No. 751,503. PATENTED FEB. 9, 1904.

C. HALLER & W. E. SINCLAIR.

MECHANISM FOR CONTROLLING LAMPS IN PHOTOGRAPHIC PRINTING DEVICES.

APPLICATION FILED JULY 3, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

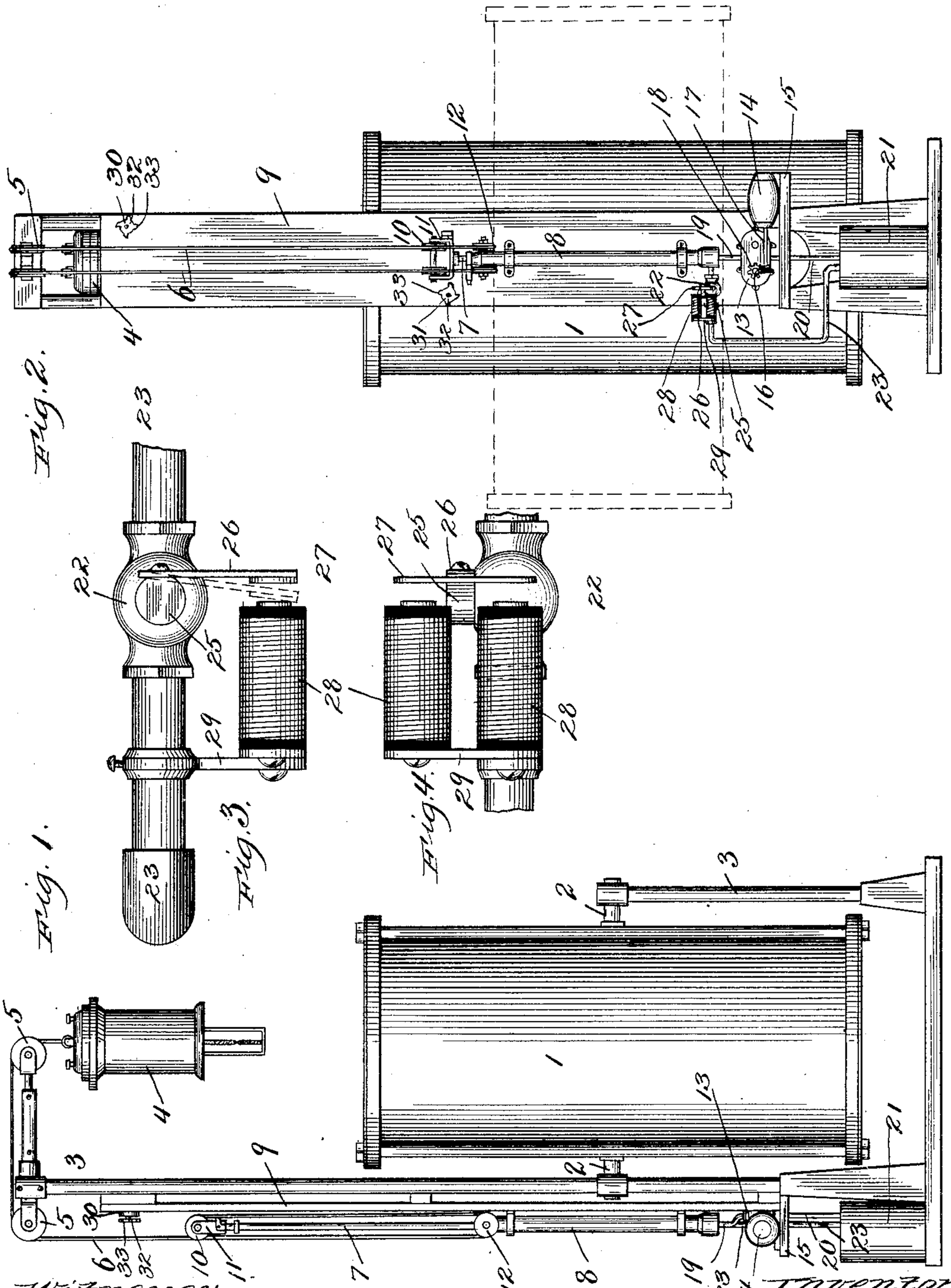

Fig. 2.

