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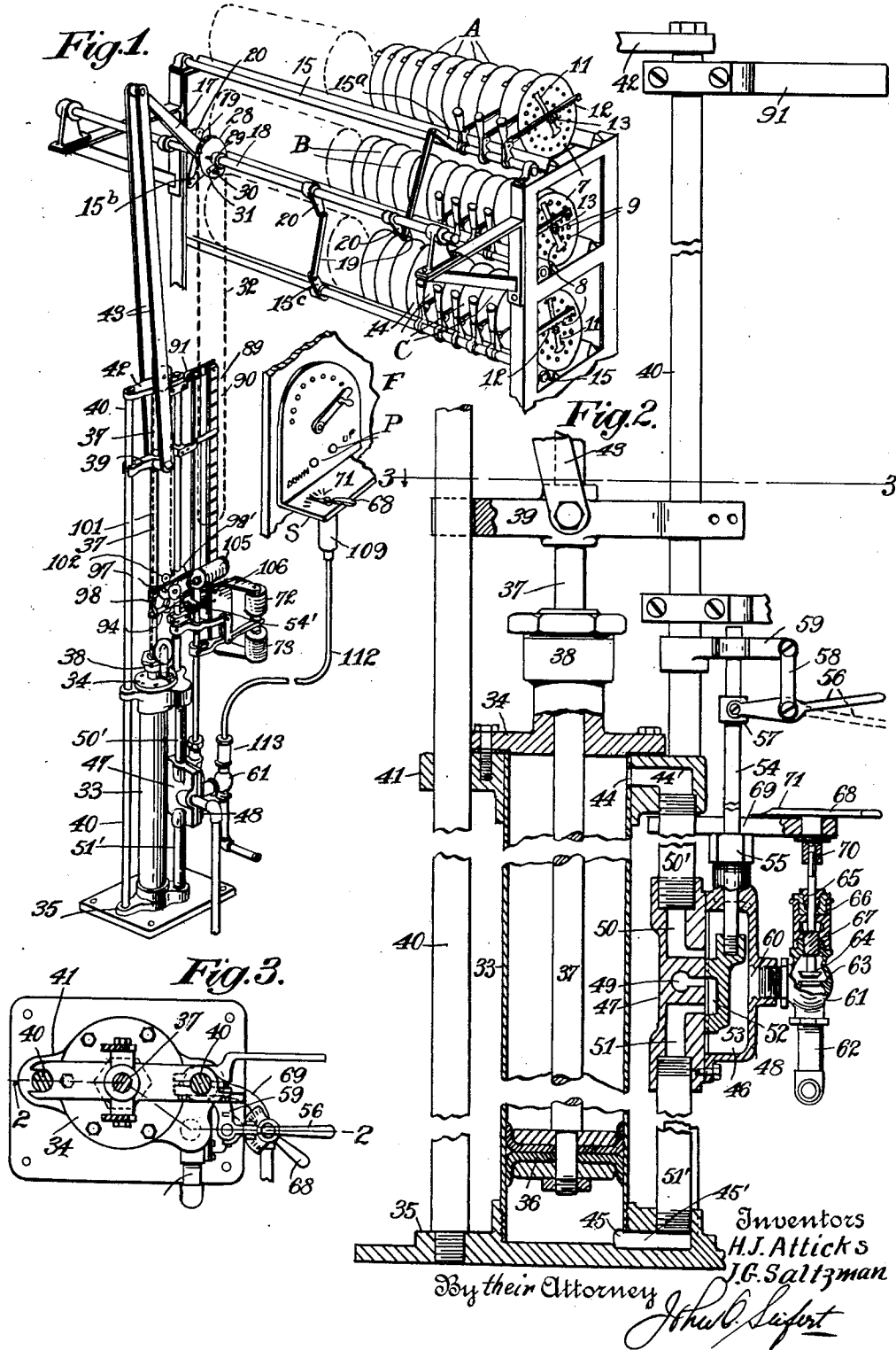
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Filed May 17, 1927

