 110 as a unit particularly when hot, said cap member 114, during the casting operation, may be provided, on opposite sides thereof, with flanges or ledges 114c to each of which a plate or member 116 is suitably secured, as by rivets or screws 117. The members 116, preferably, are formed of a phenol condensation product, fibre, or the like, and they may be grasped and the casing 110 and cap member 114 detached as a unit from the standard 20.

As stated, the cap member 114 is of channel-forming configuration and it is open at its ends to permit passage of heated air from within the lamp casing. To prevent any substantial amount of light from escaping through the aforesaid open ends of the cap member 114, it is desirable that baffles 118 formed of suitable light-opaque material be disposed in cap member 114 adjacent the respective open ends thereof. As illustrated, said baffles 118 are secured to the cap member 114 by screws or rivets 119 and said baffles converge toward each other. They are so shaped as to permit heated air to pass outwardly therearound while preventing the passage of any substantial amount of light outwardly from the lamp casing through the ends of the cap member 114.

Referring to Figs. 16, 17, 18 and 19, there is illustrated another arrangement for detachably retaining the lens 43 in position within the casing 39. As shown in Figs. 16 and 17, the lower lugs 44 for lens 43 are omitted and, in lieu thereof, there is utilized a support or cradle 120 preferably formed of metallic material, as aluminum, and receiving the lower part of said lens 43. Cradle 120 comprises a front wall 121 and a strap-like rear wall 122, said walls conforming in configuration with the surfaces of lens 43 with which they engage respectively, and said walls being suitably secured together, as by screws 123. Suitably secured, as by screws 124, to the front cradle wall 121 is an arc-shaped member 125 of suitable cushioning material, as asbestos composition forming a seat for the lower peripheral edge of lens 43, or lens 43 may be seated at its periphery directly upon the metallic saddle front wall 121 without cushioning.

Adjacent opposite ends thereof, the front cradle wall 120 carries sleeves 126, 126 disposed in parallel relation and provided at each end thereof with openings of dissimilar sizes. Sleeves 126 may be formed integrally with front cradle wall 121 or separately therefrom if desired.

Secured to the inner surface of the top wall of casing 39 is a resilient member, as a leaf spring 127, having an enlarged end 127a for direct engagement with the upper surface of lens 43.

Carried by the respective sections 128 formed at the rear of casing 39 preferably integral therewith are rods 129, 129 coactable with the sleeves 126, 126. Each rod 129 comprises a hub 129a of enlarged diameter and a slotted end 129b, the latter being spreadable to provide close-fitting engagement between rods 129 and sleeves 126.

Plate 47, forming the front wall of casing 39, is provided with lugs 130, 130 facing the rods 129, 129.

With the parts positioned as illustrated in Figs. 16 through 19, the lens 43 is retained in its normal or operative position by the cradle 120 and spring 127. If, for any reason, it is desired to remove the lens 43, the screws 69 are retracted to permit swinging movement of the levers 67. Thereupon, the plate 47 is moved to substantially horizontal position or detached from the casing 39, the lugs 130 thereof being thereby removed from engagement with the sleeves 126. The sleeves 126, cradle 120 and lens 43 may now be moved from left to right, Fig. 19, until the ends of each sleeve clear the respective hubs 129a and slotted ends 129b of each rod 129. At this time, the sleeves 126, cradle 120 and lens 43 may be lowered slightly to disengage the upper part of said lens 43 from the spring 127, whereupon the entire assembly may readily be removed from casing 39.

To reassemble the parts, an operation substantially the reverse of that described above is performed. In so doing, the plate 47 is either detached or held in substantially horizontal position. Thereupon, the lens 43, cradle 120 and sleeves 126 are passed interiorly of casing 39, the sleeves 126 passing around the respective rods 129. When the ends of the sleeves 126 engage the respective hubs 129a, the entire assembly is elevated, the spring 127 being flexed by lens 43 until the sleeves 126, at their respective rear ends are passed over the hubs 129a and at their respective front ends are passed over the slotted ends 129b of rods 129. In so doing, the spring 127 rides over the edge of lens 43 and snaps into place just as the entire assembly is moved from right to left, Fig. 19, into the position shown. The plate 47 may now be restored to the position illustrated on the drawings wherein the lugs 130 are shown as coacting with the respective sets of sleeves 126 and rods 129 to positively retain the lens assembly in its desired and proper position.

