

Oct. 23, 1934.

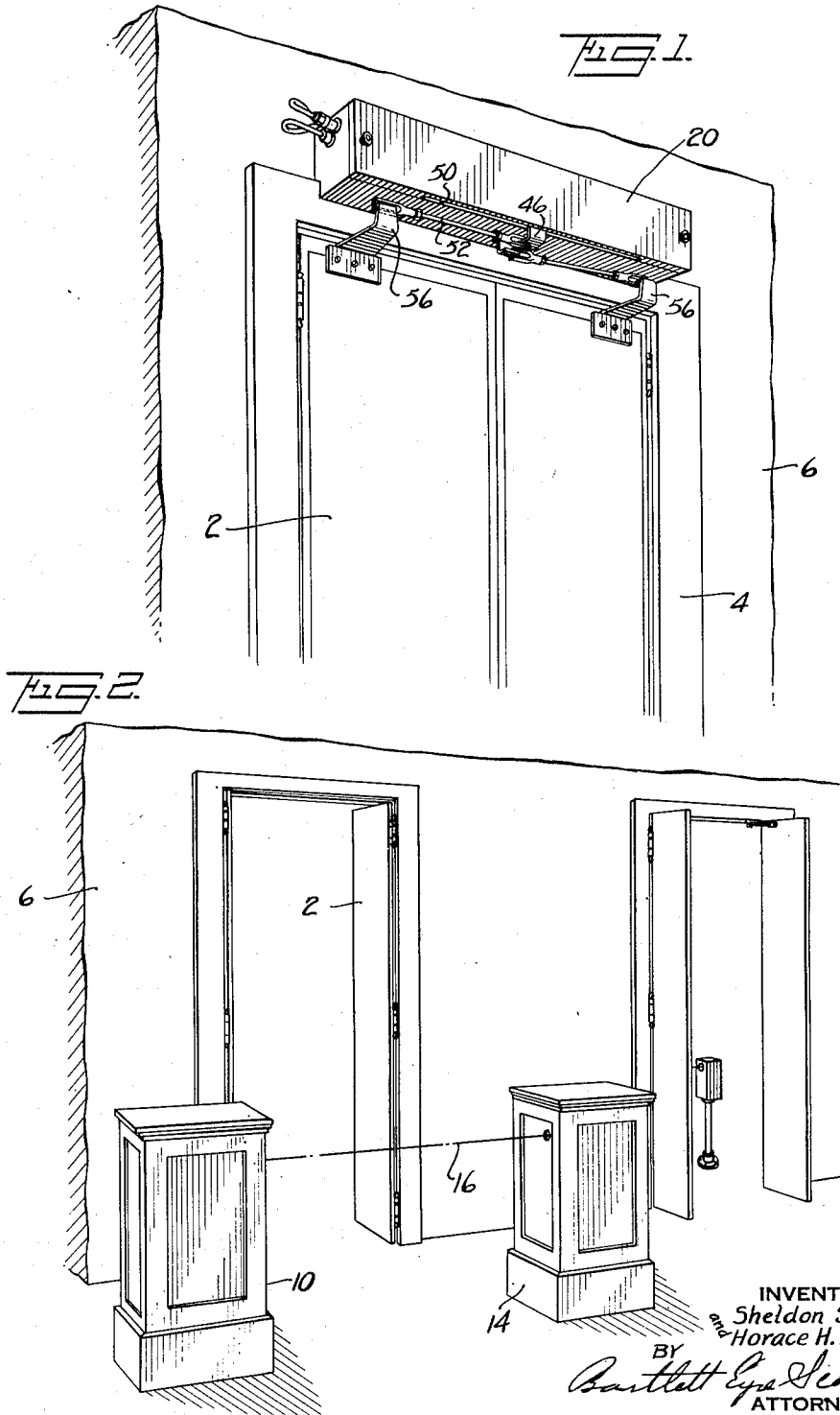
S. S. ROBY ET AL

1,978,093

APPARATUS FOR OPERATING DOORS

Filed Nov. 23, 1931

6 Sheets-Sheet 1



INVENTORS
Sheldon S. Roby
and
Horace H. Raymond
BY
Bartlett Egan Scott Keel
ATTORNEYS

Oct. 23, 1934.