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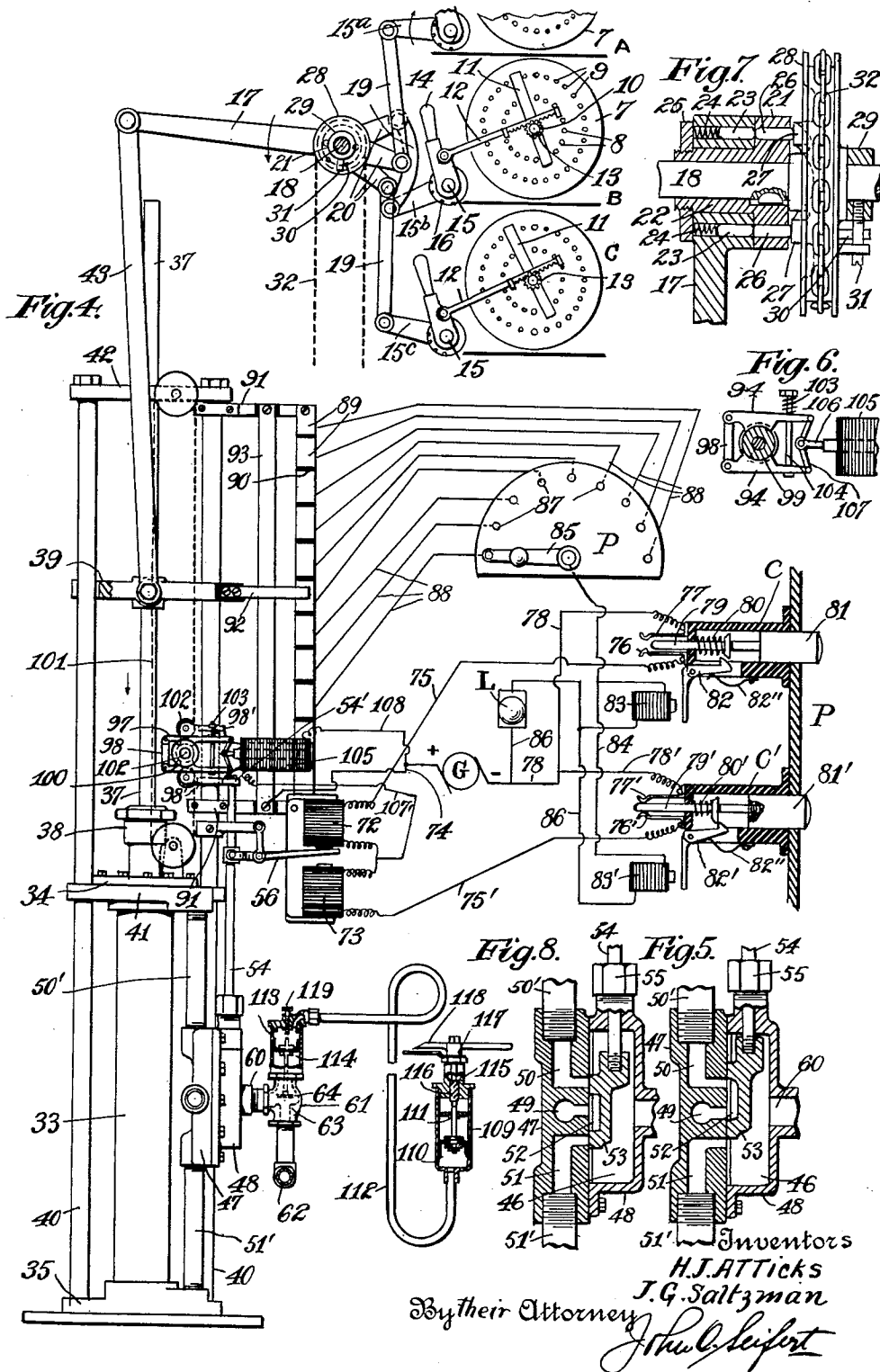
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UNITED STATES PATENT OFFICE