If, for any reason, the parts have not been properly positioned in assembled relation, the sleeves 126, by coaction with the respective lugs 130 of plate 47, prevent movement of the latter to such position that the latching mechanism comprising the levers 67 may be brought to latching position. Accordingly, the arrangement is such with the form of my invention disclosed in Figs. 16 through 19, that the plate 47, or equivalent, may not be brought to its operative position unless the lens 43 has previously been placed in its correct position.

Obviously, when the parts are disassembled as described above, the lens 43 may readily be removed from the cradle 120 since the latter is substantially a socket loosely receiving the lens 43.

Particularly with the construction illustrated in Figs. 16 through 19, it is desirable that the lower wall of casing 39 be provided with a passage 131 traversed by cooling air which passes upwardly by the cradle 120 and lens 43 to remove heat therefrom. Preferably, the front wall 121 of the cradle is cut away as indicated at 121a, Fig. 17 in order to reduce the area of contact with the lens 43. This is desirable because the cradle 121 radiates heat faster than does the lens 43 and, especially after the lamp 25 is deenergized, the dissimilar rates of heat radiation are apt to cause surface fracture of the lens 43 if the aforesaid cut away portion 121a is not provided.

Referring to Figs. 20 and 21, there is illustrated another arrangement for detachably retaining a light-reflecting member 29 on its supporting member 26. As shown, member 26, as with the

construction heretofore described, is provided with an opening of substantial size for the reception of the light-reflecting member 29. Secured in fixed relation to the member 26 is a member 132 having an upstanding part 132a forming with the adjacent surface of member 26 a channel for the reception of the lower part of the light-reflecting member 29. Detachably secured to the member 26, opposite the member 132 is a member 123 having a depending part 133a forming with the adjacent surface of member 26 a channel for the reception of the upper part of the light-reflecting member 29. Member 133 may be detachably secured to the member 26 in any suitable manner. In the example shown, a plurality of posts 134 upstanding from the member 26 are slotted to provide resilient sections, those of each post 134 being received, respectively, by passages 133b formed in the member 133 which, when in the position illustrated in Fig. 20, cooperates with the member 132 and a spring 135 carried by member 26 to retain the light-reflecting member 29 stationary in its desired position. Obviously, the member 133 may readily be detached from the member 26 and the posts 134 to permit removal of the light-reflecting member 29. In as simple a manner, the light-reflecting member 29 may be reassociated with the member 26.

As hereinbefore described, various parts or pieces of the mechanism are preferably cast from molten material. The latter may be of any suitable character but, ordinarily, it is desirable that an aluminum alloy be thus utilized.

While the invention has been described with respect to certain particular preferred examples which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting standard, a casing at one side of said standard, and a source of light in said casing, said standard comprising heat radiating rib structure adjacent the top of said casing for abstracting heat therefrom.

2. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting member, a source of light carried by said supporting member, plate structure carried by said supporting member, a light-reflecting member carried by said plate structure, a non-resilient member movable with respect to said plate structure for detaching said light-reflecting member therefrom, and means for detachably retaining said movable member to said plate structure.

3. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting member, a source of light, a plate carried by said supporting member, a light-reflecting member carried by said plate, and means for detachably retaining said light-reflecting member on said plate, said means comprising a member carried by said plate and having a section engaging said light-reflecting member and a post slotted to provide resilient sections for detachably retaining said last named member on said plate.

4. Apparatus for generating and projecting a

light beam, said apparatus comprising a supporting member, a casing carried by said member, a lens in said casing, and means for detachably supporting said lens in said casing, said means comprising a cradle receiving a part of said lens, a rod carried by said casing, and a sleeve carried by said cradle and receiving said rod.

5. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting member, a casing carried thereby, a lens in said casing, a light-reflecting member, a second lens, said light-reflecting member and said second lens being carried by a detachable wall of said casing, a second casing spaced from said first named casing, and a source of light in said second casing for directing a beam of light to said light-reflecting member and the lenses.

6. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting member, a casing carried thereby, lens structure in said casing, and a source of light adjacent thereto for passing a beam of light into coacting relation with said lens structure, said casing comprising a pivoted wall which when closed partially defines an opening traversed by cooling air.

7. Apparatus for generating and projecting a light beam, said apparatus comprising a source of light, an objective lens in the path of a beam of light emanating from said source of light, and means for supporting said objective lens, said means comprising a supporting bracket, a sleeve carried thereby and directly engaging a rim on the casing of said objective lens, and means for adjusting said sleeve axially of said bracket.

8. Apparatus for generating and projecting a light beam, said apparatus comprising a source of light, an objective lens in the path of a beam of light emanating from said source of light, and means for supporting said objective lens and for adjusting it along said path, said means comprising a supporting bracket terminating in a ring-shaped member, a sleeve in said ring-shaped member, said sleeve directly engaging a rim on the casing of said objective lens, and means for moving said sleeve with respect to said ring-shaped member, said last named means comprising an arcuate inclined slot in said ring-shaped member and a threaded member extending therethrough from said sleeve.

9. Apparatus for generating and projecting a light beam, said apparatus comprising a standard, a lamp housing at one side of said standard, a lens housing at the other side of said standard, a source of light in said lamp housing, said standard having an opening traversed by a light beam passing from one housing to the other, and an objective lens carried by said standard independently of said lens housing, said standard and said housings being cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said source of light.

10. In a projecting device, an assembly comprising a standard, a lamp housing and a lens housing, an extending member secured to said assembly above said standard, and tape-pulling mechanism carried by said member, said mechanism pulling tape across the axis of the beam of light emanating from said lamp housing, said standard forming the support for said extending member and the mechanism carried thereby.

11. Apparatus for generating and projecting a light beam, said apparatus comprising a lamp housing and a lens housing disposed in side-by-

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side relation and having a light passage between them, a source of light in said lamp housing, a condenser lens in said lens housing, said condenser lens being removable from said lens housing when one wall thereof is moved to housing-opening position, and a second condenser lens carried by said wall.

12. Apparatus for generating and projecting a light beam, said apparatus comprising a lamp housing and a lens housing disposed in side-by-side relation and having a light passage between them, a source of light in said lamp housing, a plurality of condenser lenses and a mirror in said lens housing, one of said condenser lenses and said mirror being horizontally aligned and another of said condenser lenses and said mirror being vertically aligned, said lens housing having a wall which when moved to housing-opening position permits removal of one of said condenser lenses therefrom.

13. Apparatus for generating and projecting a light beam, said apparatus comprising a lamp housing and a lens housing disposed in side-by-side relation and having a light passage between them, a source of light in said lamp housing, said lens housing having a pivoted wall, a mirror and a condenser lens carried by said pivoted wall, and a second condenser lens in said lens housing and removable therefrom when said pivoted wall is moved to housing-opening position.

14. Apparatus for generating and projecting a light beam, said apparatus comprising a supporting member, a source of light from which the direct light passes along a path, a plurality of plates extending from said supporting member, and light-reflecting members carried, respectively, by said plates, said light-reflecting members being disposed at the same side of said source of light and opposite said path.

15. Apparatus for generating and projecting a light beam, said apparatus comprising a standard having an opening, a lens supported at one side of said opening, a source of light supported at the other side of said opening, a member closing said opening save for a light transmitting passage formed therein, and means forming a passage which defines the picture aperture of said apparatus.

16. Apparatus for generating and projecting a light beam, said apparatus comprising a standard having an opening, a lens supported at one side of said opening, a source of light supported at the other side of said opening, a member closing said opening save for a light transmitting passage formed therein, and means forming a light transmitting channel aligned with said passage and secured to said member.

