

Nov. 29, 1927.

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1,650,657

IMAGE PROJECTING MACHINE

Filed Nov. 12, 1921

3 Sheets-Sheet 1

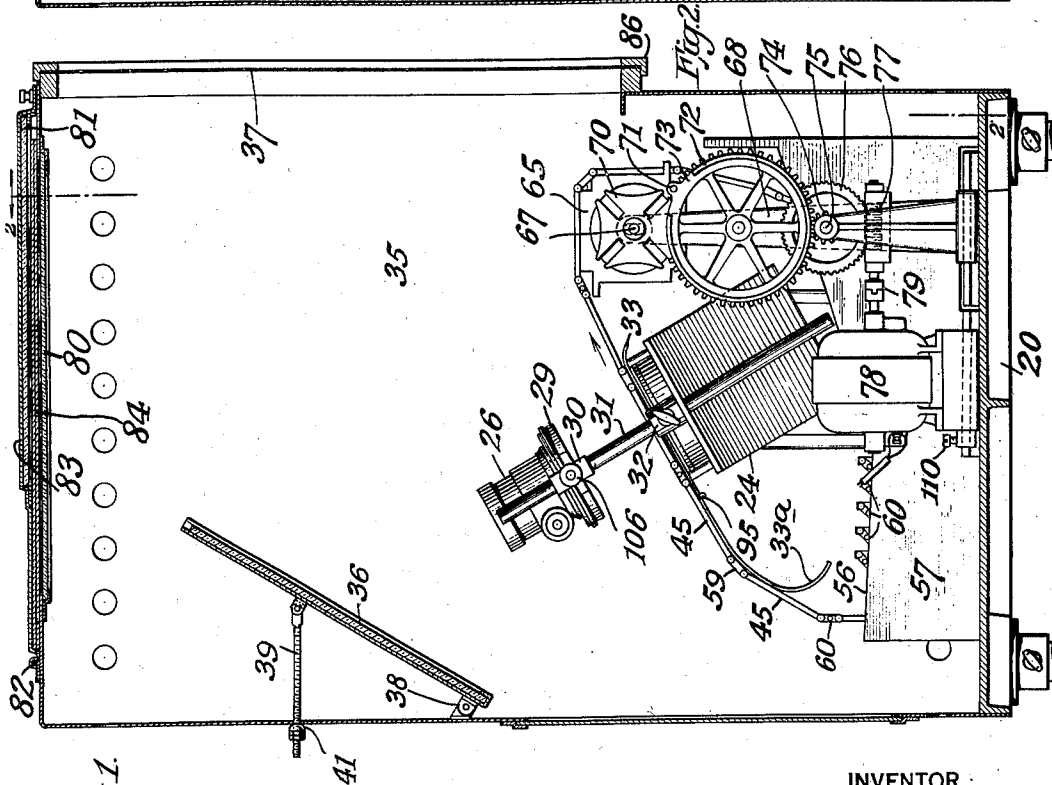
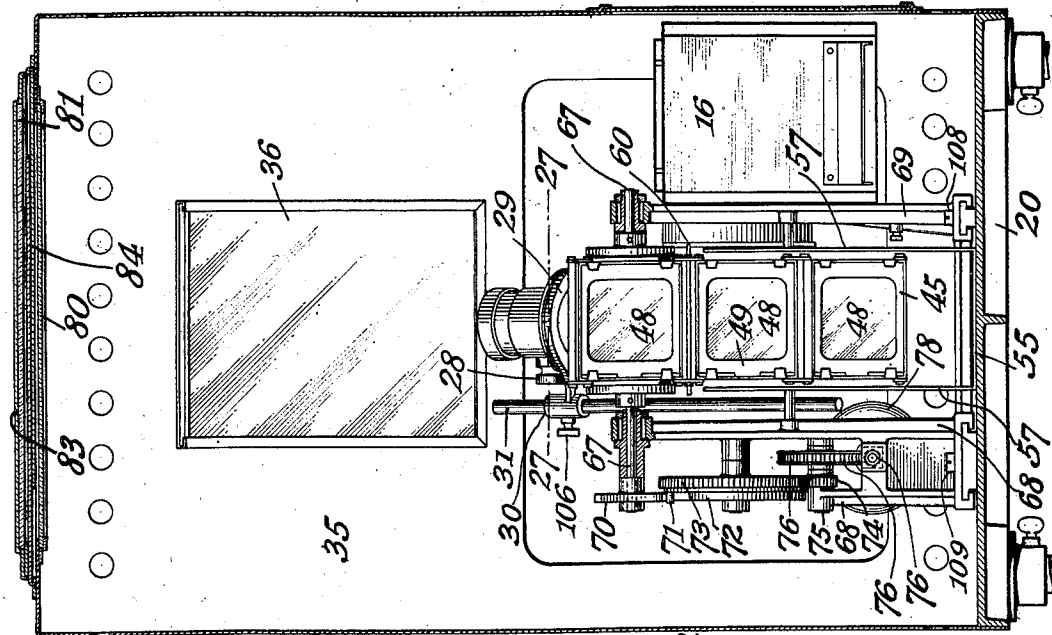