S. S. ROBY ET AL

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6 Sheets-Sheet 2

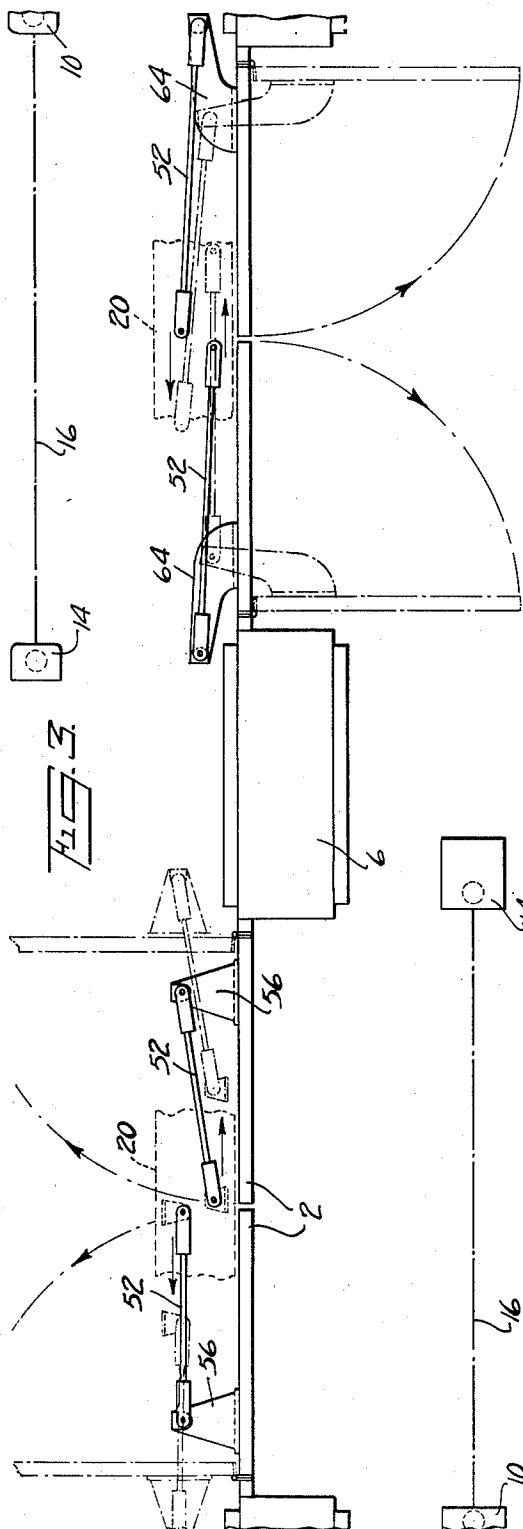


FIG. 3

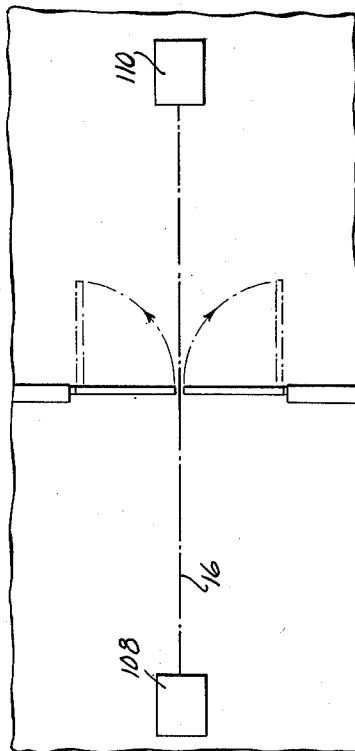


FIG. 13

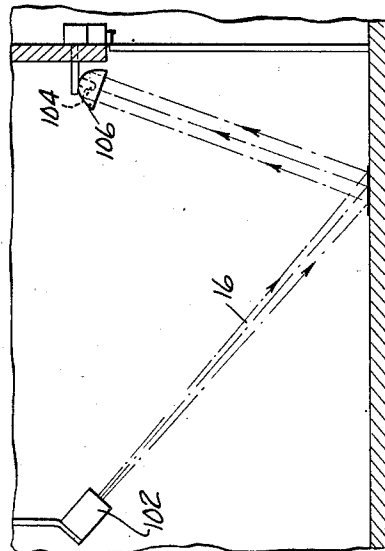


FIG. 12

INVENTORS
Sheldon S. Roby
and
Horace H. Raymond
BY
Carroll E. Smith & Co.
ATTORNEYS

Oct. 23, 1934.