Fig. 1.

Fig. 3.

Fig. 4.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

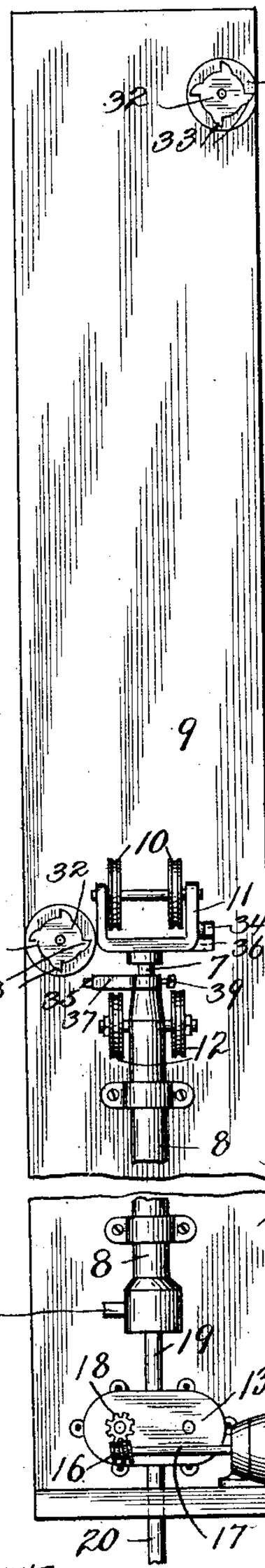


Fig. 6.

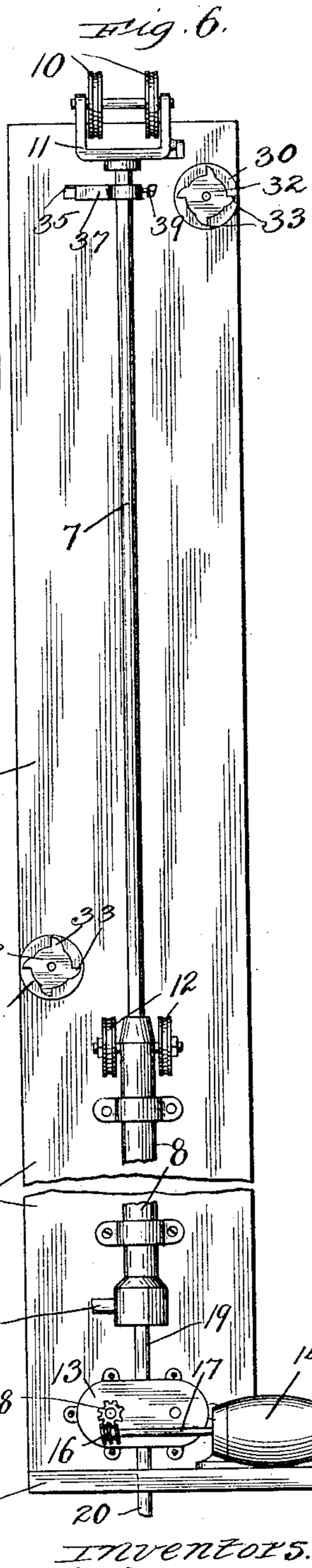


Fig. 8.