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ACTUATING MEANS FOR ELECTRIC-LIGHT DIMMERS

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This invention relates to actuating means for what is commonly termed as "dimmers" connected in series with incandescent electric lamps for the purpose of dimming the light by reducing the voltage of the lamp currents, mostly used in theatres for producing light effects, although it is also adapted for other uses, for instance, in places where it is necessary to keep lamps lighted during long periods and yet not necessary to have full illumination and thus effecting a saving in current consumption. For producing light effects in theatres groups of lamps are connected in different circuits and a dimmer is utilized for each circuit, means being provided to actuate each dimmer, or to actuate a series of dimmers of what is termed a "master" actuator to simultaneously actuate said series of dimmers, or to actuate a multiple of series of dimmers simultaneously by connecting a series of "master" actuators to what is termed a "grand master" actuator. In this latter instance it is impossible to actuate the "grand master" actuator manually without exerting great physical force, and it is the object of the present invention to provide fluid pressure operated means operatively connected with the actuating means for a single light dimmer, to a "master" actuator for a series of light dimmers, or to a grand master actuator to operate the same, and to provide means under the control of the operator with a minimum of physical exertion to control and regulate the operation of the dimmer actuating means.

It is a further object of the invention to provide means to control and regulate the fluid pressure operated means for the dimmer actuating means located at a place remote from said fluid pressure operated means.

In the drawings accompanying and forming a part of this specification Figure 1 is a perspective view of the fluid pressure operated light dimmer actuating means and showing the same in operative connection with a light dimmer means, and also showing in connection therewith means to control and regulate the operation of the fluid pressure operated means located at a place remote thereto.

Figure 2 is a side elevation on an enlarged scale, partly in section and partly broken away, of the fluid pressure operated means and showing in connection therewith means to control and regulate the operation thereof.

Figure 3 is a cross sectional view on a reduced scale taken on the line 3—3 of Figure 2 looking in the direction of the arrow.

Figure 4 is an elevational view of the fluid pressure operated means showing the same operatively connected with actuating means for a multiple of series of light dimmers, electrically operated means for actuating valve mechanism for controlling the admission of fluid pressure to and from the fluid pressure operated means to actuate the same and located at a place remote thereto, the electric connection of the parts being shown in a diagrammatical manner therewith, and also partly in section remotely located manually controlled fluid pressure actuated means for controlling the speed of operation of the fluid pressure operated means and thereby the light dimmers.

Figure 5 is a cross sectional view of valve mechanism for controlling the admission of the operating fluid pressure and the fluid pressure operating means.

Figure 6 is a detail view in elevation of electromagnetically operated braking means to hold the fluid pressure operated means against operation by the fluid pressure medium.

Figure 7 is a sectional view of clutch mechanism for releasably coupling the fluid pressure operated means with the actuating means for the light dimmers; and

Figure 8 is a view similar to Figure 5 showing another position of the valve mechanism to shut off the fluid pressure inlet from the cylinder.

In dimmers for incandescent lamps of this character a resistance element connected in the circuit of a lamp or series of lamps is embedded in a disk of insulating material 7 with contact terminals 8 connected with one terminal of said element and contact terminals 9 connected with different portions of said element, said contact terminals 8 and 9 being exposed through the surface of the disk and