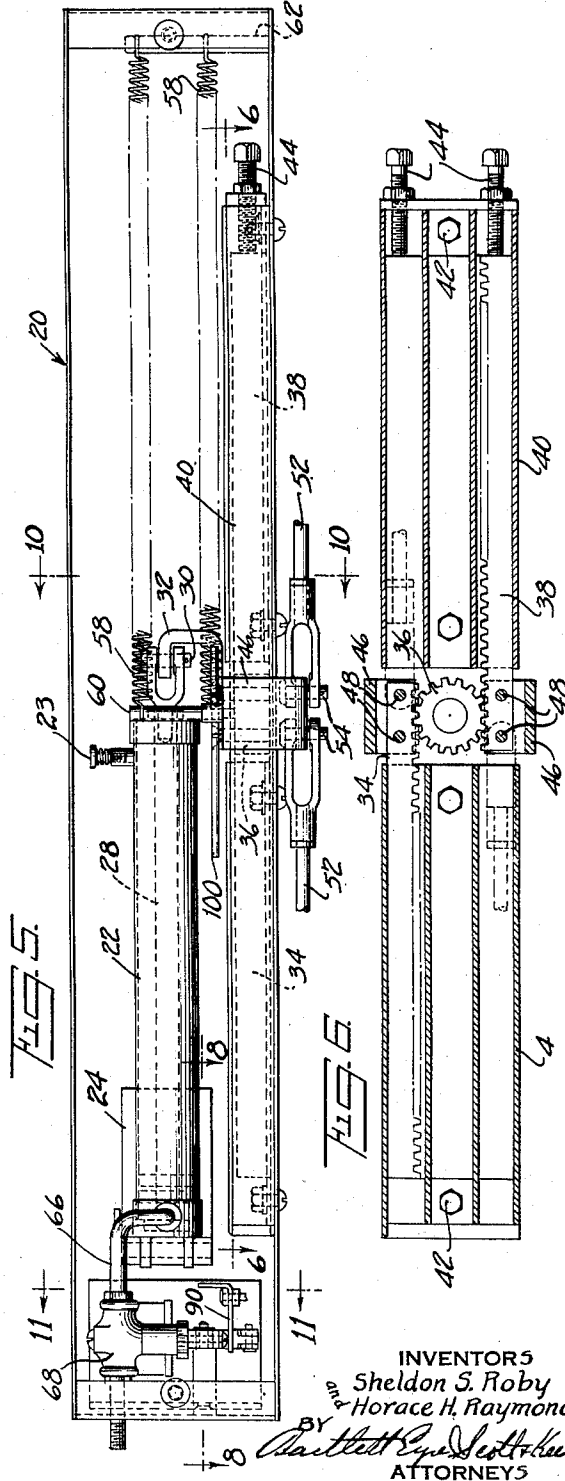
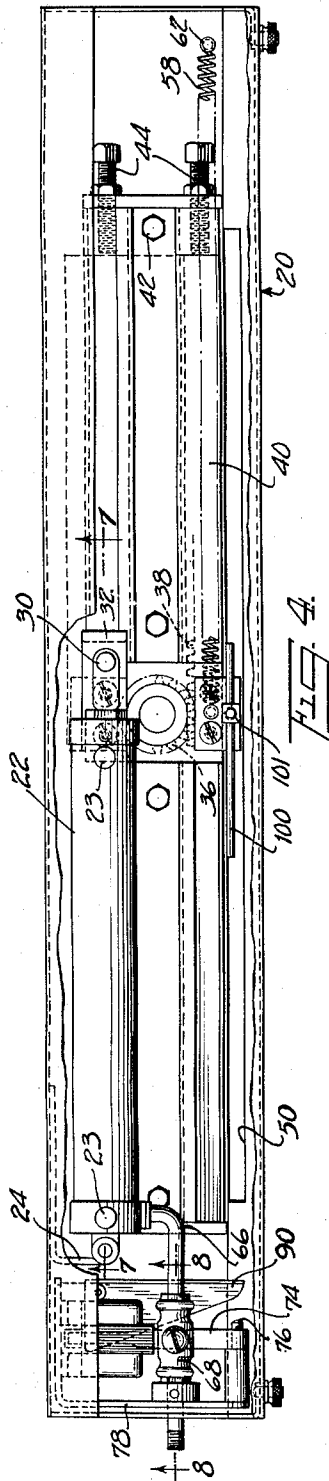
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1,978,093

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6 Sheets-Sheet 3



INVENTORS
Sheldon S. Roby
Horace H. Raymond
BY
Charles E. Scott & Co.,
ATTORNEYS

Oct. 23, 1934.