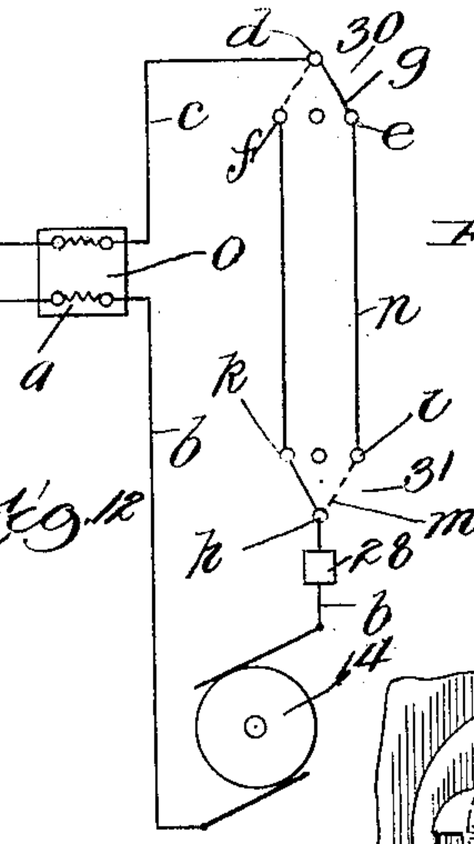


Fig. 12.

Fig. 7.

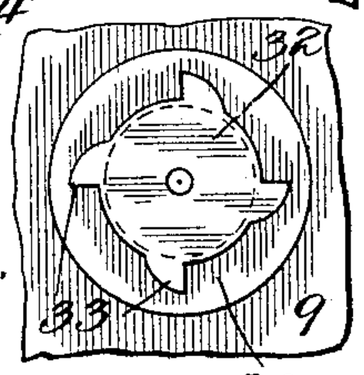


Fig. 9.

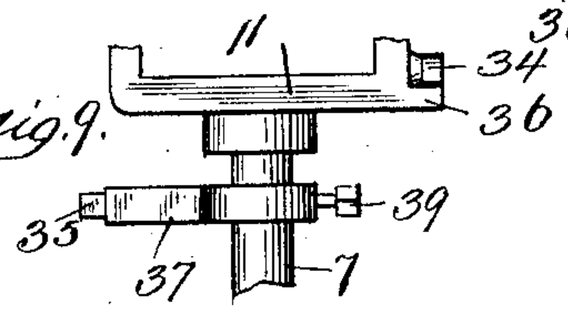


Fig. 10.

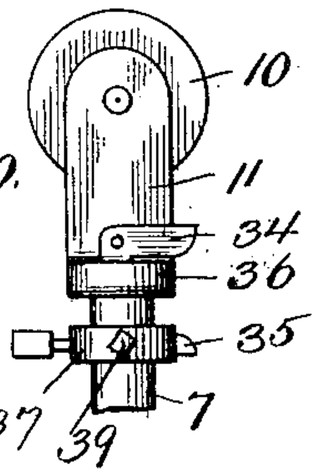
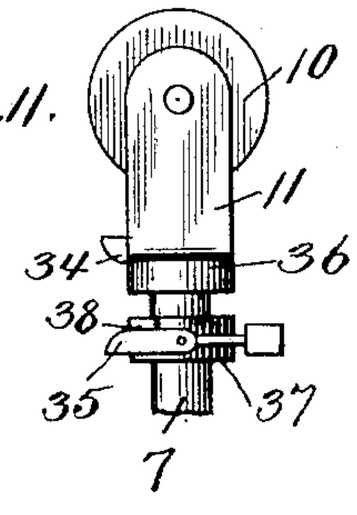


Fig. 11.



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No. 751,503. Patented February 9, 1904.

UNITED STATES PATENT OFFICE.

CARL HALLER AND WILLIAM E. SINCLAIR, OF CHICAGO, ILLINOIS, ASSIGNORS TO HALLER MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MECHANISM FOR CONTROLLING LAMPS IN PHOTOGRAPHIC-PRINTING DEVICES.

SPECIFICATION forming part of Letters Patent No. 751,503, dated February 9, 1904.

Application filed July 3, 1902. Serial No. 114,211. (No model.)

To all whom it may concern:

Be it known that we, CARL HALLER and WILLIAM E. SINCLAIR, citizens of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Mechanism for Controlling Lamps in Photographic-Printing Devices, of which the following is a specification.