Fig. 1

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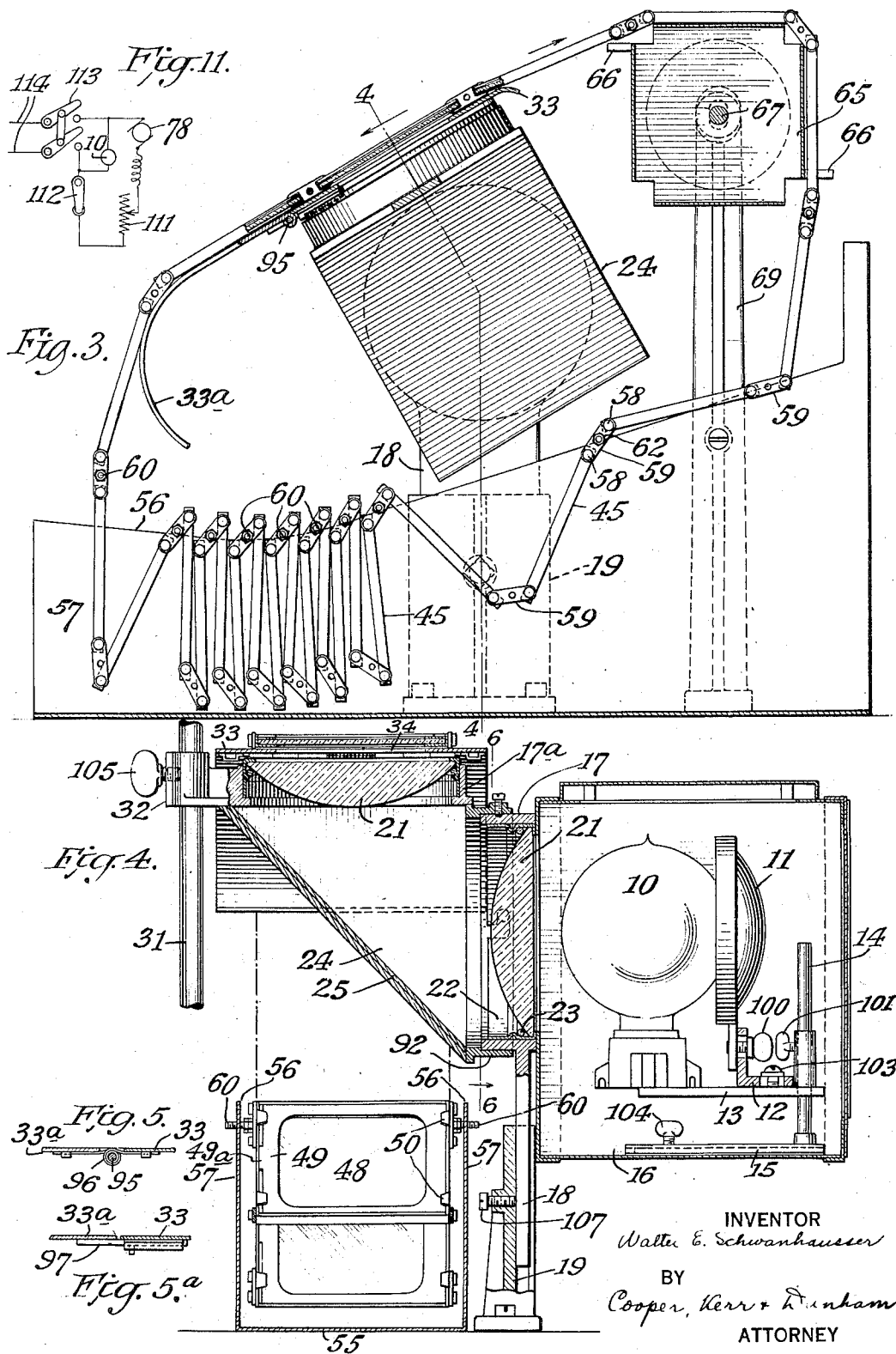
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 6.