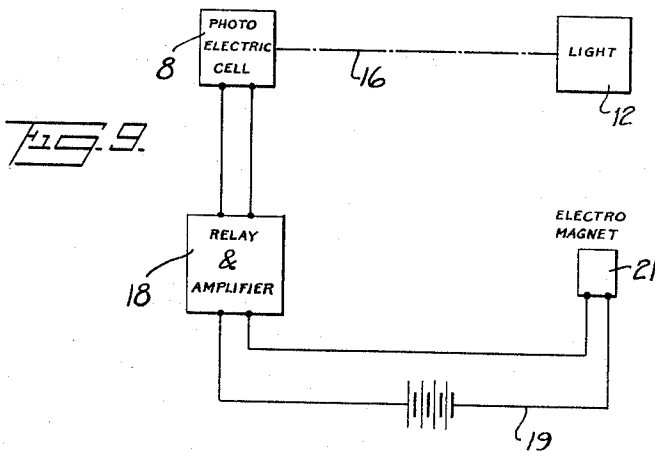
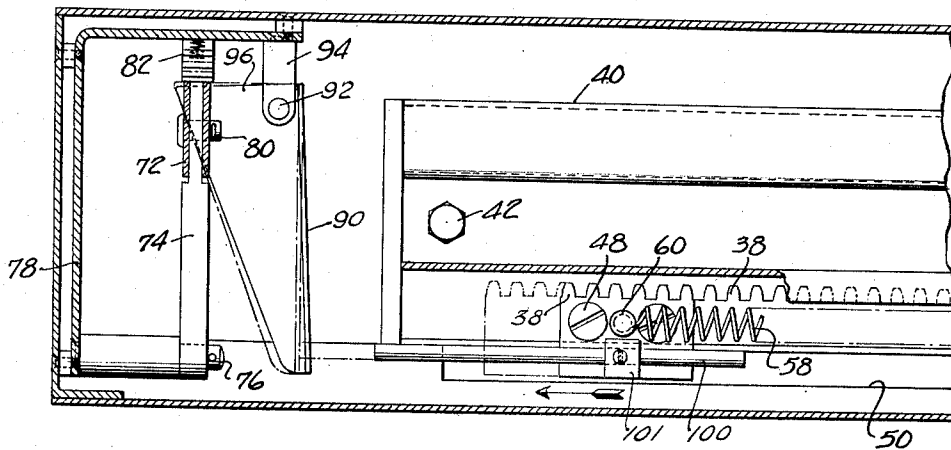
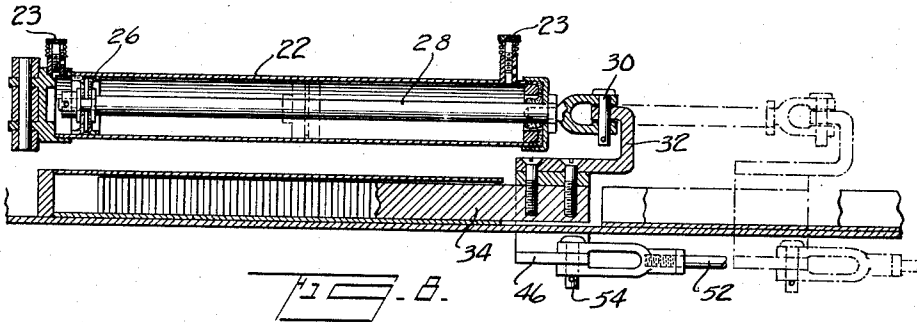
S. S. ROBY ET AL

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APPARATUS FOR OPERATING DOORS

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INVENTORS
Sheldon S. Roby
Horace H. Raymond
BY
Bartlett Egan Scott & Keel
ATTORNEYS

Oct. 23, 1934.

S. S. ROBY ET AL
APPARATUS FOR OPERATING DOORS

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FIG. 10.