the disk being mounted in fixed position, as on a shaft 10, with a circuit maker 11 rotatable on the shaft in contiguous relation to the disk to bridge said contact terminals and by rotation thereof adapted to connect variable amounts of the resistance into and out of the circuit. The contact maker 11 is actuated by a slidable rack 12 meshing with a pinion 13 rotatable with the contact maker and actuating rack pivotally connected with a lever 14 pivotally supported, as on a shaft 15. These dimmers may be arranged in series, as shown at A, B and C, each series being arranged in axially aligned relation for controlling lamps in series or multiple circuits. For this purpose the lever 14 for each resistance controlling device is arranged whereby it may be connected in predetermined position to the shaft 15 to actuate the same with the other levers by the rotation of the shaft, or to disconnect it from the shaft and render it inoperative when the shaft is rotated, or for individual operation of the lever. Each series of resistance devices is arranged to be either individually or simultaneously operated through a single shaft and the corresponding elements of each series of the devices have been given the same reference characters. Each of shafts 15 is rotatable by a lever 15^a, 15^b and 15^c, termed "master" actuators or levers. All of the series of resistance devices may be actuated simultaneously by a "grand master" actuator or lever 17 on a shaft 18 to which the master actuators are connected by links 19 pivotally connected with said levers and arms 20 loose on the shaft 18. These arms are releasably coupled to the shaft 18 whereby either one or more of the series of resistance devices may be actuated by the grand master actuator, or each series of resistance devices may be actuated by its individual master actuator. For this purpose collars 21 are fixed on the shaft 18 having a sleeve portion 22 upon which the arms 20 are mounted, the hub of the arms having a pair of pins 23 slidably mounted in openings disposed diametrically opposite in the arm hub and normally urged in a direction toward the collar 21 by a spring 24 confined between the pins and washers 25 threaded on the collars. The collars 21 also have openings with pins slidably engaged therein, as shown at 26 in Figure 7, and when the pins carried by the arms come opposite said pin carrying openings 26 they will be urged into said openings and thereby couple the arms with the shaft 18 through the collars 21. The pins 23 are actuated to release the arms from the collars by cams 27 on the side of a wheel 28 loose on shaft 18 between the collars 21 and collars 29 fixed to the shaft 18. To position the pin carrying openings 26 into and out of alinement with the pins 23, pins 30 are provided, extending laterally from the wheel 28 at opposite sides of a pin 31 which

also serves to secure the collars 29 to the shaft, the wheel being adjusted by a chain slung over the same. The mechanism so far described is old and well known in the art and further description is not deemed necessary.

The present invention relates to means to operate said actuating means for the light dimmers, embodying "grand master" and "master" actuators to actuate one or more of the light dimmers. This means comprises fluid pressure operated means including a cylinder 33 arranged with heads 34, 35 at opposite ends, the head 35 in the present instance being arranged to serve as a means to support the cylinder in vertical position. A piston 36 is slidably mounted in the cylinder and is connected to one end of a rod 37 extended through and slidable in a stuffing box 38 arranged on the head 34 and having a cross head 39 secured thereto embracing and slidable longitudinally of guide rods 40 fixed at one end in the cylinder head 35 and extending through perforations in the flange of a member 41 fixed on the cylinder and to which the head 34 is connected, the opposite ends being connected by a cross-bar 42 through which the piston rod is extended. The piston is connected with the grand master dimmer actuator by the links 43 pivotally connected to studs extending from opposite sides of the cross-bar 39.

Means are provided to admit fluid pressure from a suitable source of supply to the cylinder at opposite sides of the piston. For this purpose the cylinder is arranged with ports 44, 45 at opposite ends leading to passage 44', 45' through the member 41 and cylinder head 35 respectively. These passages are connected with a chamber 46 in a casing formed by a pair of members 47, 48, the member 47 having a port 49 for connection with the source of fluid pressure supply and communicating with the chamber 46. The passages are connected with the chamber 46 by pipes 50', 51' connected with said passages and ports 50, 51 in the casing member 47. Valve mechanism is provided to control the fluid flow through the port 49 and either of the ports 50 or 51 to the cylinder at opposite sides of the piston and simultaneously open one of the ports to the chamber 46 to exhaust the fluid pressure from the cylinder at one side of the piston as the fluid pressure is admitted to the cylinder at the opposite side of the piston. This valve mechanism comprises a block 52 arranged in the chamber 46 for sliding engagement with the wall formed by the member 47 and having a recessed portion 53 adapted to bridge the fluid pressure inlet port 49 and either of the ports 50, or 51, as shown in Figures 2 and 5. The valve 52 is operated by a rod 54 connected thereto and extended through an opening in the casing member 48 and a stuffing box connected thereto, as shown at 55, and having a hand lever 56 pivotally