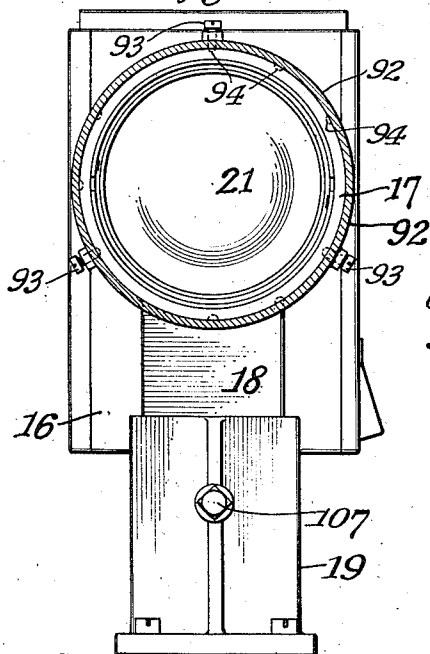


Fig. 7.

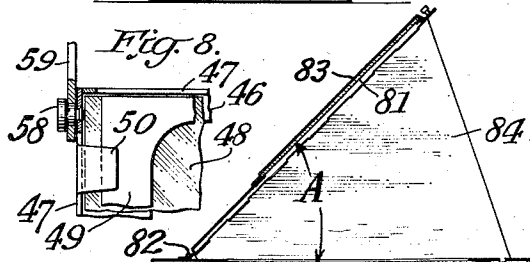
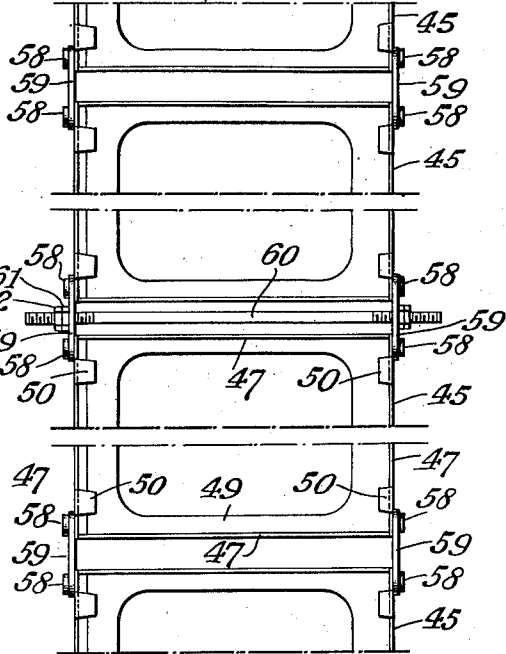


Fig. 9.