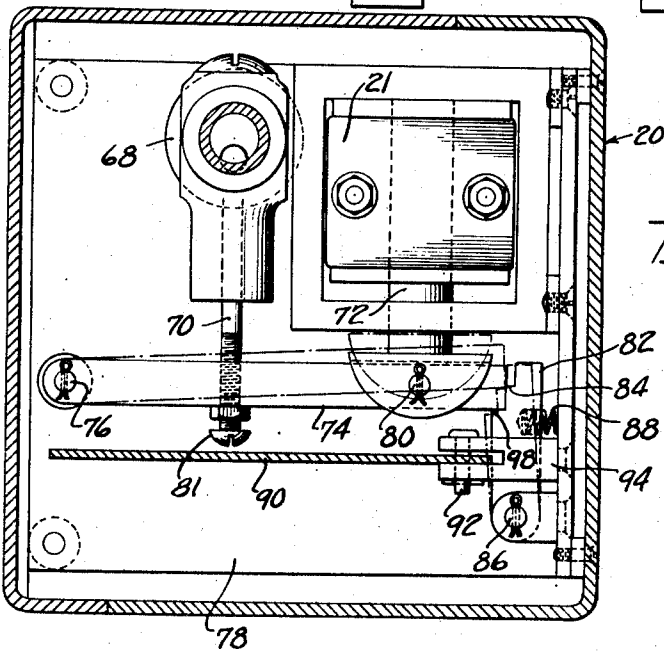
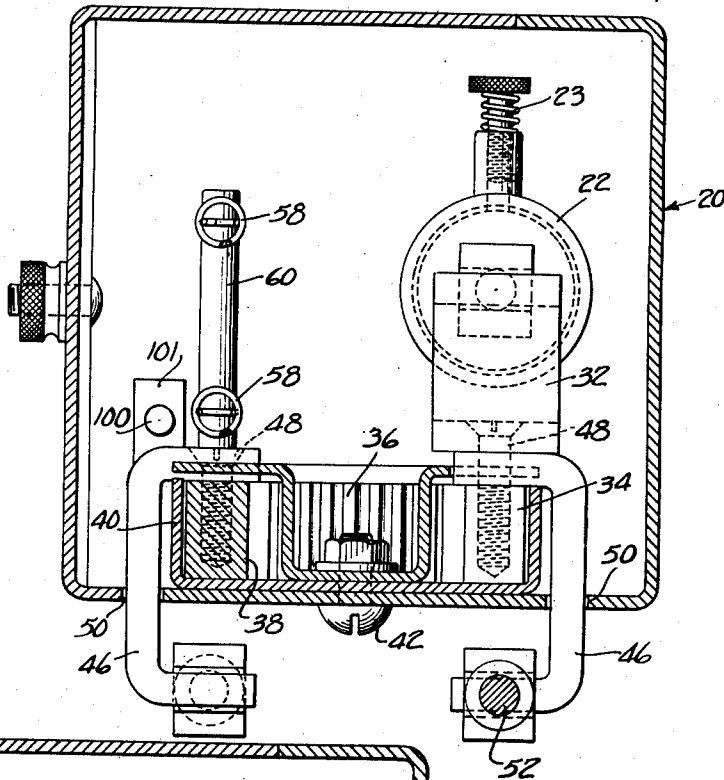


FIG. 11.

INVENTORS
Sheldon S. Roby
Horace H. Raymond
BY *Carroll E. Kottick*
ATTORNEYS

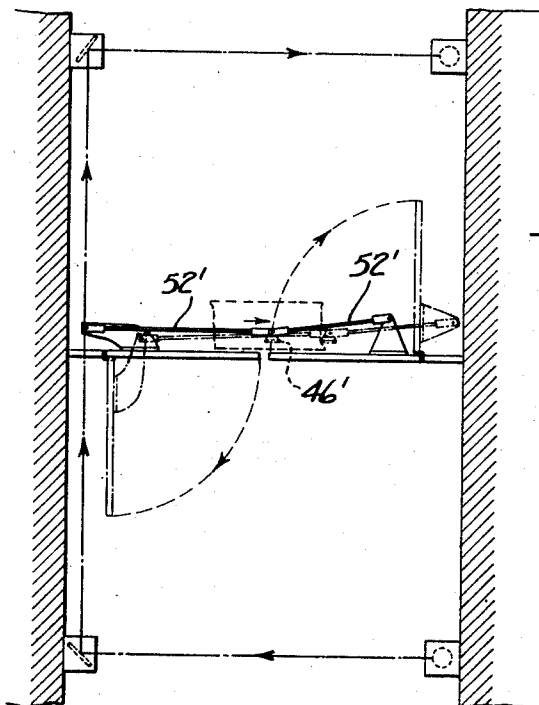
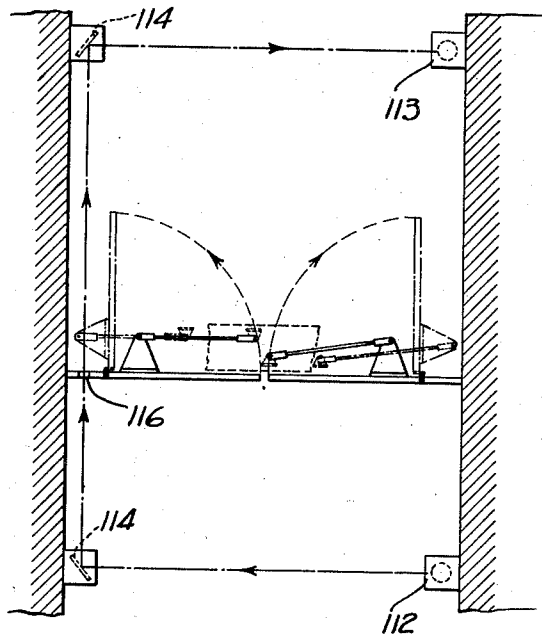
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APPARATUS FOR OPERATING DOORS