connected thereto at 57, the lever being pivotally carried by a link 58 pivotally mounted on an arm 59 fixed to and extending laterally from one of the guide rods 40. It will be obvious that when the lever is adjusted to the position shown in full lines in Figure 2 that the fluid pressure will be connected with the cylinder at the lower side of the piston through the ports 49, 51 which will exert an upward force on the piston, and that the fluid pressure at the upper side of the piston will be exhausted through the passage 44', pipe 50' and port 50 into the chamber 46. It will also be obvious that this movement of the piston will be imparted to the dimmer actuator 17 through the piston rod which may operate to cut the resistance out of the lamp circuits. When the lever 56 is moved to the dotted line position the valve 52 will be adjusted to the position shown in Figure 5 connecting the fluid pressure through the ports 49, 50 with the cylinder at the upper end of the piston and connecting the cylinder at the lower end of the piston with the chamber 46 through the passage 45, pipe 51' and port 51. It will be further obvious that when the valve 52 is adjusted to bridge the port 49 the opposite wall portions of the recess 53 will close the ports 50, 51 and thereby maintain the piston in equilibrium, which may be at any point relative to the length of the cylinder.

To control the speed of travel of the piston 36 and thereby of the actuation of the dimmers means are provided to control and regulate the rate of admission and exhaust of the motive fluid from the cylinder. In the present instance this is accomplished by controlling and regulating the rate of exhaust of the fluid from the cylinder, and comprises valve mechanism connected at the outlet 60 from the casing chamber 46 and embodying a valve chamber 61 connected to said outlet 60 having a discharge pipe 62 connected to the outlet of the valve chamber with a valve seat 63 interposed between the inlet and outlet for engagement by a valve 64 carried by a stem 65 extending through the valve casing and a stuffing box 66 connected thereto to have longitudinal movement to move the valve toward and away from the valve seat 63. Means are provided to impart variable axial adjustment to the valve and thereby open the chamber 46 to a variable extent to the discharge pipe 62 and retain it in adjusted position, such means comprising a steep pitch threaded portion 67 on an enlargement of the valve stem engaging a correspondingly threaded portion in the valve casing. This valve is actuated by a lever 68 pivotally mounted on a bracket 69 fixed to and extending laterally from the pipe 50' to have rotative movement about the axis of the valve stem, and to impart rotative movement to the valve and permit axial movement thereof.

The end of the valve stem is square in cross section and slidably engages a correspondingly formed socket in the support for the lever 68, as shown at 70. To indicate the extent of the opening of the valve 64, or the position thereof, the lever 68 is provided with a pointer 71 and the lever supporting bracket 69 provided with a dial calibrated to indicate the position of the valve in various positions of the lever with which the pointer 71 co-operates.

Means are provided to control the fluid pressure operated means for the light dimmer actuating means at a place remote from the location of said light dimming mechanism, comprising means to actuate and control the valves 52 and 64 for the regulating of the admission of motive fluid to and the exhaust thereof from the cylinder 33. The embodiment herein illustrated for actuating the valve 52 comprises electrically operated means. For this purpose there is provided a pair of electromagnets 72, 73 supported at opposite sides of the valve actuating lever 56, which serves as armature for said magnets. One terminal of each magnet is connected by conductor 74 through a magnet 105 to a generator, shown in a conventional manner at G, the other terminal of magnet 72 being connected by conductor 75 with one contact member 76 of a circuit making and breaking means, the other contact member 77 of which is connected by conductor 78 at the opposite side of the generator G. To energize the magnet 72, contact member or a stem 79 is moved to a position between and in contact with contact members 76, 77 which are in the nature of resilient blades, fixed to a tubular carrier C of insulating material in which the contact member 79 is slidably mounted. The member 79 is normally urged out of its contact making position by a spring 80 and this stem is moved to the contact making position by a push button 81. The energization of magnet 72 actuates the lever 56 to move the valve 53 to the position shown in Figure 2 connecting fluid with the lower end of the cylinder and opening port 50 to permit of the exhaust of the fluid from the upper end of the cylinder. To reverse the position of the valve 52 to direct the motive fluid to the upper end of the cylinder and the exhaust from the lower end of the cylinder the magnet 73 is energized to attract the lever 56 thereto. For this purpose the other terminal of said magnet is connected by a conductor 75' with one contact member 76' of a circuit making and breaking means the same as connected in the circuit of magnet 72, the other contact member 77' thereof being connected by conductor 78' with the conductor 78 and thereby with the generator G. A contact member 79' similar to the contact member 79, is provided to make contact with the contact members 76', 77', said contact making member 79' being carried