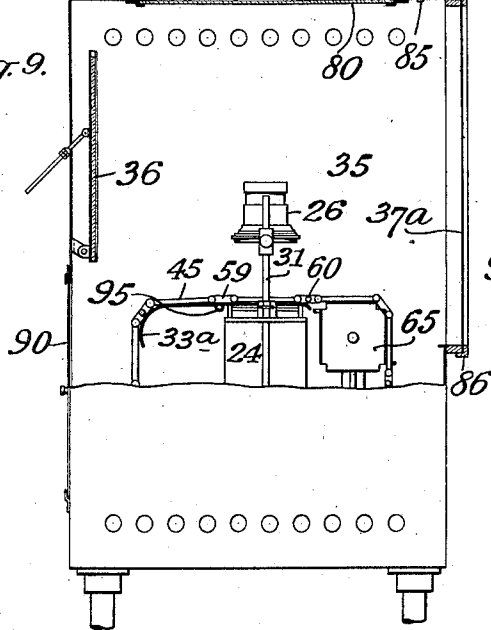
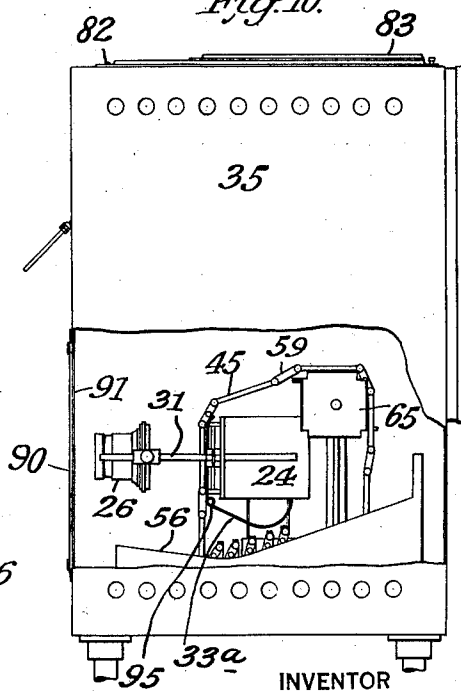


Fig. 10.



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IMAGE-PROJECTING MACHINE.

Application filed November 12, 1921. Serial No. 514,455.

This invention relates to machines for projecting images of objects. More specifically it relates to that class of machines in which the objects, whose images are to be projected, are mechanically and automatically presented to and removed from the field of exposure of the machine.

One of the principal objects of the invention is to provide a machine, of the above mentioned class, which is compact and comparatively simple in construction.

Another object is to provide a machine, of the class mentioned, which may be utilized to project the images in any one of a plurality of directions. Other objects and advantages will appear as the invention is hereinafter disclosed.

Referring to the drawings which illustrate what I now consider a preferred form of the invention,

Fig. 1 is a side elevation, partly in section, of a machine embodying the invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail sectional elevation of certain of the parts shown in Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Figs. 5 and 5^a are detail sections of parts of a guide plate and locking means therefor.

Fig. 6 is a section taken on the line 6—6 of Fig. 4.

Figs. 7 and 8 are detail views of the object holders and their connections.

Figs. 9 and 10 are somewhat diagrammatic elevations partly in section, illustrating the parts shown in Fig. 1, adjusted to different positions.

Fig. 11 is a wiring diagram illustrating one form of connections which may be employed in connection with the machine.

My invention comprises a projector, a plurality of object holders, means for supporting a group of object holders in juxtaposed, face-to-face relationship, and automatic means for successively moving the object holders from one end of the group to exposure position with respect to the projector and for returning them to the other end of said group after exposure has taken place. While the machine may be designed to project images of opaque objects without departing from the general scope of the invention, I have selected for the purpose of

illustration, a machine adapted to be supplied with transparent or translucent objects, such as lantern slides, and to project images of the same. I shall now proceed to describe physical embodiments of the above recited combination of elements.

Various forms of projectors may be employed. For purposes hereinafter appearing, I prefer to employ the one illustrated. This projector comprises a source of light, a condensing system or condenser therefor, and an objective. While other sources of light may be employed, I prefer to use a nitrogen filled, tungsten filament incandescent lamp 10 provided with a spherical reflector 11, said elements 10 and 11 being supported in the lamp house 16. The reflector 11 is mounted for vertical adjustment upon an angle 12, in turn mounted for horizontal adjustment, toward and away from the lamp, upon a bracket 13 upon which the lamp is mounted. The bracket 13 is mounted for vertical adjustment, and pivotal adjustment in a horizontal plane, upon a rod 14 mounted for horizontal adjustment at 15 upon the floor of the lamp house 16. The manipulation of these various adjustments to place and hold the lamp 10 and reflector 11 in the desired position with respect to the condenser system, will be readily understood by those skilled in the art. The lamp house 16 is provided with a short sleeve 17 and is secured to a slide rod 18, slidably mounted for vertical movement in a bracket 19 secured to the base 20 of the machine. One of the lamps 21 of the condensing system is shown detachably mounted within the sleeve 17 by means of a sleeve 22 and clamping ring 23, the sleeve 22 being detachably secured to the sleeve 17 by means of a bayonet joint. The other lens 21 of the condensing system is shown similarly mounted in a sleeve 17^a of a condenser housing 24. It should be noted that the optical axis of the last mentioned lens is in the same plane with, but substantially at right angles to, the optical axis of the lamp 10, reflector 11 and adjacent lens 21. A plane mirror or reflector 25 is mounted in the housing 24 in such position that rays of light passing along or parallel to the axis of the elements 10, 11 and adjacent lens 21 will be reflected in such direction that the reflected rays will pass along or parallel to the optical axis of the other lens 21. A suitable objective 26, embodying