1,978,093

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6 Sheets-Sheet 6



INVENTORS
Sheldon S. Roby
Horace H. Raymond
BY *Barrett E. ...*
ATTORNEYS

UNITED STATES PATENT OFFICE

1,978,093

APPARATUS FOR OPERATING DOORS

Sheldon S. Roby, Meriden, and Horace H. Raymond, Berlin, Conn., assignors to The Stanley Works, New Britain, Conn., a corporation of Connecticut

Application November 23, 1931, Serial No. 576,648

3 Claims. (Cl. 268-64)

Our invention relates to apparatus for operating doors, and has special reference to apparatus of this character that is controllable by light sensitive means.

One of the objects of our invention is to provide an apparatus for operating doors which is so constructed that as a person approaches the door, the door is opened automatically and remains open until the person has passed there-through, whereupon the door automatically closes.

Another of the objects of our invention is to provide an apparatus of the character indicated which is simple in construction, and reliable and efficient in operation.

The several features of our invention, whereby the above mentioned and other objects may be attained, will be readily understood from the following description and accompanying drawings, in which:

Figure 1 is a view in perspective of the upper portion of the rear side of a door and door-way to which our improved apparatus in its preferred form is shown applied.

Fig. 2 is a view in perspective of our improved apparatus used in association with two sets of double doors opening in opposite directions, this view showing the preferred arrangement of the photo-electric cell and light source for controlling the doors;

Fig. 3 is a transverse sectional view, partly diagrammatical, of the construction shown in Fig. 2;

Fig. 4 is a plan view of the door operating mechanism of the apparatus with a portion of the casing broken away;

Fig. 5 is a rear side view of the same, the side of the casing being removed;

Fig. 6 is a detail sectional view taken on the line 6-6 of Fig. 5;

Fig. 7 is a sectional view taken on the line 7-7 of Fig. 4;

Fig. 8 is a sectional plan view, on an enlarged scale, taken on the line 8-8 of Fig. 5;

Fig. 9 is a diagrammatical view showing especially the circuit connections for controlling the operation of the doors;

Fig. 10 is a sectional view, on an enlarged scale, taken on the line 10-10 of Fig. 5;

Fig. 11 is a sectional view taken on the line 11-11 of Fig. 5;

Figs. 12, 13 and 14 are diagrammatical views showing other arrangements of the photo-electric cell and light source from that shown in Figs. 2 and 3; and

Fig. 15 is a view similar to Fig. 14 but showing

the double doors swinging in opposite directions.

Our improved apparatus is illustrated in Fig. 2 of the drawings applied to two sets of double doors 2 which may be the entrance and exit doors of the kitchen of a restaurant, the doors having casings 4 in a wall 6.

In accordance with the present invention, as a person approaches one set of double doors, the doors automatically open and after he passes through the door-way, the doors automatically close.

In the construction shown, the opening of the doors is controlled by a light sensitive means, such as a photo-electric cell 8 (Fig. 9) which as shown in Figs. 2 and 3 may be arranged in a post or standard 10, the light source 12 being arranged in a standard 14. The two standards 10 and 14 may be conveniently arranged in front of the doors so that a person approaching the doors passes between them and across the beam 16 of light issuing from the light source to the photo-electric cell. When a person thus crosses the light beam the variation in the current from the photo-electric cell acts through a suitable amplifier and relay system or device 18, to close the circuit connection 19 with an electro-magnet 21. Upon the electro-magnet being energized, door operating means connected therewith acts to open the doors. When the doors have opened a predetermined distance to allow the person to pass through the door-way, the operating mechanism of the doors acts automatically to close the doors and to maintain them closed until another person crosses the light ray.

The operating mechanism for the doors may be conveniently mounted in a casing 20 which is adapted to be secured on the upper portion of the door casing. Preferably this casing-enclosed mechanism, when the apparatus is applied to kitchen doors, is mounted on the back or kitchen side of the door casing so that it is out of sight from the dining-room.