by a tubular carrier C' of insulating material and being biased toward an open circuit position by a spring 80' and moved to a circuit closing position against the tension of said spring by a push button 81'. The push buttons 81 and 81' are mounted on a suitable panel P, as shown in Figure 1, with the designations "Down" and "Up" on the panel adjacent the buttons as a guide to the operation of the push buttons. The contact makers 79, 79' are releasably retained in contact making position by pivoted latches 82, 82' of angle form with one arm arranged as a hook to engage over an enlargement on the contact maker stems which serve as an abutment for the contact actuating springs, and urged to such position by springs 80 and 80'. The latches 82 and 82' are urged to their latching positions by the springs 82.

Means are provided to automatically open the circuit and de-energize either of the magnets 72, 73 when the piston 36 has reached a predetermined position in the cylinder and thereby the light dimmer mechanism actuated to predetermined position, and means are provided to hold the piston actuated mechanism in said position. For this purpose means are provided to release either of the contact maker retaining latches 82, 82' which may be positioned to retain either of the contact makers 79 or 79' in contact making position. This means comprises a pair of electromagnets 83, 83' to which the latches 82, 82' serves as armature. One terminal of each of the windings of said magnets is connected by conductor 84 with a manually operable contact maker 85 rotatably mounted in the insulating panel P. The other terminals of said magnets are connected by conductor 86 through a lamp L and conductor 78 with the generator G. The circuit of said magnets is closed to energize the same and actuate the latches from the contact makers 79, 79' through the contact maker 85 and through one of a series of contact making members 87, shown as nine in number, carried by the panel P, each contact member being electrically connected by conductors 88 with contact members 89 mounted on an insulating bar 90 carried by brackets 91 fixed to one of the guide rods 40. The circuit is established through any one of the contact members 89 in circuit with the contact maker 85 through any one of the contacts 87 by a contact maker 92 mounted on and insulated from the cross-bar 39 and straddling any one of the contacts 89 and a contact bar 93 also carried by and insulated from the brackets 91 and electrically connected with the generator through the conductor 74. When the circuit of either of the magnets is closed a lamp L connected in the circuit of said magnets will be lighted to serve as a signal to indicate that the mechanism is being held against operation.

The means to hold the mechanism against operation comprises a pair of brake shoes 94 pivotally mounted on a bracket 98 to engage at opposite sides of the hub or carrying shaft 99 of a sprocket wheel 100 rotatably carried by said bracket. The bracket 98 is arranged with a pair of laterally extending guide members 98' having openings for the slidable engagement of one of the guide rods 40, the lower guide member 98' having a connection 54' with the rod 54 of valve 52. A sprocket chain 101 is guided around said sprocket wheel 100 by a pair of idler wheels 102 also rotatably carried by the bracket and passing around a pair of pulleys spaced apart a distance equal to or somewhat greater than the longest stroke of the piston, and said chain being operatively connected to the piston to participate in the movement thereof, in the present instance by connecting the same with the cross-bar 39. The brake shoes are normally urged to braking position by a spring 103 coiled about the end of a pin 104 extended through openings in extensions of the brake shoes and a nut threaded onto the end of said pin, as shown in Figure 6. When the circuit of either of the valve lever actuating magnets 72, 73 is closed to energize said magnets and actuate the lever said braking mechanism is released by electromagnetically operated means, comprising an electromagnet 105 of the solenoid type mounted on the sprocket wheel carrying bracket 98, and having the core thereof connected to the pivotal connection of a pair of toggle links 107 pivotally connected with the brake shoe extensions, the energizing of the magnet drawing the core thereof into the magnet coil and straightening out the toggle links and moving the brake shoes out of braking position. The magnet 105 is interposed in the circuit of magnets 72, 73 with one side of the generator by conductors 107' and 108. As soon as the circuit of either of magnets 72, 73 is opened the circuit of magnet 105 is opened and when said magnet is de-energized the spring 103 operates to move the brake shoes to braking position, when the bracket will participate in the movement of piston 36 and move the fluid control valve 52 therewith until said valve assumes the Figure 8 position shutting off the fluid pressure from cylinder 33 and maintaining the piston 36 and connected mechanism in equilibrium.