Our invention relates to mechanisms for controlling lamps in photographic-printing devices using artificial light; and the object of the invention is to provide means for employing liquid in a piston-chamber to raise and lower the lamp. We attain this object by the mechanism illustrated in the accompanying drawings, in which—

Figures 1 and 2 are side and face views, respectively, of the complete apparatus. Figs. 3 and 4 are plan and side views, respectively, of the drain-valve and operating devices therefor. Figs. 5 and 6 are fragmentary face views of the illustrating the operation of the chief operating parts. Figs. 7 and 8 are detail fragmentary views showing the controlling-switches. Figs. 9, 10, and 11 are detail fragmentary views showing the dogs for operating the controlling-switches. Fig. 12 is a diagram of the electrical connections.

Similar reference characters denote similar parts throughout the several views.

The glass printing-cylinder 1, which is normally in an upright position, is preferably mounted on trunnions 2 in the supporting-framework 3, so that said cylinder may be swung to a horizontal position when the negatives and sensitized sheets are being adjusted to or removed from the machine.

In order to support the lamp 4, the sheaves 5 are provided at the upper extremity of the framework and guide the hoisting-ropes 6. Said ropes are operated by the piston-rod 7, working in the cylinder 8. The mount-board 9 serves as means of attachment for said cylinder and other parts of the operating mechanism.

The sheaves 10 are mounted in the frame 11, secured to the upper extremity of the piston-rod 7, and the sheaves 12 are mounted in a fixed position on the board 9, preferably at or near the upper extremity of the cylinder 8. The hoisting-ropes are so trained over the guide-sheaves 5 and the operating-sheaves 10 and 12 that when the piston-rod 7 is at the upper extremity of its travel the lamp 4 will also be at the upper extremity of its travel and when the piston-rod is in its lowermost position the lamp will be in its lowermost position also. The weight of the lamp 4, piston-rod 7, and connected parts is such that when the cylinder-piston is free to move the lamp will descend.

The cylinder 8 is adapted to contain liquid, and the position of the piston-rod is determined by the amount of liquid beneath the piston in the cylinder. The operating liquid, which by preference is oil, is forced into the cylinder by means of the pump 13, fixed upon the mount-board 9. Said pump is operated by the motor 14, located on the fixed shelf or bracket 15. Said motor is electrically driven, as hereinafter described, and has a worm 16 fastened to its shaft 17 for meshing with the gear 18 to drive said pump, the latter being in the present instance of the type known as a "rotary" pump. The pipe 19 connects the pump with the cylinder 8, and the supply-pipe 20 connects said pump with the vessel 21, wherein the oil or other liquid is contained.

The pump normally operates in one direction only to fill the cylinder and raise the piston-rod. The lowering of the piston-rod is effected by draining the liquid from the cylinder, and this is accomplished by means of the valve 22, located in the drain-pipe 23. Said drain-pipe extends from the bottom of the cylinder to the vessel 21. When the valve is closed, the liquid cannot escape from the cylinder, and if the pump is not in operation the piston-rod will remain stationary; but when the valve is open the liquid will escape through the pipe 23 into the vessel 21 and the piston-rod will descend, thereby causing the lowering of the lamp 4.

The electrical contrivances for controlling and operating the mechanism will now be described. The valve-stem 25 has attached

thereto the controlling-lever 26, which carries the armature 27, as best shown in Figs. 3 and 4. The electromagnets 28 are secured, preferably, by means of the bracket 29 on the pipe 23 in such a position that when magnetized they will attract the armature 27 in a direction to close the valve. This occurs when the operating electric circuit is closed.