17. In apparatus for generating and projecting a light beam, a supporting member, a casing carried thereby, a lens in said casing, said casing comprising a wall movable to casing-opening position, a light-reflecting member carried by said movable wall, and a source of light with respect to which said wall is movable, light passing from said source of light to said lens and to said light-reflecting member.

18. In apparatus for generating and projecting a light beam, a supporting member, a casing carried thereby, a lens in said casing, said casing comprising a wall serving as a closure member for one side of said casing and movable to casing-opening position, a second lens carried by said movable wall in non-movable relation with respect thereto, and a source of light with respect to which said wall is movable, light passing

from said source of light to said lenses in succession.

19. In apparatus for generating and projecting a light beam, a supporting member, a casing carried thereby, a lens fixed in said casing, said casing comprising a pivoted wall, a light-reflecting member carried by said pivoted wall and disposed at an angle of substantially 45 degrees with respect thereto, and means whereby said light-reflecting member is adjustable toward or from the wall while preserving the aforesaid angular relation with respect thereto.

20. In apparatus for generating and projecting a light beam, a supporting member, a casing carried thereby, a lens in said casing, a light-reflecting member, a second lens, said light-reflecting member and said second lens being carried by a pivoted wall of said casing, and a source of light with respect to which said pivot wall is movable, light passing from said source of light to said lenses and said light-reflecting member.

21. Apparatus for generating and projecting a light beam, said apparatus comprising a source of light, an objective lens in the path of a beam of light emanating from said source of light, and means for supporting said objective lens and for adjusting it along said path, said means comprising a supporting bracket terminating in a ring-shaped member, a sleeve in said ring-shaped member, said sleeve directly engaging a rim on the casing of said objective lens, and means for moving said sleeve with respect to said ring-shaped member.

22. In apparatus for generating and projecting a light beam, a supporting member, a casing carried by said member, a pivoted wall for said casing, a lens, means for detachably supporting said lens in said casing, said wall engaging a part of said means and being non-closable when said lens is improperly positioned in said casing.

23. In a projecting device, an assembly comprising lamp and lens housings disposed in side-by-side relation, a lamp in said lamp housing, a standard supporting said assembly, said assembly having a member extending above said housings, a bracket on said member, and an objective lens carried by said bracket, said standard and said housings being cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said lamp.

24. In a projecting device, an assembly comprising lamp and lens housings disposed in side-by-side relation, a lamp in said lamp housing, a support for said lamp, a standard supporting said assembly, said assembly having a member extended above said housings, a bracket on said member, and an objective lens carried by said bracket, said support, said standard, said member and said housings being cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said lamp.

25. In a projecting device, an assembly comprising lamp and lens housings disposed in side-by-side relation, a lamp in said lamp housing, a condenser lens in said lens housing, a door for said lens housing, said lens being movable from said lens housing when said door is open, a standard supporting said assembly, a member extending above said housings, a bracket on said member, and an objective lens carried by said bracket, said standard and said housings being

cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said lamp.

26. In a projecting device, an assembly comprising lamp and lens housings disposed in side-by-side relation, a lamp in said lamp housing, a cover for said lamp housing, a condenser lens in said lens housing, a door for said lens housing, a standard supporting said assembly, a member extending above said housings, a bracket on said member, and an objective lens carried by said bracket, said cover, said door, said standard and said housings being cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said lamp.

27. In a projecting device, an assembly comprising lamp and lens housings disposed in side-by-side relation, a lamp in said lamp housing, a condenser lens in said lens housing, said lens housing having lower and upper openings for the admission and discharge of ventilating air, the wall surface of the lens housing having heat-radiating ribs thereon, a standard supporting said assembly, a member extending above said housings, a bracket on said member, and an objective lens carried by said bracket, said standard and said housings being cast material whereby substantial deformation thereof is precluded upon change in temperature thereof under the influence of said lamp.

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