This operating mechanism for the doors comprises a cylinder 22 which is secured to the rear side of the casing 20 by means of a bracket 24. The cylinder is provided with adjustable check valves 23 in its ends. A piston 26 is mounted in the cylinder and has its rod 28 extending out through the inner end of the cylinder. The outer end of the piston rod 28 is pivotally connected by a pin 30 with an angle iron or lug 32 that is secured to the inner end of a rack 34. The rack 34 is operatively engaged by a pinion 36 which also engages a rack 38. The two racks 34 and 38 are mounted to slide in guide-ways in rack casings

40 which are secured by bolts 42 to the inner side of the bottom wall of the casing 20. The movements of the racks 34 and 38 are limited by adjustable stop screws 44 on one end of the rack casing that are adapted to be engaged by the ends of the racks. U-shaped lugs 46 (Fig. 10) are secured to the ends of the racks 34 and 38 by screws 48. These lugs 46 extend downwardly through clearance slots 50 in the bottom wall of the casing 20. Said lugs are operatively connected with the doors by means of connecting rods 52 having one end of each of them pivotally connected by a pin 54 with one of the lugs 46, and its other end pivotally connected with a bracket member 56 secured to one of the doors.

With this construction it will be apparent that upon movement of the piston toward the right, viewing Fig. 5, the piston rod acts through the lug 32 to move the rack 34 toward the right, and this rack through its connection with one of the double doors swings the door toward open position. Also, this rack 34 through the pinion 36 moves the rack 38 in the opposite direction, and thus simultaneously swings the other door open, the two double doors being swung open substantially at the same time or if desired one slightly in advance of the other.

The racks 34 and 38 are operated in the opposite direction to swing the doors closed, by means of coiled springs 58 having one end secured to a pin 60 carried by the lug 46 of the rack 38, and having their other or outer ends secured to a pin 62 which projects upwardly from the bottom wall of the casing 20.

In the case of the entrance doors, as shown in Fig. 3, where the photo-electric cell and operating mechanism are both located on the same side of the door, for example on the kitchen side where the apparatus is used in restaurants, the brackets to which the rods 52 are connected have laterally projecting ends 64 so that the point of leverage between the pivotal connection of the brackets and rods will be properly located to effect the desired operation of the doors.

Compressed air or other fluid is supplied to the outer end of the cylinder 22 to operate the piston in a direction to open the doors as above described, through a pipe 66 which may be connected with any suitable source of fluid supply. The passage of the fluid into the cylinder is controlled by a suitable self-closing valve 68 that has a downwardly projecting valve stem 70 which when raised opens the valve, and when released moves downwardly to close the valve. The valve stem is connected with the core 72 of the electro-magnet 21 (Figs. 8 and 11) so that when the coil of the electro-magnet is energized as above described, the valve is opened. As shown, this connection between the valve stem 70 and the magnet core 72 comprises an arm 74 having one end pivotally mounted on a pin 76 secured to a bracket plate 78 which also supports the magnet 21 within the casing 20. The other end of this arm is pivotally connected with the lower end of the magnet core 72 by means of a pin 80. The valve stem 70 rests upon an adjustment screw 81 on the arm 74.

When the electro-magnet is energized by variation in current of the photo-electric cell as above described, the magnet core 72 is drawn upwardly to open the valve and the valve is held open by means of an upstanding dog 82 having a shoulder 84 which snaps beneath the free end of the arm 74. The dog 82 has its lower end pivotally mounted on a pin 86 secured in ears on the bracket plate 78, and the dog is pressed toward the end of the

arm 74 by means of a coiled spring 88 interposed between the rear side of the dog and the bracket plate 78.

When the double doors are opened a predetermined distance, the dog 82 is released from the arm 74 so as to allow the valve 68 to close. To provide for this, a sheet metal arm 90 is pivotally mounted on a pin 92 secured in the bifurcated end of a bracket 94 mounted on the bracket plate 78. This arm is provided with a projecting end portion 96 arranged adjacent the forward side of the dog 82, so that when the arm 90 is swung in one direction, the dog 82 is forced back to release its shoulder 84 from the arm 74, the end of the arm then dropping down into engagement with a stop shoulder 98 on the dog.

To thus swing the arm 90, a horizontal pin or rod 100 is adjustably secured in a boss 101 on the lug 46 of the door operating rack 38. As the doors approach a predetermined open position, the outer end of the rod 100 engages the outer end of the arm 90, thus swinging the arm in a direction to release the dog 82 to permit the valve 68 to close. By adjusting the longitudinal position of the rod 100, the time of closing of the valve may be varied as desired with relation to the distance the doors are open.

When the compressed air supply is shut off from the cylinder 22, the door closing springs 58 act immediately to swing the doors to closed position. It will be apparent that by adjustment of the check valves 23 the speed of the opening and closing of the doors may be varied as desired, the valve at the right hand end of the cylinder controlling the speed of opening of the doors, and the valve at the other end of the cylinder controlling the speed of the closing of the doors.