the usual lenses, is mounted, upon a support 29, for pivotal adjustment about an axis 27—27, this adjustment being effected by means of a thumb screw 28. The support 29 is shown provided with a sleeve 30 rotatable and slidable upon a rod 31, in turn slidable in and rotatable with respect to a sleeve 32 secured to the condenser housing 24. The manipulation of these various adjustments to place and hold the objective 26 in the desired position with respect to the condenser system 21 will be readily understood and needs no further description. The housing 24 has secured thereto a plate 33, having a window 34 which forms the exposure field or opening of the projector. In other words, if a lantern slide or similar object be placed at the window 34, an image of the same may be projected upon a suitable screen.

I prefer to enclose the entire machine in a housing 35 which may be provided with a window and screen 37 in one side thereof. The screen 37 is of such material that an image projected thereon from within the housing will be visible from the outside thereof. While the images might be projected upon the screen 37 directly from the objective 26, I prefer to provide an intermediate mirror or reflector 36 adapted to receive the rays of light from the objective 26 and to reflect them upon the screen 37. In this way the effective distance between the objective and screen, and the consequent magnification, is made a maximum for a given sized housing 35. It will be noted that the frame carrying the reflector 36 is pivotally mounted at 38 on one of the side walls of the housing 35 and may be held in various positions of adjustment about said pivotal axis by virtue of a threaded rod 39 which is pivotally connected at one end to the said reflector frame, which extends through a suitable hole in the housing wall and which is provided with adjusting nuts 41. Having described the principal parts of the projector, I shall proceed to describe the object holders.

The object holders being all alike, a detailed description of one will suffice for all. Particular attention is now directed to Figs. 7 and 8. Each holder 45 comprises a plate 46 provided with flanges 47 to form a shallow box-like structure to receive the lantern slides, or other transparencies, 48. Each holder 45 comprises also a plate 49 adapted to be placed over the corresponding slide 48 and to be held in such position by lugs or clips 50 provided on certain of the flanges 47. The preferred configuration of plates 49 is best shown in Fig. 2. By properly bending certain, or all, of the clips 50 the slides may be removed from, inserted into, and held in position in the holders. Each of the plates 46, 49 is provided with a window of the same size as, and in registry with, the

picture upon the corresponding slide or object 48.

As previously stated, means are provided for supporting a group of object holders in juxtaposed, face-to-face relationship. One form of such means is illustrated in the drawings and may be constructed substantially as follows:

An open topped trough 55 is secured to the base 20 of the machine and the upper edges 56 of the opposite side walls 57 of said trough serve as a track. The object holders 45 are connected together to form an endless chain or series. For this purpose each holder 45 is provided with four laterally projecting studs or pivot pins 58, each of such pivot pins of each holder being connected by a corresponding link 59 to an adjacent pivot pin of an adjacent holder. While other arrangements may be adopted without departing from the general scope of the invention, I preferably provide rods 60, one for alternate pairs of links 59. Each of the rods 60 extends through openings intermediate the ends of the corresponding links 59, the laterally projecting opposite ends of said rods being screw-threaded and provided with cooperating adjusting and lock nuts 61 and 62. The design of parts is such that the holders 45 may assume the positions, with respect to track members 56, shown in the drawings, particularly Figs. 3 and 4. It will be noted that the laterally projecting ends of the rods 60 track upon the trackway 56—57 and a group of the holders 45 (see the left hand side of Fig. 3) are supported in juxtaposed, face-to-face (as distinguished from edge-to-edge) compact relationship. I shall now describe what I now consider a preferred form of means for successively moving the object holders from one end of the group to exposure position, with respect to the projector, and for returning them to the other end of said group after exposure has taken place.