Referring to the diagram Fig. 12, *a* represents the service or source of electrical energy for the system. *b* and *c* are the main wires, *b* running to the motor 14 and *c* running to the upper three-point switch 30. Said switch 30 has the three points *d*, *e*, and *f*, the main line *c* being permanently connected to the point *d*. The switch-bar *g* is pivoted on the point *d* and may connect said point *d* with either the point *e* or point *f*. In a similar manner the lower point-switch 31 has the fixed point *h* permanently connected to the main line *b*. By means of the switch-bar *m* said point *h* may be connected to either the point *i* or point *k*. The line *n* permanently connects the points *e* and *i*, and the line *o* permanently connects the points *f* and *k*. The electromagnets 28 are in series with the main line, being in the present instance located between the motor 14 and lower switch 31. It is apparent that when the circuit is closed the motor will be in operation and the magnets will be magnetized, so as to close the valve 22. This will occur when both switch-bars *g* and *m* connect with the wire *n* or both with the wire *o*. When, however, both switch-bars do not connect to the same wire *n* or *o*, the magnets will be inoperative, and the pump 13 will be locked on account of the locking action of the worm 16 and gear 18. Therefore when the circuit is open the normal condition of the apparatus will be such that the pump 13 will be stopped and locked and the valve 22 will remain closed. The three-point switches 30 and 31 are so constructed that the rotation of the ratchet-plates 32 thereof will cause the respective bars *g* and *m* to switch. Said ratchet-plates 32 are provided with teeth 33, adapted to be engaged by the dogs 34 and 35 for rotating said plates, and thereby operating the switches. The dogs 34 and 35 operate the switches 30 and 31, respectively. The upper dog 34 is pivotally mounted on the sheave-frame 11 and normally rests on the ledge 36 in such a position that when the piston-rod 7 has nearly reached the upper limit of its travel the dog will engage a tooth on said upper switch-plate, and thereby throw the switch 30. On the down motion, however, the dog rises upon coming into contact with the next succeeding ratchet-tooth 33, and therefore passes by without rotating the upper ratchet-plate. In an analogous manner the lower dog 35 is pivotally mounted on the bracket 37 and is weighted, so as to normally rest in contact with the ledge 38 thereon. The parts are so arranged that on the downward motion of the piston-rod 7 the dog 35 will rotate the ratchet-plate of the lower switch 31, thereby throwing said lower switch; but on the upward travel said dog will pass by without affecting said lower switch. The lowest point of the travel of the piston-rod 7 is determined by the position of the lower dog 35 on said rod, and in order to vary said lowest point the bracket 37 is adjustable on said piston-rod by means of the set-screw 39.

In operation in the normal condition of rest the lamp 4 and piston-rod 7 are in the highest position, with the pump 13 stationary and the valve 22 closed. At this time the dog 34 is above the upper switch 30 and the switches 30 and 31 are in such condition that the circuit is open. For example, the switch-bar *g* connects with the point *e*, while the switch-bar *m* connects with the point *k*, as shown in full lines in the diagram Fig. 12. Now suppose it is desired to put the lamp in motion to travel down and up within the cylinder 1 for printing. Inasmuch as the circuit is open, the magnets 28 are inactive, and the operator may throw the lever 26, so as to bring the armature 27 away from the magnets and open the valve 22. The opening of the valve permits the liquid to escape from the cylinder 8, and the action of gravity upon the lamp and piston causes the same to descend, the liquid flowing through the drain-pipe 23 into the vessel 21. In descending the piston-rod causes the dog 35 to engage the ratchet-plate of the lower switch 31 and close the circuit—that is to say, throw the switch-bar *m*, so as to connect with the point *i*. (Shown in the diagram Fig. 12.) The closing of the circuit causes the magnetization of the magnets 28, so that they attract the armature 27 and close the valve 22. At the same time the closing of the circuit causes the motor 14 to start and operate the pump 13 to fill the cylinder. This causes the rise of the piston-rod 7 and lamp 4. In rising to its highest point the piston-rod causes the dog 34 to throw the switch 30, so as to open the circuit—that is, throw the bar *g* so as to connect with the point *f*, the bar *m* still connecting with the point *i*. The opening of the circuit causes the stoppage of the motor; but the valve 22 remains closed, so that the lamp stays at its highest position until the operator again opens the valve. It is desirable that the lamp should normally stay at its highest position, for it is necessary that the lamp be above the cylinder 1 when the latter is rotated on its trunnions. Moreover, it is usual to require but a single complete return travel of the lamp for printing, and by thus stopping the lamp at the end of the up travel it is not necessary for the operator to be present to prevent overexposure by reason of more than one trip of the lamp. The next succeeding trip of the lamp is similar to the first, except that the line *o* will be in circuit when the circuit is closed instead

of the line *n*, as above described. Each alternate complete trip of the lamp will employ the line *n*, and the intervening trip will employ the line *o*.