To control the fluid outlet regulating valve 64 at a place remote from the fluid operated means auxiliary fluid actuated means is provided. For this purpose a cylinder 109 is mounted below a shelf S extending outward from and below the panel F (Figure 1) having a reciprocating piston 110 (Figure 4) therein arranged with a stem slidably mounted in and extended through a diaphragm in the cylinder, as at 111. The cylinder at the end of the piston opposite to the piston stem

is connected by a pipe or tubing 112 to a cylinder 113 at one side of a piston 114 reciprocatory therein, said cylinder being connected to the valve casing 63 and in communication therewith at the side opposite to the discharge pipe 62, and the piston connected with the stem of valve 64 which is extended from the piston. There is a liquid in the connecting tubing 112 and cylinders 109, 113 of a quantity sufficient to fill the tubing and one of said cylinders. The piston 110 is moved in one direction to force any fluid in front of the piston out of the cylinder into and back of the piston in cylinder 113 by a rotary and axially movable stem 115 having a steep pitch thread connection with a closure for one end of the cylinder 109, as at 115, the stem 115 being connected with a hand lever 117 rotatably mounted on the shelf S similar to the connection 70 of the stem of valve 64 with its operating lever 68. The lever 117 is arranged with a pointer 118 to co-operate with calibrations arranged on the shelf to indicate the extent of adjustment and position of the piston 110. This movement of the piston 110 forces fluid out of the cylinder 109 into the cylinder 113 where it exerts a force upon the piston therein to move the same to position the valve against the valve seat 63 and maintain it in such position against the force of the outgoing fluid from the cylinder 33 into the valve casing 61 against the opposite side of the piston 114. The movement of the piston 114 is limited in the one direction by an adjustable abutment in the form of a screw 119 for the engagement of the end of the valve stem extended through the piston. To permit the opening of the valve 64 the stem 115 is adjusted by the lever 117 to permit of movement of the piston 110 in the direction of said stem.

While we have illustrated one embodiment of our invention it will be obvious that various modifications may be made in construction and arrangement of parts, and that portions of the invention may be used without others, and come within the scope of the invention.

Having thus described our invention we claim:

1. In a mechanism of the character described, in combination with at least one electric light dimmer of the type including a plurality of stationary contacts and a movable contact member frictionally engaging the stationary contacts, means for operating said dimmer comprising a hydraulic fluid operated device, means for transmitting power from said device to the movable contact of said dimmer and means for variably controlling the rate of flow of motive fluid through said device whereby the rate of operation of said dimmer may be variably controlled and undesirable changes in the rate of operation of said dimmer due to variations

in the friction between the movable contact and the stationary contacts of said dimmer are avoided.

2. In a mechanism of the character described, in combination with a plurality of electric light dimmers of the type including a plurality of spaced stationary contacts and a movable contact member frictionally engaging the stationary contacts, means for operating said dimmers comprising a cylinder, a piston reciprocally mounted in said cylinder, means for connecting said piston to the movable contact members of said dimmers, means for admitting an incompressible operating fluid under pressure to said cylinder and means for variably controlling the rate of admission of said operating fluid whereby the rate of operation of said dimmers may be variably controlled and undesirable changes in the rate of operation of said dimmers due to variations in the friction between the movable contact members and the stationary contacts of said dimmers are avoided.

Signed at the city of New York, in the county and State of New York, this 10th day of May, 1927.

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