As previously stated, the compact or collapsed portion of the chain of holders is supported by the trackway 56. The chain passes thence upwardly over and in engagement with the plate 33, the latter being provided with a curved extension 33^a which guides the chain in such movement. The chain then passes in contact with the periphery of a polygonal drum 65, then down to the trackway 56—56. While the drum 65 may assume other forms, I have shown one of substantially square cross-section, the length of each side of the square being substantially equal to but slightly greater than the length of each holder 45. The corners of the drum are cut away to accommodate the connecting links 59 as clearly shown in Fig. 3. The opposite ends of the drum 65 are each provided with a pair of ears or lugs 66 which lie outside the chain of holders 45,

serving to guide the latter in their movement over the plate 33, and serving also as teeth to engage the chain to aid the drum in propelling the same. The relationship of parts is such that when the drum 65 is in any one of its four positions of rest there will be a slide or object in correct exposure position at the exposure opening 34 of the projector. The drum 65 is secured to a shaft 67 journaled for rotation, and a limited degree of vertical movement, in standards 68, 69 carried by the base 20.

Means are provided for actuating the drum 65 intermittently or step-by-step, a quarter turn at each operation. The particular form of such means illustrated in the drawings comprises a Geneva stop movement driven by an electric motor through a suitable train of gearing. The four-point Geneva wheel 70 is secured to the shaft 67, to which the drum 65 is secured and is operated by the pin 71 and cam 72 both of which are carried by the spur gear 73 journaled for rotation on a stub shaft carried by the standard 68. The gear 73 meshes with and is driven by a pinion 74, secured to a shaft 75 journaled for rotation on the bracket 68. The shaft 75 has also secured thereto a worm gear 76 which meshes with and is adapted to be driven by a worm 77 journaled for rotation upon, but constrained against endwise movement with respect to, the bracket 68. The electric motor 78 is adapted continuously to operate the worm 77, the shafts of the motor and worm being operatively but detachably connected by means of a clutch 79.

Assuming that the chain of holders 45 is charged or loaded with a series of slides or objects to be displayed in series and that the parts occupy the position illustrated in Fig. 1, the machine may be operated as follows: The lamp 10 and motor 78 are energized from any suitable source of E. M. F. The direct rays from the lamp, reinforced by the rays reflected from the reflector 11, pass through the lens 21, are reflected by the mirror 25, pass through the other of the lenses 21, thence through the window 34, through the particular slide or object 48 at that time in exposure position, through the objective 26 upon the reflector 36, from which they pass to the screen 37. Obviously an enlarged image of the object depicted upon the particular slide then exposed will be visible upon the screen. When a predetermined time has elapsed, the length of this interval of time depending upon the speed of the motor 78 and other factors, the pin 71 operates the Geneva wheel 70 through a quarter turn. The drum 65 is operated to the same extent to move the chain of holders 45 in the direction of the arrow (see Fig. 1) a sufficient distance to remove the previously exposed slide 48 from exposure position and to substitute in its place the next succeeding slide 48. The chain then again stops for a predetermined time interval during which time an image of the last mentioned slide is projected upon the screen. This operation continues automatically so long as the motor 78 and lamp 10 are energized.

It will be noted that there is a group of juxtaposed, face-to-face holders 45 at all times upon the trackway 56—56. The holders are moved from one end of this group to exposure position and returned to the other end of the group after exposure. The greater portion of the chain of holders is in collapsed, and therefore compact, position. By virtue of this construction the simple machine illustrated is capable of handling a large number of serial slides without assuming the comparatively large size of other machines heretofore proposed.

If desired, the same machine may be employed to project the images upon a ground glass or other suitable screen 80 provided in the roof of the housing 35 (see Fig. 9). To effect this change the condenser housing 24, and its connected parts, are rotated about the sleeve 17 of the lamp housing 16 to the position shown in Fig. 9, the reflector 36 being moved out of the path of the light rays. The machine may be provided with a reflector 81, preferably so mounted as to form an angle A of 45° with respect to the screen 80, and by virtue of which the images upon the screen may be conveniently viewed by an observer or observers standing to the right of the machine, as shown in Fig. 9. The reflector 81 is shown supported on the inside of a plate or door 83, hinged at 82 to the roof of the housing 35. Two triangular flaps 84 of opaque sheet material of suitable stiffness are each hinged to a corresponding side of the door 83 so as to be movable from a collapsed position folded under the closed door (see Figs. 1 and 2) to a position illustrated in Fig. 9. In the last mentioned position the flaps 84 serve not only as light shields but also as supports for the raised door 83 and reflector 81 carried thereby. In order firmly but detachably to hold the parts in the position shown in Fig. 9, each of the side flaps 84 may be provided at its free edge with a lug 85 adapted to enter a corresponding opening or depression in the top of the housing 35, as shown in Fig. 9. When the screen 37 is not being employed it may readily be removed from the two-part frame 86 and an opaque plate 37^a substituted therefor. Except for changes above noted the operation of the machine, as shown in Fig. 9, is substantially the same as that set forth in connection with Figs. 1 to 8. In either case images of a series of slides 48 are automatically and successively projected upon a screen.