The travel of the lamp may be made shorter by lowering the adjusted position of the bracket 37 on the rod 7, thereby causing the dog 35 to sooner engage the lower switch 31.

At the time of the conception of our present invention we were aware of the invention of Charles E. Sargent, as described in his application for Letters Patent, filed in the United States Patent Office May 8, 1903, Serial No. 156,204.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a lamp-controller for electric printing apparatus, the combination of a lamp, a cylinder, a piston working in said cylinder and connected to said lamp, and a valve for the escape of operating fluid from said cylinder during the motion of said piston in lowering said lamp, said valve being open during the motion of said piston in lowering the lamp, and closed during the motion of said piston in raising the lamp.

2. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; a valve through which the operating fluid escapes from said cylinder during the motion of the piston in lowering the lamp; and means for automatically operating said valve.

3. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; automatic means for causing the piston to travel in one direction; and a valve for controlling the travel of said piston in the opposite direction.

4. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; means for causing the piston to travel in one direction; a valve for controlling the travel of said piston in the opposite direction; and means for opening said valve at the end of the piston travel in the first-mentioned direction.

5. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; means for causing the piston to travel in one direction; a valve for controlling the speed of travel of said piston in the opposite direction; and positive-acting means for automatically closing said valve at the end of the piston travel in said last-mentioned direction.

6. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; a valve for the escape of operating fluid from said cylinder during the motion of said piston in lowering the lamp, said valve being open during the lowering of said piston and closed during the raising thereof; and a pump for raising said piston.

7. In a lamp-controller for electric printing apparatus, the combination of a lamp, a cylinder, a piston working in said cylinder and connected to said lamp; and a pump for moving said piston.

8. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; a pump for moving said piston in one direction and a valve for controlling the speed of piston travel in the opposite direction.

9. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; a pump for forcing liquid into said cylinder to move said piston; and means for locking said pump to prevent the escape of liquid therethrough.

10. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; a valve for controlling the flow of liquid to and from said cylinder; a rotary pump for liquid connecting with said cylinder; and a worm and gear for operating said pump, said worm and gear constituting a locking device for preventing the accidental escape of liquid from said cylinder through said pump.

11. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; means for supplying fluid under pressure to said cylinder; an escape-valve connected with said cylinder; and electrical apparatus for simultaneously closing said escape-valve and admitting fluid to said cylinder from the source of fluid-supply.

12. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; an electrically-operated source of supply of fluid under pressure to said cylinder; an electrically-operated escape-valve in said cylinder; an electric circuit controlling both said source of supply and said escape-valve; and means for making and breaking said circuit.

13. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; electrically-driven means for supplying fluid under pressure to said cylinder; an escape-valve in said cylinder; electromagnets for operating said valve; an electric circuit containing said supplying means and said electromagnets in series; switches for making and breaking said cir-

cuits; and means connected to said piston for operating said switches during the travel of said piston.

14. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder, and connected to said lamp; electrically-driven means for supplying fluid under pressure to said cylinder; an escape-valve connected to said cylinder; electromagnets for operating said valve; an electric circuit containing said supplying means and said electromagnets in series; switches for making and breaking said circuits; means connected to said piston for closing said circuit when the piston is at the lowest point of its travel and for breaking said circuit when the piston is at the upper extremity of its travel.

15. In a lamp-controller for electric printing apparatus, the combination of a lamp; a cylinder; a piston working in said cylinder and connected to said lamp; electrically-driven means for supplying fluid under pressure to said cylinder; an escape-valve connected to said cylinder; electromagnets for operating said valve; an electric circuit containing said supplying means and said electromagnets in series; switches for making and breaking said circuits; means connected to said piston for breaking said circuit when the piston is at the upper extremity of its travel; and other means adjustably secured to said piston-rod for closing said circuit substantially as described.

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