It will be apparent from the foregoing that as a waitress or other person crosses the light ray in approaching the doors, the doors immediately swing open and after she has passed through the doors, the doors immediately start to close, the adjustable valves 23 of the check cylinder 22 controlling the speed of the opening and closing of the doors. If a second person crosses the light ray before the doors start to close, the doors will remain open a sufficient length of time to permit that person to pass through, and in case the doors are partially closed when the light ray is again crossed, the doors will immediately swing back to full open position. Our improved apparatus is of simple, strong and durable construction, takes up but a minimum amount of space, and is convenient and reliable in operation.

In Fig. 12 the beam of light from the light source 102 instead of being directed transversely of the doors and directly to the photo-electric cell as shown in Fig. 3, is directed downwardly to a spot on the floor in front of the door, and is reflected therefrom to the photo-electric cell 104, a parabolical reflector 106 surrounding the cell to reflect the light thereto. With this arrangement both the photo-electric cell and light source is located overhead and out of the way.

In Fig. 13 the light source 108 and the photo-electric cell 110 are located at opposite sides of the double doors, the light beam passing through an opening between the edges of the doors, or in case of a single door through an aperture therein. With this arrangement, the doors open when a person comes within the light beam in approaching the doors from either side and they remain open until he leaves the path of the light after he passes through the door. This arrangement is especially advantageous when used in connec-

tion with the doors of storerooms and other places where articles are moved on trucks through the doors and where there may be a considerable variation in time that is taken in passing through.

Thus with the use of but a single photo-electric cell and light source, traffic may be maintained in two directions through the same door-way.

In Fig. 14, the light source 112 and the photo-electric cell 113 are located at opposite sides of the door, and mirrors 114 are suitably arranged at opposite sides of the door so that the light ray is directed first across the approach to the door at one side thereof to one of the mirrors 114, then through an aperture 116 in the door frame or wall to the other mirror, and then across the other approach to the door to the photo-electric cell. With this arrangement the doors open upon a person or object crossing the transverse portion of the light ray at either side of the doors.

In Fig. 15, instead of the two sections of the double doors being hinged on the same side as in Fig. 3, they are hinged to swing in opposite directions. To connect these sections with our improved door operator, the two rods 52' may be connected with the same rack operated lug 46' as shown.

It will be apparent that our improved door operator may be located on either side of the door casing regardless of which side the door is hinged, and in case of a pair of double doors they may be hinged on the same or opposite sides as above described.

As will be evident to those skilled in the art, our invention permits various modifications without departing from the spirit thereof or the scope of the appended claims.

What we claim is:

1. Door operating apparatus comprising power operated mechanism acting when the power is turned on to move the door from closed position to a predetermined open position or in case the door has closed to any intermediate position to return it to said predetermined position and to maintain it in the latter position so long as the power is on, means controlled by the interception of a light beam for turning on the power and maintaining the power turned on so long as the light beam is intercepted, a device rendered effective when the power is thus turned on to retain the power on independently of whether or not the light beam is intercepted, means for releasing

said retaining device when the door has reached said predetermined open position, means for turning off the power when said retaining device is released and the light beam is unintercepted, and a spring for closing the door when the power is turned off and for yieldingly restraining the opening of the door.

2. Door operating apparatus comprising fluid pressure operated mechanism acting when the fluid is turned to move the door from closed position to a predetermined open position or in case the door has closed to any intermediate position to return it to said predetermined position and to maintain it in the latter position so long as the fluid is turned on, a self-closing valve for turning on and off the fluid when the valve is respectively opened and closed, means controlled by the interception of a light beam for opening the valve and maintaining it open so long as the light beam is intercepted, a device rendered effective when the valve is thus opened to retain it open independently of whether or not the light beam is intercepted, means for releasing said retaining device when the door has reached said predetermined open position, and a spring for closing the door when the valve is opened and for yieldingly restraining the opening of the door.

3. Door operating apparatus comprising fluid operated mechanism acting when the fluid is turned on to move the door from closed position to a predetermined open position or in case the door is closed to any intermediate position to return it to said predetermined position and to maintain the door in the latter position so long as the fluid is turned on, a self-closing valve for turning the fluid on and off upon respectively opening and closing the valve, an electro-magnet and suitable connections with the valve adapted when the magnet is energized to open the valve, means controlled by the interception of a light beam for energizing said magnet and to maintain the magnet energized so long as the light beam is intercepted, a device rendered effective when the valve is thus opened to retain the valve open independently of whether or not the electro-magnet is energized, means for releasing said retaining device when the door has reached said predetermined open position, and means for closing the door when said valve is closed.

SHELDON S. ROBY.

HORACE H. RAYMOND.