The same machine may be employed to project images upon a comparatively remote screen (not shown). Thus the condenser housing 24 and the elements carried thereby 5 may be rotated about the sleeve 17 from either of the positions illustrated in Fig. 1 and Fig. 9 to the position illustrated in Fig. 10. In this position of parts, the opaque sliding door 90, with which the 10 housing 35 is provided, is removed to permit the light rays which emanate from the objective 26 to pass through the window or opening 91 and thence to a suitable more or less remotely located screen exterior of the 15 housing. When the machine is employed as shown in Fig. 10 or Fig. 1, the door 83 and flaps 84 are collapsed as shown in these two last mentioned figures. Obviously the operation of the machine, in the arrangement 20 shown in Fig. 10, in automatically projecting images of the successive slides 48, is substantially the same as that explained in connection with Figs. 1 to 8.

In order to maintain the necessary operative relationship between the drum 65, the projector and the chain of holders and slides carried thereby, the following expedients may be adopted: The ring or annulus 92, connected to the condenser housing 24, surrounding the sleeve 17, and by virtue of which the condenser housing may be rotated with respect to the lamp housing 16 about the optical axis of the lens 21 and lamp 10, is provided with a plurality of set screws 93. 35 Each of these set screws (three are shown in Fig. 6) is adapted to be screwed into one or another of three depressions or recesses 94 in the periphery of the sleeve 17, there being a total of nine of such recesses shown 40 in this instance. The design and arrangement is such that when the condenser housing 24 is in any of its three positions shown in Figs. 1, 9 and 10, the set screws 93 register with corresponding ones of the apertures 94, whereby the housing 24 may be releasably held in any one of such three positions.

The guide plate 33^a is movable from a position (with respect to the plate 33) shown 50 in Fig. 1 or Fig. 9 to a position illustrated in Fig. 10, and vice versa. The plate 33^a is hinged at 95 on the plate 33 and a coiled spring 96 (see Fig. 5) surrounding the pivot 95 and connected at its opposite ends to said 55 plates 33, 33^a serves to bias the latter to the position shown in Fig. 10. A bolt 97, slidably mounted upon the plate 33, is movable from a position shown in Fig. 5^a in which it holds the plate 33^a in the position 60 shown against the action of the spring 96, to a release position in which the plate 33^a is free to move under the impelling action of the spring.

As previously stated, the lamp house 16, 65 and the parts supported thereby, are verti-

cally adjustable at 18, 19. The standards 68, 69 are horizontally adjustable toward and away from the condenser housing by virtue of the construction clearly shown in Figs. 1 and 2. Similarly the motor 78 is horizontally adjustable toward and away from 70 the standards 68, 69. The operation of the various set screws 100, 101, 103, 104, 105, 106, 107, 108, 109, 110, etc., releasably to hold the various parts in adjusted positions, 75 will be readily understood by those skilled in the art, and needs no detailed description.

Various forms of electrical connections may be employed to energize and control energization of the motor 78 and lamp 10. One 80 suitable form is illustrated in Fig. 11 in which the motor 78 is shown as a series motor connected in series with a rheostat or variable resistance 111 and a switch 112 across the d. p. s. t. switch 113. The other 85 side of the switch 113 is shown connected to line wires 114, supplied with E. M. F. from any suitable source (not shown). The lamp 10 is also shown connected across the switch 90 113. To start the machine the switches 112 and 113 are closed thereby energizing the lamp and motor. If it is desired to stop the motor 78 for the purpose of adjusting the optical elements or to maintain any desired 95 slide exposed, this may be effected by opening the switch 112. By virtue of the rheostat 111 the speed of the motor and consequently the time of exposure of each slide may be controlled within limits. To stop 100 the machine both switches 112 and 113 are opened.

The construction, manipulation and operation of my invention will be apparent to those skilled in the art in view of the foregoing disclosure. It will be appreciated that 105 I have devised a machine which is in effect three machines. By suitably adjusting the parts the machine may be employed as shown in any one of Figs. 1 or 9 or 10, and in each case the same instrumentalities are 110 employed automatically to project images of a succession of slides or objects 48.

In describing the operations of removing a slide from its holder or inserting a slide 115 into its holder, it was stated that these operations may be performed by bending the clips 50. However, a preferred method of accomplishing these results is as follows: Suppose it is desired to remove a slide 120 from its holder 45 (see Fig. 4). The projecting portion 49^a of the plate 49 is raised by a knife blade or other suitable tool, until it is clear of the adjacent flange 47. The plate 49 may then be slid to the left until 125 the right hand edge of the plate is freed from the right hand pair of clips 50. The right hand end of the plate 49 may then be raised and the plate moved to the right until it is freed from the left hand pair of 130 clips 50. The plate 49 is thus freed from

all four of its retaining clips and may be removed. Each slide 48 is preferably of such width that, when slid to the left in its holder, its right hand end will be clear of the right hand pair of clips 50, and the slide may then be raised (at its right hand edge) and slid to the right to be freed from the left hand pair of clips 50. The operation of inserting a slide 48 and its plate 49 into an empty holder will be understood in view of the foregoing description.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus, which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combinations and relations described, some of these may be altered and others omitted without interfering with the more general results outlined and the invention extends to such use.

What I claim is:

1. In a machine for automatically projecting images of a series of slides, in combination, a magazine for a series of slides, intermittently operating means for moving each foremost slide from said magazine to exposure position and thence delivering it to the rear of said magazine, an objective located exteriorly of the path of movement of said slides, a reflector around which said slides travel in their cyclic movement, and adapted to receive rays of light and reflect them through the exposure position and thence through said objective, a lamp located to one side of the path of movement of said slides for supplying light rays to said reflector, and means whereby said reflector and objective may be adjusted about an axis substantially at right angles to the optical axis of said objective to project images in any desired one of a plurality of directions.

2. In a machine for automatically projecting images of a series of objects in any one of a plurality of directions, in combination, a projector comprising an objective, a support for said projector, means whereby said objective may be adjusted, with respect to said support, from an operative position in which its optical axis occupies a predetermined position to an operative position in which its optical axis is at an angle not less

than a right angle to said first named position, a plurality of object holders, and power-actuated means for intermittently moving said object holders serially across the field of exposure of said projector.

3. The combination with a projector, comprising a lamp housing, a source of light and condensing means therefor supported by said lamp housing, of a condenser housing connected to said lamp housing and rotatable with respect thereto about the optical axis of said first named condensing means, a reflector and lens so supported by said condenser housing that an incident ray passing along the optical axis of said first named condensing means will be reflected by said reflector along the optical axis of said lens, and an objective carried by said condenser housing, of power-actuated means for intermittently moving object holders serially across the field of exposure of said projector.

4. In combination, a housing having an opening in one of its walls and an opening in another of its walls, a translucent screen for at least one of said openings, an image-projecting machine mounted in said housing and having an objective adjustable with respect to said housing from an operative position in which it is directed toward one of said openings to an operative position in which it is directed toward the other opening, a plurality of object holders, and power-actuated means for intermittently moving said object holders serially across the field of exposure of said image-projecting machine.

5. In a machine for automatically projecting images of a series of objects, in combination, a chain of object holders, means for supporting a portion of said chain in collapsed position, means for intermittently moving said chain through an exposure position, an objective located exteriorly of said chain, a reflector surrounded by said chain and adapted to receive rays of light and reflect them through the exposure position and thence through said objective, a lamp located to one side of the path of movement of said chain for supplying light rays to said reflector, and means whereby said reflector and objective may be adjusted about an axis substantially at right angles to the optical axis of said objective to project images in any desired one of a plurality of directions.

In testimony whereof I hereto affix my signature.

WALTER E. SCHWANHAUSSER.